

Engineering Student Use of Facebook as a Social Media 'Third Space'

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CONTEXT In the context of engineering education, the potential of social media to open new modes of communication, interaction and experimentation between students and teachers has been identified. Facebook (facebook.com) is a popular social network system, with hundreds of millions of users, and examples of its use in engineering education can be found documented in the literature. A systems view of engineering education would typically position social media as a communication space that is either: i) controlled by the university for academic purposes; or, ii) controlled by students for social purposes. An emerging area of social media research is the investigation of student-created Facebook groups as a 'third space', between the institutional space of teacher-managed Facebook groups and the non-institutional, student personal space of the Facebook network.

PURPOSE This paper investigates and characterises public Facebook pages and groups relating to engineering at Deakin University to determine if they exhibit the distinctive characteristics proposed in the literature for student-created 'third space' Facebook groups.

APPROACH A search was undertaken to locate public Facebook pages and groups relating to engineering at Deakin University, and the posts and comments from those pages were captured. The Facebook data were graphed to visualise the frequency of posts and comments over time. The text content from the posts and comments was analysed using text analytics and the results visualised to show major themes present.

RESULTS Five Facebook pages and six Facebook groups were identified, containing 1484 posts and comments, and more than 51,400 words. Visualising the frequency of posts and comments showed highly variable levels of online activity between the different pages and groups. Text analytics visualisations of the post and comment content showed the distinctive characteristics proposed in the literature for student-created 'third space' Facebook groups.

CONCLUSIONS The public Facebook pages and groups relating to engineering at Deakin University were largely student-created, and exhibited the distinctive characteristics proposed in the literature for student-created 'third space' Facebook groups. For engineering educators, the pilot investigation documented in this paper offers another method for analysing and understanding the content of online discussion spaces, including student-created Facebook groups relating to their studies, and discusses implications for engineering educators of the emergence of student-created social media third spaces for learning.

KEYWORDS Social media. Facebook. Text analytics. Third space.

Introduction

Social networking systems (SNSs) are one of many communications technologies that have been widely adopted by students of all ages, and hence have the potential to be a valuable contributor to education (Roblyer, McDaniel, Webb, Herman, & Witty, 2010). Online learning management systems (LMSs) are now ubiquitous in higher education, and while typically providing useful features for education administration, they often lack effective tools for the support of online social communication (Al-Atabi & Younis, 2010; Irwin, Ball, Desbrow, & Leveritt, 2012). It is suggested that social interaction is an important indicator of education quality, so it is natural that, as SNSs have developed alongside the adoption of LMSs, many educators have looked to SNSs as an additional online communications channel that could be used productively in education (Roblyer et al., 2010). Facebook (facebook.com) is a popular SNS, with hundreds of millions of users (Aharony, 2012; Irwin et al., 2012). There has been a long-standing natural affinity between Facebook and higher education, as the platform was originally designed for US students to use on-campus (Gafni & Deri, 2012), and initially requiring a '.edu' domain email account to register (Mathews, 2006). Now open to, and used widely by, the general population outside of universities (Roblyer et al., 2010), self-reported use of Facebook by students is very high, and, not surprisingly, universities have investigated the educational uses of Facebook (Gafni & Deri, 2012). Students generally come to university well-versed in the use of technology and social media, so even though Facebook was not specifically designed with education applications in mind, it has transitioned from being purely a SNS to being used in many areas of student life, including education, with many students mentioning education and specific items of school work in descriptions of their use of Facebook (Roblyer et al., 2010).

In the context of engineering education, the potential of social media to open new modes of communication, interaction and experimentation between students and teachers has been identified (Kamthan, 2010). Documented applications of the popular microblogging service Twitter (twitter.com) include: the use of Twitter to engage a large group of engineering students during an information literacy class (Morrow, 2010); the use of Twitter by engineering students on work integrated learning placements (Paku & Lay, 2011); and, the use of Twitter by students to send commands to a hosted installation of the numerical computing environment Matlab (Judd & Graves, 2012). The examples in the literature of the use of Facebook in engineering education are no less diverse. Including: social media tools (including Facebook) being used to link software engineering students with practicing industry professionals (Morgado et al., 2012); a liaison librarian using Facebook to interact with engineering students (Mathews, 2006); the use of a Facebook group to support students in a unit on thermodynamics and heat transfer (Al-Atabi & Younis, 2010); Taiwanese engineering students learning English and using Facebook to practise making English sentences (Wang, Sheu, & Masatake, 2011); and, software engineering students collaborating at two universities autonomously adopting Facebook for group communications when the provided communication system proved unwieldy (Charlton, Devlin, Marshall, & Drummond, 2010). It is this latter, student-created use of Facebook for educational purposes that we are interested in here, using the framing concept of a social media 'third space'.

