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**An Exploration of the Technological, Pedagogical
and Content Knowledge (TPACK) Framework:
Utilising a Social Networking Site in Irish Higher Education**

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Abstract

Research into the use of social media for academic purposes is growing. Much of it suggests that social networking sites (SNSs) could be used as innovative tools for teaching (Duncan & Baryzck, 2013; Harris, 2012; O'Brien & Glowatz, 2013). This paper argues that research in this field has often neglected to take account of the pedagogy involved in successfully utilising a SNS for educational purposes. Koehler & Mishra (2009) have proposed the technological, pedagogical and content knowledge framework (TPACK) to explore the relationship of technology to teaching in order to build the basis for further research. We explore the suitability of the TPACK framework in the context of SNSs for academic engagement, and we review its relevance to the adoption of a SNS as a teaching tool. Our investigation so far suggests that the current TPACK framework overlooks some important elements that are relevant to the adoption of SNSs. This paper outlines some of these overlooked elements and evaluates the use of the TPACK framework in the exploration of SNS usage in higher education to engage students with curriculum. Specifically, we address the key question, 'Does the TPACK framework provide an insight into the knowledge base required to effectively deliver a module utilizing SNSs?'

Keywords: eLearning, Irish Higher Education, Social Networking Sites, TPACK

Introduction

Available academic literature on the use in higher education of social networks, such as Facebook or Xing, has increased. Facebook has over 1.31 billion monthly active users (Statistics Brain, 2015) and was initially created for university students. SNSs for academic purposes are viewed cautiously by some academics, while others perceive them as potentially useful in allowing for investigation, cooperation, and problem solving during the course of module delivery, especially online module delivery (Duncan & Baryzck, 2013). This paper reviews how Facebook is used as a pedagogical tool for student engagement. The TPACK framework is a useful heuristic tool for exploring the elements required for effective teaching with technology. However, our data points to some of its limitations.

Literature Review

Social Networking Sites as Academic Tools: The Case of Facebook

Harris (2012) proposes that the literature about Facebook in education can be organised into two key categories: first, the literature before 2010, which focuses mainly on student life from a marketing and communication perspective; second, the literature that looks at Facebook as an academic tool for teaching and learning activities and which began to flourish after 2009. In considering Facebook's usefulness for academic purposes, researchers and educators should bear in mind that this SNS was not intended for learning and teaching. It was built for social purposes and was later adopted as an academic tool in some institutions. To date, much of the second category of literature has focused on the learner and learning, rather than on the teacher and teaching (Harris, 2012). We suggest that a third category is now emerging, one that looks at the pedagogic considerations of utilising SNSs at third level. In an earlier article, we found that Facebook, when used as an academic tool, promotes student engagement beyond just information-sharing. Our study provided some insight into post-experience, post-graduate usage of SNSs (O'Brien & Glowatz 2013). It found that learner participants demonstrated high levels of collaboration and

academic discussion, which ultimately prompted deeper engagement with the module concepts than might have occurred in the traditional classroom environment. Given the increasing interest in social networking sites for academic purposes, our current paper offers a review of the TPACK framework and uses it to explore the considerations of teaching with a SNS.

The TPACK Framework

The TPACK framework was introduced for teachers and researchers to enable them to conceptualise the knowledge base to teach effectively with technology (Schulman, 1987). Koehler & Mishra (2009) point out that traditional teaching technologies – including tools as simple as a pencil, for example -- tend to have characteristics such as specificity, stability, and transparency of function.¹

By contrast, digital technologies tend to be usable in many different ways, and they are unstable and opaque in that their mechanics are not usually visible to users. From a teaching perspective, they present challenges of perception. Facebook, for example, is generally understood as a social tool, and institutions may therefore be reluctant to use it for academic purposes. The TPACK framework, however, does allow for exploration of Facebook from a teaching perspective by outlining a complex interaction between three areas of knowledge -- content, pedagogy and technology -- which together produce the category of “flexible knowledge” required to integrate technology into teaching. As so far the Framework has looked only at technology in more general terms, this paper reviews it in the context of a social networking site.

According to TPACK, the central elements of good teaching with technology include content, pedagogy, and technology, and only the planned interplay between these three domains can generate the type of flexible knowledge required to successfully incorporate technology into

¹ In the research to date, different terms have been used to refer to the instructor, including both ‘teacher’ and ‘lecturer.’ Articles from the United States tend to refer to the ‘teacher’ (Schulman, 1986; 1987). As the term ‘lecturer’ is more commonplace in Irish higher education, it is used here inclusively to mean teacher, instructor, and lecturer.

teaching. Koehler & Mishra (2009) acknowledge that teaching is a complex phenomenon, noting that teachers often need to practice ‘their craft’ in dynamic environments that require them constantly to develop their own understanding. What is more, a new technology may be obscure and unstable. It may present unexpected challenges surrounding ethics and privacy. It may be regarded with suspicion by the educational institutions or departments in which practitioners work. Thus, the task of integrating technology into teaching can be complex and difficult. Mishra & Koehler (2009) believe that while there is no ‘one best way’ to incorporate technology into the learning environment, the three central components of content, pedagogy and technology are central to its success. They argue that the interaction between these three areas is crucial to the quality and scope of any technology integrated into teaching. Building on Shulman’s work (1986; 1987), Mishra & Koehler maintain that the TPACK framework may capture how a lecturer’s knowledge of educational technology influences ways in which the domains of content and pedagogy interact with knowledge in the classroom. As important as these three components are, so too are the relationships between the areas of knowledge: PK (pedagogical knowledge), TK (technological knowledge), and CK (content knowledge) which make up the core components of the overall TPACK framework (Figure 1).

