TReACLE: a framework for TwitteR Analysis in a SoCial and Learning Environment

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Social Media has infiltrated all manner of users, and none more than the current digital native who is studying at university. This has led to the rise in questions of how best to use these computer-mediated communications in academic settings. Recent research shows that Twitter is very popular amongst students, though little work exists on the impact of Tweeting, and how it can be measured. This paper discusses the current work in progress to develop a framework that offers guidance to codify the connections that students in Higher Education make, using Twitter. Data suggest that it is still too early to determine the success of the framework, nonetheless, the scope for future work points towards many possibilities for full development and application.

Computer Mediated Communication, Twitter, Social Interaction, Education

1. INTRODUCTION

'Social Media' is a ubiquitous expression that has become intrinsically linked to websites such as Facebook, Flickr, YouTube, Twitter, and Instagram. Using the word 'social' to describe such media suggests that it is situated in a social space where users interact in some way with said media. Social Media is defined by Kaplan and Haenlein (2010: p61) as "*a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content*".

Educators with an active interest towards using technology in the classroom in order to support their teaching, have attempted to integrate various Social Media tools (such as blogs, micro-blogs, video websites and social networking websites) into the learning process (Rankin 2009; Ebner *et al.* 2010). In 2005, Stephen Downes announced a new term, 'e-Learning 2.0', and consequently created a name for the use of wikis, weblogs and podcasts in educational settings.

Wankel (2009) claims "the millennial generation of students are digital natives coming to higher education with extensive experience in Social Media. Business and other organizations are expecting their recruits to have high proficiency in these technologies, too." Wankel's article is an overview of the use of the main Social Media in teaching; Facebook, blogs, YouTube, Twitter, MySpace, and Second Life are discussed with examples of how they can be used to foster robust collaboration among learners.

As Social Media has become more intrinsically linked with everyday life, becoming a critical part of personal, educational and commercial interaction, added research has been carried out in this area. These social media technologies "facilitate remarkably diverse and broad participation while accelerating the formation of effective collaborations" (Schneiderman et al., 2011, p. 25).

This research was motivated, primarily, by the anecdotal evidence that university students are spending more and more time online and connecting via social media networks, especially out of the classroom. Furthermore, the inspiration for this work was fuelled by the lack of specific frameworks, together with the recent surge of popular interest in Twitter as a micro-blogging tool, especially in education (Fumero-Reverón, 2011).

The aim of this research is to explore the development of a framework that offers guidance on how to codify these connections. Is it possible for students to develop community via Tweeting? Can Tweeting bring benefits to the learning experience?

2. BACKGROUND AND RELATED WORK

Before expanding on the theoretical foundation of this study, it makes sense to understand where Twitter is situated.

At the time of writing, Twitter has over 50 million registered users, Tweeting more than 340,000,000 Tweets per day. Whilst Twitter was not the first micro-blogging platform, and is certainly not the only one in existence, it is, by far, the most popular. Indeed, the name Twitter is in most instances used as a pseudonym for micro-blogging, and the word "tweet" as both a noun and a verb has now entered the English lexicon.

Although Twitter can be used as an announcement channel, the dialogic nature of Twitter and its capacity to enable dialogue, discussion and communication has markedly added to its popularity (Marwick and boyd 2010). Twitter allows users to create pathways so that messages can be directed toward one person (@), be privately viewed (DM), or be retweeted (RT), i.e. shared with others. Honeycutt and Herring (2009) examine several of the ways in which Twitter can be used, which they refer to as "categories of intention". These classifications incorporate everyday conversation, distributing knowledge or website addressed, broadcasting news, and dialogue. It comes as no surprise that educators are showing an interest in using Twitter in the classroom, given its rising acceptance and tractability.

Research has shown that universities are somewhat poor at using dialogic features in their websites (Gordon & Berhow, 2009). However, there is little evidence to suggest that universities have seriously approached their use of Social Media in a dialogic context. Within education, Twitter can be used to enhance social interaction, with strong instructional value (Dunlap and Lowenthal, 2009). According to Junco et. al. (2011), the use of Twitter can be used as a motivator, when applied within a course. Dunlap and Lowenthal state the importance of social presence amongst staff and students, highlighting the significance of that feeling that another person is there and real, in a community of learners where people connect in a social and emotional way through the communication medium. A position supported by Vygotsky (1978) who emphasises the importance of creating social communities, which lead to learning at a higher cognitive processing level.

Short et al. devised the expression 'social presence' in 1976, with work that was based on research, centered on one-to-one interpersonal communication. Their social presence theory catalogues various types of communication along a scale, somewhat on the level of awareness that someone feels towards others in the communication. However, changes in types of communications, since 1976, have had an effect on this definition, which has had to evolve with time. More recently, literature has emerged that offers findings about how communication is carried out online, and how it is interpreted. This has been especially important due to the advent of online learning courses. According to Kanwar and Swenson (2000), socialisation can be defined as the "process by which people learn the characteristics of their group and the attitudes, values, and actions thought appropriate for them" (p. 18). Jacobson (2001) explains presence as "the sense of being caught up in the representation of virtual worlds" (p. 653). Considering these meanings, it can be comprehended how the student's awareness of presence could have an influence on their motivation to, both socialise with other students, and the level to which they interact with their education online.

The importance of emotional issues surrounding education is demonstrated clearly by the work of Mavrikis, Maciocia and Lee (2003), who state that it is difficult to develop educational systems that take sentiments into account because of the "pervasive influences of affective factors" but mostly "due to the existence of various, usually contradictory theories" (p. 1). As online educational scenarios become more widespread, educators are starting to recognise that creating social presence is becoming key to improving more successful teaching environments, especially true in Higher Education, where students have less online restrictions than school or colleges.