The idea of the 'third space' is attributed to Bhabha (2004), arising from postcolonial critique of political hegemony, and the desirability of creating a dialogic third space where neither the speaker's nor the listener's meaning is presumed to be 'correct'. It is in the intersections and overlaps between spheres that discourses not possible in existing settings can occur (Aen & Dalsgaard, 2016). In education, the concept of dialogic third space can incorporate class-based discussions, such as the development of science literacy (Wallace, 2004), but can also be used as a framework for characterising particular forms of usage of SNSs, and in particular Facebook. DePew (2011) describes the use of Facebook by three multilingual university students as a space to develop their English skills through the informal mixing of different written languages in an online setting. Lantz-Andersson, Vigmo, and Bowen (2013)

report on the use of Facebook as a collaborative learning space for high school students, from four countries, learning English. Aaen and Dalsgaard (2016) document a study of Facebook groups created and managed by Danish high school students. Facebook can be useful for students in their social life as well as for academic purposes (Gafni & Deri, 2012). Here we are specifically interested in student-created Facebook groups, “characterised by a merging of the personal and institutional space, meaning that discourses from the normally separated spaces are included in the third space” (Aaen & Dalsgaard, 2016, p. 182).

This paper investigates and characterises public, student-created Facebook pages and groups relating to engineering at Deakin University. We use text analytics methods to visualise the content of the posts and comments to determine if they exhibit the distinctive characteristics proposed in the literature for student-created ‘third space’ Facebook groups.

Method

A ruling was obtained from the relevant institutional human research ethics committee (HREC) that the collection and use of publically accessible historical Facebook records in a manner that does not identify any individuals did not require formal ethics approval for research purposes. A search was undertaken to locate public Facebook pages and groups relating to engineering at Deakin University. The NCapture program (QSR International, 2017) is able to capture publicly available posts made by a specific Facebook account, as well as all follow-up comments associated with an original post. All of the publicly available posts and comments returned from NCapture queries of the identified Facebook pages and groups were captured. The NVivo program (QSR International, 2016) was used to convert the captured Facebook data into Microsoft Excel (Microsoft, 2013) spreadsheets. The Facebook data were graphed to visualise the frequency of posting activity over time. The text analytics software package KH Coder (Higuchi, 2016) was used to analyse and visualise the text content of the collected Facebook posts and comments to show the major themes present. KH Coder supports a range of text data analysis and visualisation methods – the one that we employ here is the multi-dimensional scaling (MDS) plot.

Text analytics typically requires pre-processing of the source text to achieve the best analysis result. Here we seek an overall characterisation of the content of public Facebook pages and groups relating to engineering at Deakin University, so all post text data were pooled. The data were exported in plain text format, converted to all lower case, and imported into KH Coder. Common English words and parts of speech, such as ‘the’, ‘and’, ‘a’, etc., add little to the analysis, and their relatively high frequency generally masks significant terms (Bolden & Moscarola, 2000). KH Coder supports the use of a stop word dictionary, in which common words to be ignored in the analysis may be specified. We used the default English stop word dictionary supplied with KH Coder. A second issue that can mask the significance of terms in text analytics is the presence of inflected and/or derived forms of words, for example, a root word such as ‘sing’ may also be present in the source text as ‘sings’, ‘sang’, ‘singing’, etc. Lemmatisation is a process to consolidate inflected and derived words into their root form, so that the underlying concept is accorded its due weighting based on frequency of occurrence (Bolden & Moscarola, 2000). We used the default English lemmatisation algorithm implemented by KH Coder.

MDS computes a measure of ‘distance’ between all pairs of text terms, and then seeks a lower dimensional representation of the terms, such that original distance values between all term pairs are displayed with the least possible error (Namey, Guest, Thairu, & Johnson, 2007). KH Coder supports a number of distance measures and dimensional reduction techniques – here we use the Jaccard distance measure (Hu & Liu, 2012) and the Classical distance scaling method for dimensional reduction (Abdi, 2007). Words/terms clustered close together in the resultant MDS visualisation are found more frequently close together in the source text, and may reveal key themes in the Facebook posts. Here we produce a two dimensional visualisation for ease of interpretation. Based on specifying the minimum frequency of occurrence of a term for inclusion in the MDS analysis and visualisation, terms

appear as circles/bubbles in the plot, and the relative frequency of terms is indicated by the size of their bubble.