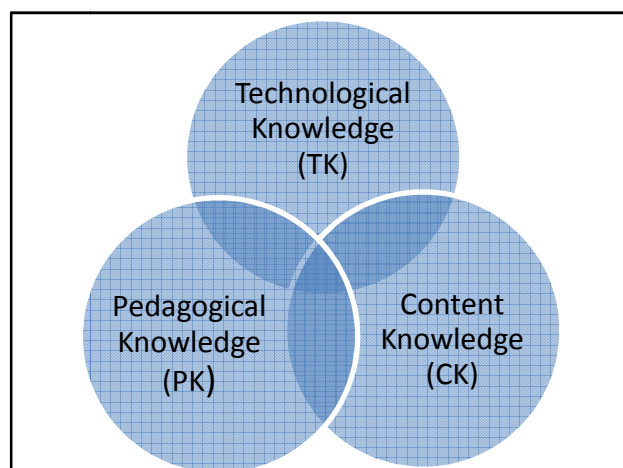


Figure 1 The TPACK Framework and its knowledge components

TPACK Framework Components

In total, the TPACK Framework is comprised of seven components. **Content knowledge (CK)** relates to lecturer knowledge regarding the material to be taught or learnt. A lecturer needs to have in depth content knowledge of the concepts, theories, evidence, practices and approaches that might develop a student's understanding of the material. In our case study outlined below, the content knowledge pertained to the discipline of Management Information Systems and its incorporation of Facebook. **Pedagogical Knowledge (PK)** provides insight into the lecturer's knowledge about the methods or practices of teaching and learning, including educational values, rationales and intents. It also includes awareness of how students learn and are assessed, and how content knowledge is best communicated. According to Koehler & Mishra (2009) **Technology Knowledge (TK)** is the most dynamic element of the framework given how any particular technological tool can be outdated by the time it is researched or discussed. TK is never an 'end state' (2009, p.74) but is all the time advancing as the individual interacts with the technology. **Pedagogical Content Knowledge** refers to the lecturer's unique understanding of the subject matter interpreted and presented to students via insight into the curriculum, the needs of the cohort, the required assessments, and so on. It depends upon the ability of the lecturer to negotiate the relationships between the different discipline ideas, pedagogic strategies, and the prior knowledge of the learners. **Technological Content Knowledge (TCK)** addresses the close relationship between content knowledge and technology, which, in its constant state of change, prompts new understandings of the world. Koehler & Mishra (2009) give the example of how digital computing advanced understanding of mathematics and physics and led to a fundamental change in the nature of these fields. An appreciation of the impact of technology on practices and knowledge of a particular subject area is fundamental to advancing appropriate technological tools in educational settings. Lecturers who appreciate distinctions between specific technological tools will be best suited to address the subject-matter and how technology might change the content of their discipline, or vice versa. **Technological Pedagogical Knowledge** demonstrates how an understanding of learning

and teaching can alter when a specific technology is utilised in a certain fashion, including how the quality of the teaching object or environment relates to the module and to the potential development of suitable pedagogical strategies and designs to aid student learning. Finally, **Technology, Pedagogy and Content Knowledge (TPACK)** is an emergent form of knowledge that pervades all the key constituents (2009). TPAC knowledge derives from the dynamic between pedagogy, technology and content knowledge, and yet it is a unique type of knowledge that forms the basis of effective teaching with technology. It demands an appreciation of concepts using technology; of pedagogic tools using technology; of concepts presented to students as challenges; of the ability of technology to overcome some of these challenges; of students' previous knowledge and theories of epistemology; and of how technologies have led to new ways of understanding. Koehler & Mishra (2009) acknowledge that there is no single correct amalgamation of how these elements should be understood or utilised. A ready lecturer will be able to adapt and respond to the fields of technology, content and pedagogy (T, C and P) and the areas of interplay between them (PCK, TPK, TCK and TPACK).

Implications of TPACK

The TPACK framework is adaptable to most academic inquiry into the utilisation of SNSs for teaching purposes. It acknowledges a number of the key variables and allows for the flexible combination of them depending on the dynamic of the learning environment. An inherent strength of the framework is its capacity for aiding the review of technology not simply as an 'add-on,' but with a view to the connections between the three domains of content, technology and pedagogy in the learning environment (2009). So while the framework does help conceptually with the knowledge base required by lecturers, it may also misrepresent the human interaction required in this knowledge transfer. There could be three elements to this misrepresentation: first the lecturer's accumulated knowledge of the teaching practice brought to the learning experience; second the centrality of the learner's understanding in the experience of being taught with technology; third the

lecturer's proficiency with the technology, particularly a SNS, to enhance the quality of the education experience. Each of these elements is briefly discussed from a theoretical perspective before the results of this study are reviewed.

First, Voogt *et al.* (2013) completed a systematic literature review of 55 peer-reviewed journal articles and one book chapter that were published between 2005 and 2011 in order to explore the theoretical and practical uses of TPACK. They note the value of the TPACK framework in acknowledging that technology supports students in learning the conceptual and procedural aspects of a particular subject domain. Voogt *et al.* (2013) suggests that it is important to understand how technological reasoning affects academics' decisions when using technology. Equally, they suggest that lecturers themselves may need to be introduced to the benefits of technology for their subject in order to improve the learning and teaching environment.

Second, the current framework does not sufficiently account for lecturer knowledge of students' cultural backgrounds, social demographics, or pre-existing familiarity with the technology to be utilised. This shortcoming extends beyond the idea of pedagogic knowledge or its related areas of pedagogic content knowledge or pedagogic technological knowledge. It is indicative of a deeper concern regarding the centrality of the student to the learning process as outlined in the current TPACK framework. The model currently focuses on knowledge and the transfer of knowledge, rather than on the learning experience of the student. The research below demonstrates the importance of the lecturer's understanding of the students' profiles, as well as the lecturer's own 'Craft Knowledge' and 'Technological Knowledge'.

Third, an academic needs not only to be knowledgeable about technology, but be perceived by students as an expert with the adopted technological tool. Students' expectations of their lecturers and the use of technology in their teaching have changed. Central to a more engaging classroom

experience is an expectation for lecturers to have a high level of Technological Knowledge. This paper reviews the findings of one case study at University College Dublin (UCD) where the TPACK framework was used to gain insight into the knowledge base required to deliver a module effectively using a SNS. It also considers how the framework might be best adapted to reflect the student and lecturer experience.

Methodology

A case study design methodology was selected for this research project as it allowed for an in-depth analysis and encouraged the use of multiple data collection tools (Yin, 2008). Using online survey instruments, Qualtrics and SurveyMonkey, the authors designed a questionnaire as the primary data collection tool. Three surveys were distributed to the following select student cohorts during the academic year 2013/2014 at UCD's School of Business (Table 1).

Student Group	Module Title	Module Code	Academic Year	Sample Size	SNS Use	Allocation of module assessment
Master of Science (I-Business) full-time students	ICT Project Management	MIS40740	2013/2014	52	Closed Facebook group	Online contribution via Facebook (20% of module assessment)
Master of Science in Management	Business Information Systems Management	MIS40760	2013/2014	99	Closed Facebook group	No marks
Bachelor of Commerce (full-time)	eMarketing and Social Networking	MIS20040	2013/2014	192	Facebook Fan page	No marks

Table 1 Summary of data set sorted by student cohort

In each case, students were circulated with an online survey and had a two week period (Monday, 24th March 2014 until Sunday, 6th April 2014) to respond anonymously. Eighty three surveys were

completed, yielding a response of 34% (83/243). Identical questions were also administered that examined the use of Facebook in higher education and the students' experience of it .

Questions were a mix of open-ended, closed-ended and rating scale (which used a modified Likert scale). A copy of the survey is included in Appendix One. Qualtrics (<http://qualtrics.com/>), the survey instrument, was used to distribute the survey online as it had been used for other programme evaluations so the students were familiar with it. The statistical data was analysed using the tools of the Qualtrics survey software. This allowed the data to be analysed and cross-tabulated where appropriate. Descriptive statistics were used to summarise the survey's quantitative data/ content analysis, using themes arising from the literature, and were used for coding for open ended questions. Seven key themes were identified. They were student expectations, student experience, impact of technology, perception of knowledge base, student engagement, and challenges.

Research Findings

In exploring the extent of student expectation regarding the lecturer's Technological Knowledge, several findings emerged. Students' own usage of SNSs is quite high (Table 2). In particular, Facebook was the most utilised SNS of the investigated student cohort. 'Whatsapp' and 'Google+' were also popular social media applications that students cited under the 'Other' option.

Q. 7 Which of the following Social Media applications do you use?

Question	Daily	Weekly	Less than weekly	Never
Facebook	32%	0%	0%	0%
YouTube	61%	25%	6%	1%
LinkedIn	19%	24%	27%	19%
Twitter	18%	22%	17%	31%
Instagram	17%	12%	12%	46%
Other	8%	1%	2%	12%

Table 2 Student SNS Usage

Given the high rate of student usage and their familiarity with these technologies, there appeared to be an expectation that lecturers would be as proficient as students in using them. Some students alluded to a lower technological proficiency amongst teaching staff and appeared to experience some disappointment about this deficiency on various modules, as indicated by the representative student comments below:

Lecturers may not be able to understand our most effective learning habits. Also, it is slightly annoying when the lecturer is fumbling with the technology in class.
(Respondent 22 to Question 27)

We are used to our attention being grabbed by various different media, giving new and interesting angles on old discussions/topics so when different forms of technology aren't used to effectively express the point that is being made it is hard to pay attention. Social media/technology has increased my engagement with topics so when it isn't there I find there is some detachment.
(Respondent 24 to Question 27)

In question 19, students were asked to consider what impact the use of a social networking site, in this case Facebook, had on their learning for their respective modules. The responses to this question are presented in Table 3.

Q.19 What impact had the Facebook page/group on your learning for this module?