Results

Five public Facebook pages and six public Facebook groups relating to engineering at Deakin University were identified. Figure 1 presents, in the form of a heat map, the total Facebook activity (posts plus comments) for each of the pages and groups identified, in six monthly intervals, over the time period for which Facebook data were available. Based on examination of the 'About' information for the pages, and the listed 'Admins' for the groups, it was determined that Page1 was operated by academic staff, and that Group3 and Page4 were operated by ex-students (alumni). As the focus here was student-created Facebook pages and groups (Aaen & Dalsgaard, 2016), these three sets of data were removed from the analysis, leaving a consolidated data set of 1484 posts and comments, some of which dated back ten years, and comprising more than 51,400 words. Figure 2 presents the MDS visualisation of the text content of the 1484 posts and comments.

Group1	0	0	0	0	0	0	0	0	0	0	0	5	0	0	8	1	0	1	0	0
Group2	12	1	1	1	1	2	1	3	2	7	5	8	17	27	44	25	9	10	28	10
Group3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	11
Group4	0	0	0	0	0	0	0	0	0	7	23	58	56	47	20	3	3	38	38	25
Group5	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	2	2	0	0	0
Group6	0	0	3	276	285	48	7	6	2	0	0	0	0	0	0	0	0	0	0	0
Page1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	37	0	0	0
Page2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	9	12	26	20	6
Page3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	114	2	2
Page4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Page5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	9	12	26	20	6
	Jul 07	Jan 08	Jul 08	Jan 09	Jul 09	Jan 10	Jul 10	Jan 11	Jul 11	Jan 12	Jul 12	Jan 13	Jul 13	Jan 14	Jul 14	Jan 15	Jul 15	Jan 16	Jul 16	Jan 17

Figure 1: Heat map of total Facebook activity for pages and groups in six monthly intervals

Discussion

There are some limitations to the data set used here. The search strategy used to locate candidate Facebook pages and groups was basic – a search based on the string “deakin engineering”. There almost certainly exist other pages and groups related to engineering at Deakin University not identified by the search, including those created by students. Within the full set of pages and groups identified by the search, there were several that were private, hence the content of those posts and comments was not accessible for inclusion in the analysis. With those limitations acknowledged, we can consider the results in detail.

Figure 1 shows highly variable levels of online activity between the different pages and groups, and within a given page or group, over the time period under consideration. Some have existed for an extended duration and have had at least some level of activity up until the time of the analysis. Others are more recent in their creation, and others still have come into life and apparently petered out during the time frame examined. It seems that student-created Facebook pages and groups do not automatically thrive or persist.

The MDS visualisation presented in Figure 2 includes an indication of clustering of terms using different bubble colouring. The clustering is based on the adjacency of terms when mapped to the two dimensional plot space, and is indicative only. KH Coder provides a keyword-in-context (KWIC) concordance feature that can identify the locations in the source post-and-comment text of phrases that contain one or more specified keywords within a specified distance of each other (Bolden & Moscarola, 2000).