#	Answer	Response	%
1	Increased student productivity (better communication, engagement and learning experience)	64	82%
2	No impact	14	18%
3	Decreased student productivity (worse communication, engagement and learning experience)	0	0%
Total		78	100%

Table 3 Impact of Facebook on Student’s Learning

Overall, the use of Facebook for academic purposes resulted in an increased level of student productivity (82%). The positive aspects of the use of Facebook included ‘easier communication with lecturers’, ‘interesting posts’, and accessibility of information for the module. Others mentioned that the ‘informal form’ and the opportunity to learn from class mates in discussion or in locating resources was beneficial. A number of students mentioned the benefit to their own learning of the lecturer using Facebook. Furthermore, the Facebook page appeared to alter the relationship between the lecturer and the student, with some students perceiving the lecturer to be more accessible as a result of social media, as illustrated by the following student quotes:

Facebook page also makes our lecturer far more approachable which is hugely beneficial and greatly enhances the learning experience.
 (Respondent 24 to Question 20)

I use Facebook every day, every hour, every min, every sec haha.....I would say the positive impact is due to it's just there at your fingertips, if the lecture wants to post something nearly everyone see it straight away Also, I believe that when you see the lecture is actually making the effort to engage, students are much more likely to want to keep up with the discussion in class.
 (Respondent 17 to Question 20)

The information is shared instantaneously, we can see what other students are thinking about the course, it's like having the module outside the classrooms, very interesting because we don't realize we are working when we click on a link shared throughout the Facebook page.
 (Respondent 27 to Question 20)

Using Facebook as a channel to generate discussion may help to encourage students who are more introverted or find participating in lecture intimidating.
(Response 16 to Question 17)

Firstly, it had a positive impact because of the ease with which we could contact XX (name redacted) and expect a response. I use Facebook several times a day and it is more convenient to post a question to the group, than to send an email, (which I only check once a day, if even). Secondly, it exposed me to articles and videos that backed up what we had done in class, but that I may not have come across on my own.
(Respondent 44 to Question 20)

While students reported generally enjoying the accessibility of the module and the discussion available on Facebook, they were more tempered in terms of how a SNS might help them on other modules or the extent to which it helped engage them with their studies, as outlined by the findings in Table 4 below. Further findings about academic engagement, student collaboration and module content discussion are presented overleaf.

Q. 22 Students were asked to assess their experience of Social Networking and its impact on their studies								
#	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total Responses	Mean
1	Using Facebook for this module influenced my academic performance but distracted me from my studies	3	17	16	31	7	74	3.30
2	I would like more modules to make use of Social Networking Sites such as Facebook	19	36	15	4	1	75	2.09
3	Using Social Networking Sites helps to engage me more with my studies	12	39	14	8	1	74	2.28
4	I found the module more enjoyable because it used Facebook	19	23	25	7	0	74	2.27
5	I find using Facebook for this module was convenient	23	39	8	3	1	74	1.92
6	I found Facebook allowed me to think and/or discuss module concepts which I would not of otherwise	9	26	32	6	1	74	2.51
7	It helped me to improve collaboration with fellow	9	30	25	8	2	74	2.51

	class members							
	Facebook is for personal and social use only,							
8	I dislike its use for academic purposes	3	4	15	32	20	74	3.84

Table 4 Impact of Social Networking on the Students’ Studies

While Facebook did appear to enhance student perception of the lecturer and of lecturer accessibility, the results of other aspects of teaching and learning, and their relationship with Facebook itself, were more varied. Table 4 suggests that students generally enjoyed the experience of social networking as a part of their studies. Some were of the opinion that they were able to discuss module concepts, which, they felt, would not have been possible otherwise and that Facebook helped with student collaboration. But they were more measured in their support of it in regard to teaching and learning. While some students did report that using Facebook was ‘enjoyable,’ others suggest it was a distraction from their studies (see question 1 of Table 4 above).

The majority of students perceived an academic’s lack of technological knowledge as a negative impact on the their own learning, as outlined in Table 5 below:

Q. 26 In your opinion, do you think a lecturer’s possible lack of technological knowledge (i.e. the lecturer NOT utilising innovative ICT and Social Media as part of the module delivery) has a NEGATIVE impact on your learning experience? (Question 26)

Answer	%
Yes	64%
No	36%
Total	100%

Table 5 Impact of Lecturer’s Level of Technological Knowledge on Perceived Student Learning

Not only was it the case that students may expect lecturers to draw upon social media, social media was seen to be potentially linked to the credibility of the teaching delivered. Some students spoke about a loss of 'legitimacy' in how an academic not using SNSs is perceived amongst the students. While there is no data in this study to suggest this reduced legitimacy, it is possible that the observation might be particularly valid in relation to modules that teach technology or business information systems management. When asked if a technology knowledge gap affected their learning, a number of students suggested that it was important that staff are seen to be abreast of new technologies and that the perception alone has implications for their teaching credibility, as outlined by the illustrative quotes provided below:

Because the lecturer loses all legitimacy in front of his students.....It is all related, so if a lecturer does not use the technology (practical) as they are explaining the theory of it, it is hard to appreciate the theory the lecturer is teaching you.
(Respondent 30 to Question 27)

I believe that it may have negative impact if a lecturer does not understand the relevance of new media or means of communication. It can damage the reputation and rapport of a lecturer when he/she is giving a class, and thus lose their interest/respect for the rest of the semester.
(Respondent 29 to Question 20)

We are used to our attention being grabbed by various different media, giving new and interesting angles on old discussions/topics so when different forms of technology aren't used to effectively express the point that is being made it is hard to pay attention. Social media/technology has increased my engagement with topics so when it isn't there I find there is some detachment.
(Respondent 25 to Question 27)

It is all related, so if a lecturer does not use the technology (practical) as they are explaining the theory of it, it is hard to appreciate the theory the lecturer is teaching you. (Response 31 to Question 27)

Finally:

It makes me feel more comfortable with this module, gives it legitimacy. It gives the teacher an image of someone that wants to be close to his students, and thus it is motivating.
(Respondent 29 to Question 20)

In summary, students appeared to find the use of Facebook for their learning beneficial, as outlined in Table 3 and Table 4. While Facebook was reported by students as advantageous, there were some

mixed insights into its impact on other teaching and learning areas such as student collaboration and online student discussion. Students were strongly engaged with social media networks themselves as outlined by Table 4 and had some expectations regarding what use lecturers might make of such resources. Students reported that where a lecturer appeared not to be innovative with ICT and social media as part of the module experience, their learning was impacted upon negatively. (See Table 5 above.) This feedback provides insight into the knowledge base expected by students of lecturers to effectively deliver a module using an innovative SNS. Where a lecturer demonstrated this knowledge base and engaged successfully with a social network, lecturer credibility appeared to increase.

Discussion

The TPACK framework does provide invaluable insights into the many complexities of the knowledge bases that lecturers utilise to successfully design and deliver modules incorporating SNSs. TPACK provides a heuristic tool to understand the dynamics involved in engaging students, and its elements of pedagogical knowledge, content knowledge, and technological knowledge are alluded to by students in their responses above. Developed by Koehler & Mishra (2009), the framework acknowledges a number of the key variables, such as the technological knowledge students expect of their lecturers in order to design and implement innovative and sustainable module content and delivery strategies for today's and tomorrow's student cohorts. From the data presented here, a lecturer's technological knowledge does seem to favourably impact on a student's learning and help to develop an engaging virtual learning environment, in this case on a social networking site. Students related the experience of using a social networking site as having a positive impact on their learning as outlined in Table 3 above. They reported a sense of increased engagement and productivity. They appreciated the 'accessibility' of their lecturer. The lecturer's proficiency with technology appeared to support the interplay between the content and pedagogical knowledge to support a flexible, positive learning environment. In particular, students' perceptions

of the impact on their learning of a lecturer's lack of technological knowledge are interesting (Table 5). Students associate the technological knowledge of an academic with competence. As outlined, there are potentially three elements to this concept of technological knowledge. First, the lecturer's accumulated knowledge of their practice of teaching does impact upon students. Second the student experience of being taught with sustainable technology-driven initiatives must be monitored. Students repeatedly commented on the flexibility, accessibility, informality and level of engagement experienced with this module. The data presented here further suggested that lecturers ought to understand the needs of students these days and identify feasible tools to 'reach out' to the student population. The opportunity to discuss course material and to engage directly with the lecturer appears to have demonstrated that the lecturer understood the students' experience and what might assist their learning. Third, the lecturer's proficiency with the chosen technology appears to have a direct impact on the concept of technological knowledge. Students outline the frustration experienced when a lecturer does not use or does not proficiently make use of technology in their teaching. The absence of technology in the classroom suggests a lack of legitimacy and indicates a potential gap in the understanding of the expectations of 'digital natives.'

To summarise, the authors identified a number of key observations:

- A lecturer needs to understand the students' knowledge and familiarity with technology. This observation is in line with the TPACK framework. The data above and the samples of student quotes suggest that students appreciated where the lecturer had a technological knowledge of a SNS. A lecturer's ability to gauge student levels of engagement and familiarity with technology enhanced their experience and perceived learning. Students appeared frustrated when teaching staff were not in tune with their students' familiarity with technology, as illustrated by the survey quotes above, particularly that of Respondent 29 to Question 20.
- The importance of lecturer's craft knowledge when using new technologies needs to be acknowledged. This is overlooked by the current TPACK framework. The approach of an

individual to their teaching, including the knowledge that underpins their pedagogy, their depth of knowledge of subject matter, their knowledge of students and curriculum, and even their belief system appears to directly impact on student learning. As one student stated above:

I use Facebook everyday, every hour, every min, every sec haha.....I would say the positive impact is due to it's just there at your fingertips, if the lecturer wants to post something nearly everyone see it straight away Also, I believe that when you see the lecture is actually making the effort to engage, students are much more likely to want to keep up with the discussion in class. (Respondent 17 to question 20)

- The data suggests that a lecturer who positively engages with technology experiences increased credibility with students. Students were very positive regarding the extent of lecturer engagement and also the opportunity for lecturer engagement using a social network site. In addition to students having a positive experience of using a Social Networking Site, lecturer affinity for SNSs appears to impact directly on student perception too.

Conclusion and Future Research

While the existing TPACK framework has proven useful, it would be more useful if it graphically incorporated the student experience. Further empirical work is required to understand the complex exchange between student and staff in the digital environment, particularly in higher education. As technology continues to be of increasing importance to the learning environment, the TPACK framework is likely to become more important too.

Further research might explore the question, 'How might the TPACK framework be adapted to best reflect the experience of both lecturer and student?' The TPACK framework (Koehler & Mishra, 2009) is indeed a useful heuristic to explore the knowledge base for lecturers to teach with technology. It provides a means to explore the complex dynamic of the learning environment. However, it requires further exploration into the 'craft knowledge' of lecturers and the means by which they effectively combine the disparate elements of the learning experience to create a positive learning environment, especially a virtual one. A follow up survey has been circulated to

explore the academic's perception of technological knowledge and how it affects students and student learning. In addition to the three key observations outlined above, there is some concern regarding the omission of the student within the TPACK framework. This is an important dimension that warrants further exploration in this dynamic and emergent field of investigation.