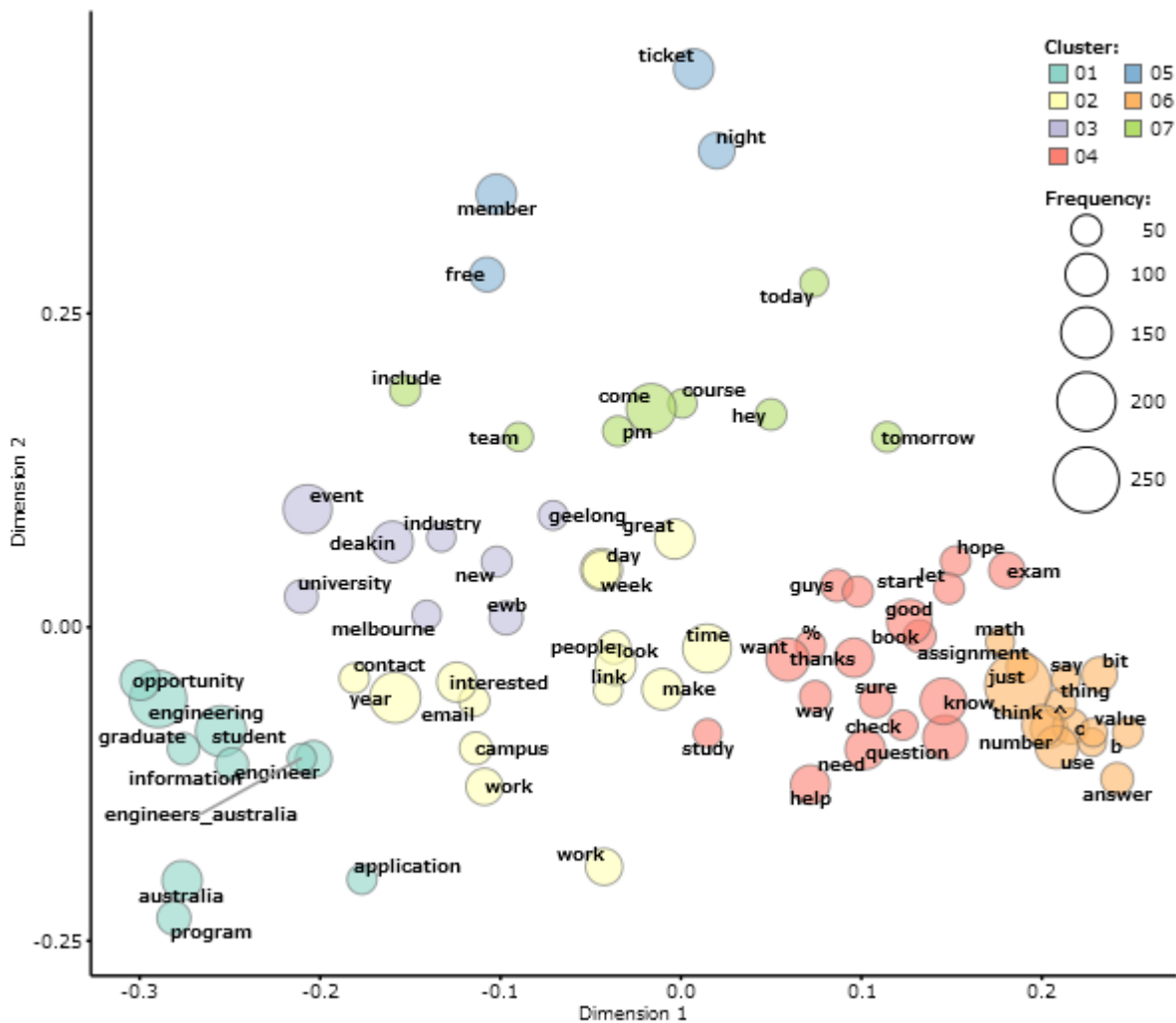


Figure 2: Multidimensional scaling plot of student Facebook posts and comments

The orange cluster at the lower right contains terms such as ‘number’, ‘bit’, ‘value’, ‘b’, ‘c’, ‘^’, ‘math’ and ‘answer’. The KWIC concordance was used to interrogate the original context of these terms, and it was found that they relate to discussions about specific assignment questions, including Boolean arithmetic problems, problems involving exponentiation (using the ^ operator), and mathematical problems with the variables b and c. The red cluster at the lower right contains terms such as ‘book’ (relating to the sourcing, quality and use of texts), ‘question’ (speculating on the likely content of exams, directions to, and comments about, set problems – students asking their peers for help with solutions was a minor component), ‘assignment’ (administrative processes, as well as some general discussion about specific questions) and ‘exam’ (strategies for preparation, comments on past papers, and public procrastination). The yellow cluster at the lower middle contains terms such as ‘campus’ (specifying the location of an event, or relating to the current or forecast location of the message poster, including off-campus for the significant number of Deakin University engineering students enrolled in that mode), ‘email’ (the poster giving their contact information) and ‘day/week/ year’ (for various temporal matters related to studies – timetables, course maps, etc.).

The aqua cluster at the lower left contains terms such as ‘engineers australia’ (referring to the campus chapter and Victoria Division matters), ‘opportunity’ (posts about volunteering, internship and other work openings) and ‘engineering’ (in a range of contexts including study, discipline, professional and graduate education). The purple cluster in the middle left contains terms such as ‘melbourne’ (where events will be held), ‘ewb’ (events, projects and other opportunities related to Engineers Without Borders) and ‘industry’ (mainly about the

annual Deakin Engineering Society industry dinner). The green cluster in the centre contains terms such as 'today/tomorrow' (as notifications or reminders of events), 'come' (a reminder/exhortation to attend particular events) and 'team' (referring to group events, particularly EWB activities). The blue cluster at the top contains terms such as 'ticket/night/member/ free' – being essentially the details for certain purely social events.