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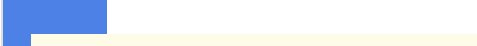

Appendix One (Survey and Results)

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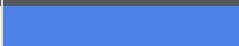
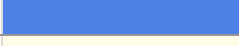
1. Research: The use of Social Media for academic purposes The research project is being conducted by Matt Glowatz and Orna O'Brien both employed at UCD's School of Business. What is the research about? The use of social networking can assist with student engagement. The purpose of this survey is to assess the experience of students in using a SNS in the academic environment exploring students' experience of using Facebook, the challenges and opportunities presented by it and the student insight into the online discussion environment. Why is the research being conducted? The results of the study will inform faculty about students' perception and attitude towards the use of Social Media in the higher education sector. How will the data be used? Once the survey has been completed, the data gathered from each student will be analysed based on the themes set out in the survey. How will your privacy be protected? The survey does not require students to indicate their identity when completing it, thus, protecting their anonymity. When preparing the final research report, no student will be named or identified. The report will only present the findings in a general way through a statistical overview of the changes evident in academic skills across the year. Narrative comments made by students in the survey may also be incorporated into the report (without any reference to the names of the students concerned). What are the benefits of taking part in this research study? Participating in the survey will allow you to reflect upon your overall experience of using a social networking site for academic purposes. This reflection will assist the programme in ensuring that appropriate support is provided to students undertaking the module in the future and that continuous improvements are made to the module to maximise the students' learning experience. What are the risks of taking part in this research study? There are no risks to students from taking part in this study. All data gathered will be securely stored by the researchers and data will be held in a confidential and anonymous manner. No student will be identifiable in any research report produced. Can you change your mind at any stage and withdraw from the study? Your participation in the survey is entirely voluntary. You may withdraw from the study at any stage (such withdrawal will be entirely free of any consequences). How will you find out what happens with this project? A summary of the project findings will be circulated to participants by email upon request. The survey should take approximately 10 minutes to complete, thank you. For any further questions, please contact Matt @ matt.glowatz@ucd.ie Please state "Yes" below to Indicate that you have read the above information and are happy to participate in this study. Otherwise, you will be redirected to the end of this survey, thanks.

#	Answer	Response	%
1	Yes	82	99%
2	No (you will be redirected to the end of this survey)	1	1%
	Total	83	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.01
Variance	0.01
Standard Deviation	0.11
Total Responses	83

2. How old are you?				
#	Answer		Response	%
1	18 - 24		59	72%
2	25 - 29		18	22%
4	30 +		5	6%
	Total		82	100%

Statistic	Value
Min Value	1
Max Value	4
Mean	1.40
Variance	0.61
Standard Deviation	0.78
Total Responses	82

3. Are you?				
#	Answer		Response	%
1	Male		41	50%
2	Female		41	50%
	Total		82	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.50
Variance	0.25
Standard Deviation	0.50
Total Responses	82

4. Are you an.....?				
#	Answer		Response	%
1	Irish student		51	64%
2	International student spending one semester or one year @ UCD		29	36%
	Total		80	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.36
Variance	0.23
Standard Deviation	0.48
Total Responses	80

5. Which of the following devices do you use for general day-to-day purposes?							
#	Question	Every Day	Every Week	Less than weekly	Never	Total Responses	Mean
1	Desktop Computer	5	9	16	39	69	3.29
2	Laptop	69	10	0	0	79	1.13
3	Tablet (iPad etc)	14	12	17	28	71	2.83
4	Smartphone	77	1	0	2	80	1.09
5	eReader	3	3	4	57	67	3.72

Statistic	Desktop Computer	Laptop	Tablet (iPad etc)	Smartphone	eReader
Min Value	1	1	1	1	1
Max Value	4	2	4	4	4
Mean	3.29	1.13	2.83	1.09	3.72
Variance	0.91	0.11	1.34	0.23	0.57
Standard Deviation	0.96	0.33	1.16	0.48	0.75
Total Responses	69	79	71	80	67

6. Which of the following devices do you use for educational purposes?

#	Question	Every Day	Every Week	Less than weekly	Never	Total Responses	Mean
1	Desktop Computer	2	7	17	41	67	3.45
2	Laptop	73	6	0	1	80	1.11
3	Tablet (iPad etc)	8	9	11	38	66	3.20
4	Smartphone	34	24	8	9	75	1.89
5	eReader	3	2	2	59	66	3.77

Statistic	Desktop Computer	Laptop	Tablet (iPad etc)	Smartphone	eReader
Min Value	1	1	1	1	1
Max Value	4	4	4	4	4
Mean	3.45	1.11	3.20	1.89	3.77
Variance	0.64	0.18	1.18	1.04	0.52
Standard Deviation	0.80	0.42	1.08	1.02	0.72
Total Responses	67	80	66	75	66

7. Which of the following Social Media applications do you use?

#	Question	Every Day	Every Week	Less than weekly	Never	Total Responses	Mean
1	Facebook	79	0	0	0	79	1.00
2	YouTube	51	21	5	1	78	1.44
3	LinkedIn	16	20	23	16	75	2.52
4	Twitter	15	18	14	26	73	2.70
5	Instagram	14	10	10	38	72	3.00
6	Other (please specify)	8	1	2	10	21	2.67

Other (please specify)
Whatsapp
Whatsapp
whatsapp
Snapchat, Whatsapp
pinterest
wechat
Google +
Google+
tumblr
WhatsApp, etc.
Buzzfeed
Whats app

Statistic	Facebook	YouTube	LinkedIn	Twitter	Instagram	Other (please specify)
Min Value	1	1	1	1	1	1
Max Value	1	4	4	4	4	4
Mean	1.00	1.44	2.52	2.70	3.00	2.67
Variance	0.00	0.46	1.12	1.35	1.46	2.26
Standard Deviation	0.00	0.68	1.06	1.16	1.21	1.50
Total Responses	79	78	75	73	72	22

8. How familiar are you using any the following Social Media applications ?

#	Question	Very familiar	Familiar	Not familiar / I don't use this application	Total Responses	Mean
1	Facebook	77	3	0	80	1.04
2	YouTube	67	13	0	80	1.16
3	LinkedIn	26	33	20	79	1.92
4	Twitter	26	25	28	79	2.03
5	Instagram	25	12	40	77	2.19
6	Other (please specify)	4	2	8	14	2.29

Other (please specify)
Whatsapp
Whatsapp
pinterest
wechat
Google +
Google+

Statistic	Facebook	YouTube	LinkedIn	Twitter	Instagram	Other (please specify)
Min Value	1	1	1	1	1	1
Max Value	2	2	3	3	3	3
Mean	1.04	1.16	1.92	2.03	2.19	2.29
Variance	0.04	0.14	0.58	0.69	0.82	0.84
Standard Deviation	0.19	0.37	0.76	0.83	0.90	0.91
Total Responses	80	80	79	79	77	14

9. Do you follow any company's or organisation's social media channels for educational purposes, e.g. assignment preparation, knowledge transfer, using gathered information for class discussion?

#	Answer	Response	%
1	Yes	59	74%
2	No	21	26%
	Total	80	100%




Statistic	Value
Min Value	1
Max Value	2
Mean	1.26
Variance	0.20
Standard Deviation	0.44
Total Responses	80

10. If you answered "yes" to the above, which channels do you use to follow these companies/organisations (multiple answers are possible)?

#	Answer	Response	%
1	Twitter	23	40%
3	LinkedIn	28	48%
4	Facebook	45	78%
5	Google+	7	12%
6	Web Site	31	53%
7	Other, please specify	4	7%

Other, please specify
YouTube
youtube
Youtube
Instagram

Statistic	Value
Min Value	1
Max Value	7
Total Responses	58

11. Which module are you enrolled in?				
#	Answer		Response	%
1	MIS20040 (eMarketing & Social Networking)		34	43%
2	MIS40740 (ICT Project Management - MSc iBusiness)		15	19%
3	MIS40760 (Business Information Management - MSc Business)		30	38%
	Total		79	100%

Statistic	Value
Min Value	1
Max Value	3
Mean	1.95
Variance	0.82
Standard Deviation	0.90
Total Responses	79

**12. For what particular purposes do you check your Facebook account for this module?
(Multiple answers are possible)**

#	Answer	Response	%
1	I didn't use Facebook it for this module	2	3%
2	To read what fellow class members posted	72	90%
3	To discuss and contribute to existing posts	34	43%
4	To create new discussion posts	22	28%
5	To ask general module-related questions	38	48%
6	To contact the lecturer	27	34%
7	Other (please specify)	1	1%

Other (please specify)
To work on group assignments

Statistic	Value
Min Value	1
Max Value	7
Total Responses	80

13. On average, how many times do you check the Facebook group/page for this module?

#	Answer	Response	%
1	Never	1	1%
2	Once a month	1	1%
3	Once a week	22	28%
4	Several times a week	18	23%
5	Once a day	15	19%
6	Several times each day	18	23%
7	Other (please specify)	5	6%
	Total	80	100%

Other (please specify)
Available upon request

Statistic	Value
Min Value	1
Max Value	7
Mean	4.49
Variance	1.87
Standard Deviation	1.37
Total Responses	80

14. Would you have used this module's Facebook page if marks were NOT awarded for participation on this module?

#	Answer	Response	%
1	Yes	13	87%
2	No	2	13%
	Total	15	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.13
Variance	0.12
Standard Deviation	0.35
Total Responses	15

15. Would you have used this module's Facebook page more frequently if marks were awarded for participation/contribution?

#	Answer	Response	%
1	Yes	56	86%
2	No	9	14%
	Total	65	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.14
Variance	0.12
Standard Deviation	0.35
Total Responses	65

16. Should assessment marks be awarded for participation/contribution on this module's Facebook page/group?

#	Answer	Response	%
1	Yes	29	36%
2	No	51	64%
	Total	80	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.64
Variance	0.23
Standard Deviation	0.48
Total Responses	80

17. Please use the space below to provide more information why marks SHOULD be awarded for a student's contributions to this module's Facebook page?

Text Response

Available upon request

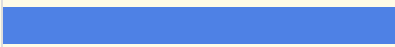

Statistic	Value
Total Responses	23

18. Please use the space below to provide more information why marks should NOT be awarded for a student's contributions to this module's Facebook page?

Text Response

Available upon request

Statistic	Value
Total Responses	38

19. What impact had the Facebook page/group on your learning for this module?				
#	Answer		Response	%
1	Increased student productivity (better communication, engagement and learning experience)		64	82%
2	No impact		14	18%
3	Decreased student productivity (worse communication, engagement and learning experience)		0	0%
Total			78	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.18
Variance	0.15
Standard Deviation	0.39
Total Responses	78

20. Please use the space below to provide more information why the module's Facebook page had a positive impact on your learning experience?

Text Response
Available upon request

Statistic	Value
Total Responses	48

21. Please use the space below to provide more information why the module's Facebook page had a negative impact on your learning experience?