In their investigation of Danish high school student use of Facebook from a 'third space' perspective, Aaen and Dalsgaard (2016) found student-created groups contained the following types of content: "(1) social expressions, (2) social events outside of school, (3) social events on school, (4) academic content and subjects and (5) practical matters concerning school" (p. 183). In our investigation we observe largely the same categories of student communication. As Aaen and Dalsgaard (2016) concluded in a high school context, we also conclude here that student-created Facebook pages and groups related to engineering at Deakin University are being used as a social media third space. It is an online space that is different to, and operating in a space between, the 'first space' personal use of social media by students, and the 'second space' institutional use of social media to create online learning environments within the Facebook SNS. It is an online community where, "students blend the personal, social life with academic schoolwork in one space within the Facebook groups" (Aaen & Dalsgaard, 2016, p. 172).

Depending on the nature of the source text, it may be possible to attribute an ordinal or other meaning to the dimensions of the resultant MDS visualisation (Namey et al., 2007). Across the lower half of Figure 2, from right-to-left horizontally we see terms related to: specific assignment questions (orange); study skills and activities (red); course and campus issues (yellow); and, work and professional matters (cyan). Vertically, from bottom-to-top about the centre of Figure 2 we see terms related to: campus and course (yellow); activities related to engineering, but distinct from students' studies (purple); logistics for certain student group activities (green); and, promotion for purely social events (blue). Dimension 1 of the MDS plot can be interpreted as being related to the focus of student academic activities – ranging from very specific details at positive scores, through to big picture issues related to career and profession at negative scores. Dimension 2 of the MDS plot can be interpreted as being related to nature of student activities – ranging from study-related at negative scores, through purely social at positive scores.

In their current form, these student-created Facebook pages and groups appear to be serving a range of social and academic purposes, with some of them containing regular communication activity and persisting over an extended period. Based on strong student interest in, and adoption of, Facebook, some researchers have urged university educators to actively engage with students in the Facebook online space, to take advantage of this additional communication channel for educational purposes (Irwin et al., 2012; Roblyer et al., 2010). Others have urged caution for academic staff considering engaging with students in social media spaces, as it may be seen as intruding into the students' private domain (Hung & Yuen, 2010) or as violating the norms of student-staff relationships (McEwan, 2012), or, could lead to academics finding out 'too much information' about students, or students being placed in an awkward position due to the unequal power distribution (Karl & Peluchette, 2011). It is interesting to wonder if academic staff (or any other 'outsiders') were to make their presence known by actively posting into student-created social media spaces such as these, or even if it became known to students that there were lurking external observers of their proceedings, whether this would have any influence on the way that students operated in such social media third spaces. This project peered in from the outside to characterise the content passively, and did not actively engage with the users and their activity. While the work was conducted with HREC approval, it was also conducted using deontological ethical theory applied in a SNS context (Malesky & Peters, 2012) as a guiding principle for navigating the potentially ambiguous scenario presented by academic staff viewing student activity uninvited. Here our intent was to tread as lightly as possible to answer the research question, for example, using automated computer text analytics, rather than hand coding, not

reproducing verbatim illustrative quotes from posts, etc. While academic staff can 'secretly' observe the proceedings of public student-created Facebook pages and groups in detail, in normal circumstances we recommend against this. It is unlikely that such student SNS use would be an assessable task, staff intrusion may disrupt an otherwise productive student online community, and, ultimately, students can make the space private anyway if they wish.

A question posed by the presence of social media third spaces is, if students are finding apparently educationally useful affordances in the use of such third spaces, and academic staff do not wish to actively intrude into their functioning, how can they never-the-less be factored in to the learning designs of units and courses in ways that are productive for student learning? Student use of Facebook for educational purposes is longstanding (Karl & Peluchette, 2011; Selwyn, 2007), so in one sense, academic staff might simply do nothing. There is evidence that student use of Facebook as a 'mirror space' to a formal LMS discussion forum can be more active and rich than the institutionally provided version (Karl & Peluchette, 2011). While academic staff promoting the possible use of SNSs by students for education purposes might not actually be news to most students, encouragement to students to 'bring back' into the formal LMS environment a summary of any relevant offsite discussions could be a productive way to capitalise on student-created SNS spaces.

Conclusion

The public Facebook pages and groups relating to engineering at Deakin University located in this study were largely student-created, and those exhibited the distinctive characteristics proposed in the literature for student-created 'third space' Facebook groups. Students were using these online spaces for discussing a range of academic, personal and social issues that were more or less related to their engineering studies. The focus of this paper has been on the Facebook SNS. The Twitter SNS also features in the related literature, and there exists an ever-expanding range of SNSs, each typically offering some new function that students might use in differing ways. Aaen and Dalsgaard (2016) noted that studies of voluntary student-created Facebook groups without participation from educators are underrepresented in the educational literature. With this research project we have made a modest contribution – both as a specific case study, and by offering a methodology that others interested in this area could use, including in the characterisation of other SNSs.

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