Text Response

Statistic	Value
Total Responses	0

22. Please select one option								
#	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total Responses	Mean
1	Using Facebook for this module influenced my academic performance but distracted me from my studies	3	17	16	31	7	74	3.30
2	I would like more modules to make use of Social Networking Sites such as Facebook	19	36	15	4	1	75	2.09
3	Using Social Networking Sites helps to engage me more with my studies	12	39	14	8	1	74	2.28
4	I found the module more enjoyable because it used Facebook	19	23	25	7	0	74	2.27
5	I find using Facebook for this module was convenient	23	39	8	3	1	74	1.92
6	I found Facebook allowed me to think and/or discuss module concepts which I would not of otherwise	9	26	32	6	1	74	2.51
7	It helped me to improve	9	30	25	8	2	74	2.51

	collaboration with fellow class members							
8	Facebook is for personal and social use only, I dislike its use for academic purposes	3	4	15	32	20	74	3.84

Statistic	Using Facebook for this module influenced my academic performance but distracted me from my studies	I would like more modules to make use of Social Networking Sites such as Facebook	Using Social Networking Sites helps to engage me more with my studies	I found the module more enjoyable because it used Facebook	I find using Facebook for this module was convenient	I found Facebook allowed me to think and/or discuss module concepts which I would not otherwise	It helped me to improve collaboration with fellow class members	Facebook is for personal and social use only, I dislike its use for academic purposes
Min Value	1	1	1	1	1	1	1	1
Max Value	5	5	5	4	5	5	5	5
Mean	3.30	2.09	2.28	2.27	1.92	2.51	2.51	3.84
Variance	1.12	0.79	0.84	0.91	0.71	0.75	0.88	1.04
Standard Deviation	1.06	0.89	0.91	0.96	0.84	0.86	0.94	1.02
Total Responses	74	75	74	74	74	74	74	74

23. Rank the following eLearning applications in order of preference accessing module related content (most preferred (1) to least preferred (5) device). Note: Please move your mouse over the selected answer and move up/down

#	Answer	1	2	3	4	Total Responses
2	Blackboard	26	24	15	2	67
3	Facebook	16	29	20	2	67
4	Combination of both	23	10	30	4	67
5	Other	2	4	2	59	67
	Total	67	67	67	67	-

Other
Twitter
Twitter
Dropbox
Blog
e-mail
3, 1, 2
A mix of both in 1 tool: eg. Bluekiwi
Books, Journals and other study materials
academic websites
Whatsapp

Statistic	Blackboard	Facebook	Combination of both	Other
Min Value	1	1	1	1
Max Value	4	4	4	4
Mean	1.90	2.12	2.22	3.76
Variance	0.73	0.65	0.99	0.49
Standard Deviation	0.86	0.81	1.00	0.70
Total Responses	67	67	67	67

24. In your opinion, what other Social Media applications would benefit your learning experience at university? (Multiple answers are possible)

#	Answer	Response	%
1	Twitter	13	18%
2	YouTube	54	73%
3	Blogs	40	54%
4	Wikis	27	36%
5	LinkedIn	16	22%
6	Other	4	5%
7	Social Media applications would not be used for studying and learning in higher education	5	7%

Other

Whatsapp
 Whatsapp
 Podcasts of the lectures
 whatsapp, a short message to remind about meetings/fairs, or so

Statistic	Value
Min Value	1
Max Value	7
Total Responses	74

25. Do you believe today's student is more knowledgeable about day-to-day technologies and applications, such as Social Media, Mobile and the Internet, than the lecturer?

#	Answer	Response	%
1	Yes	46	61%
2	No	13	17%
3	Don't know	17	22%
	Total	76	100%

Statistic	Value
Min Value	1
Max Value	3
Mean	1.62
Variance	0.69
Standard Deviation	0.83
Total Responses	76

26. In your opinion, do you think a lecturer’s possible lack of technological knowledge (i.e. the lecturer NOT utilising innovative ICT and Social Media as part of the module delivery) has a NEGATIVE impact on your learning experience?

#	Answer	Response	%
1	Yes	49	64%
2	No	27	36%
	Total	76	100%

Statistic	Value
Min Value	1
Max Value	2
Mean	1.36
Variance	0.23
Standard Deviation	0.48
Total Responses	76

27. Why do you think the technology knowledge gap has a negative impact on your learning experience?

Text Response
Available upon request

Statistic	Value
Total Responses	35

28. Should lecturers incorporate the following applications as part of their module design to improve student's learning experience?

#	Question	Definitely	Maybe	No	Total Responses	Mean
1	Facebook	44	26	2	72	1.42
2	Twitter	11	32	23	66	2.18
3	YouTube	41	29	2	72	1.46
4	Blogs	26	34	7	67	1.72
5	Wikis	13	39	12	64	1.98
6	Other	4	1	1	6	1.50
10	Blackboard	51	17	2	70	1.30

Other
Whatsapp
Readings,Cases
Podcasts
Google+
Class Participation
whatsapp

Statistic	Facebook	Twitter	YouTube	Blogs	Wikis	Other	Blackboard
Min Value	1	1	1	1	1	1	1
Max Value	3	3	3	3	3	3	3
Mean	1.42	2.18	1.46	1.72	1.98	1.50	1.30
Variance	0.30	0.49	0.31	0.42	0.40	0.98	0.27
Standard Deviation	0.55	0.70	0.56	0.65	0.63	0.99	0.52
Total Responses	72	66	72	67	64	8	70

29. Do you have any other comments related to the use of Facebook for this module?

Text Response

Available upon request

Statistic	Value
Total Responses	26

30. Please enter your email address here if you are willing to participate in a more detailed interview by phone or face-to-face for this particular research, thanks.

Text Response

Statistic	Value
Total Responses	24