This social community aspect can be achieved via experiential learning, as students are engaged with their course material, as opposed to just thinking about what they are learning and repeating the knowledge. Kolb (1984) explains learning as the "process whereby knowledge is created through transformative experience" (p. 41).

Notwithstanding the absence of empirical work concerning the use of Twitter in a Higher Education setting, experience points to some common notions of its use. Chiefly, the conceivable advantages of Twitter, to nurture an awareness of community both inside and outside the classroom, are recognisable. Literature points to the social advantages of Social Media (Hardey, 2009; Shaltry, 2013) including Twitter (Lomicka, 2012), in connecting educators with students, and students with other students.

3. FRAMEWORK DESIGN

Initially, an adaptation of the method proposed by Rourke et al. (2001) was used to classify the Tweets in this research. However, whilst the 1st level of the coding scheme is based on Rourke's work, the 2nd level is derived from normalising the Tweets collected during the study and thematising and codifying the data.

Firstly, the primary approach that had to be determined was the decision of how Tweets were going to be measured. One of the issues under discussion is the choice of the unit of analysis to

perform content analysis. One approach is to consider each individual sentence (in this case Tweet) as a single unit (Fahy et. al., 2001). Or researchers could attempt to detect a thematic pattern in a message, and consider this as the unit of analysis, as Henri proposes (1992).

Nonetheless, the preferred option for this research is to adopt Rourke et. al's approach (2001). Rourke proposed taking the complete message posted at a certain moment in the discussion as the unit of analysis. Thus, in this research, the unit of analysis is the entire Tweet, within consideration of the space and timeline it occurs in.

Rourke theorised that social presence is one of the three elements of the Community of Inquiry. The other two elements are cognitive presence and teaching presence, as shown in Figure 1.
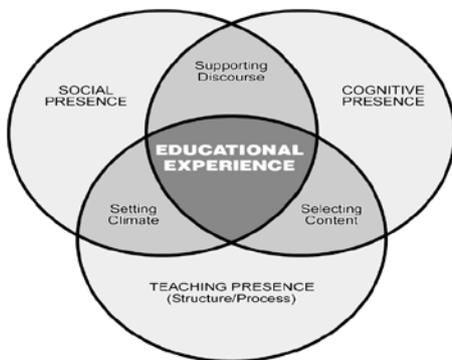

Figure 1: Community of Inquiry Model

This is a model that has been used considerably in Computer-Mediated Communication (CMC) research in education (Garrison et al., 2000). This Community of Inquiry model accepts that the creation of knowledge ensues via the relationship of these three fundamental components. This model formed the basis for the TReACLE framework.

The three specific categories within Social Presence are: affective, interactive, and cohesive.

(i)   Affective (A) – the expression of emotion, feelings, and mood

(ii) Interactive (I) – continuing a thread, quoting from others' messages, referring explicitly to others' messages, asking questions, complimenting and expressing appreciation or agreement

(iii) Cohesive (C) – activities that build and sustain a sense of group commitment

Rourke's method was not proposed explicitly for social networking tools; therefore it had to be adapted for Twitter. A typical example of this is the 'continuing a thread' guidance that Rourke provides, which is far more relevant for online forums than for Tweets. In this instance, a direct reply to a Tweet was considered as fitting the bill for this illustration. Similarly, occurrences of retweeting were considered akin to quoting.

4. METHOD

4.1 Introduction

The use of Twitter was a course requirement for the students for the duration of one week. They were given a task to carry out that was embedded within the module content. Students were given the following information:

> We are going to use the Internet to explore the Marketing Mix. In this session you will use inquiry-based learning techniques to think about how we can contextualise the Marketing Mix to promote post-graduate Computing courses at UCLan.
>
> Think about the following points and how they apply to post-graduate course in Computing at UCLan:
>
> What kind of students are post-graduate courses marketed   at?
> How do students find out about post-graduate courses?
> How are other universities selling their post-graduate courses?
>
> Tweet your findings as you go, using the #co2604 hashtag. Before next week's class you must Tweet at least 10 times. These must occur on at least 2 different days. You may Tweet about this task, or about anything you want.

A common hashtag was used in order to find and sort tweets more effectively. Tweets represented status updates and current happenings in students' lives. The instructional goals for incorporating Twitter into this class were to build community amongst the learners and to encourage debate around the module content to extend learning outside of classroom.

4.2 Participants

In total 22 students (19 male, 3 female) participated in this study, they were enrolled on a Level 5 Business Computing module at the authors' institution.

The students were encouraged to Tweet amongst themselves and also amongst others. The two members of staff who taught on the module also Tweeted in this study.

Particular consideration was given to ensure that all participants were comfortable taking part in this research. The growing use of Social Media tools

highlight particular ethical concerns for research in this area (Venezia, 2012).

Researchers who carry out work in this topic may find it challenging to appreciate where the line is drawn between the public and private, or to understand exactly how intrusive the research can be and how it impacts on the research subjects. New conceptual gaps now exist in the traditional method of applying research ethics policies (Bassett, 2002).

All students who directly participated in the research were asked for their consent. However, Tweets were harvested systematically from the public stream and it was not possible to obtain informed consent from all subjects. Tweets are created in the public space of the Web therefore Tweets are public by default, though users can protect their Tweets by making them available only to their followers. Nonetheless, interactions in Social Media often have an ephemeral appeal. This adds to the expectation about information being protected. People can be disposed to supply personal and sensitive information to an online medium, which in principle is accessible for anyone - without intending their statements to be distributed.

There were no assumptions made about the safety of the users. All data was considered sensitive, regardless of whether it had already been released into the public domain by the user, and was made anonymous so that the user could not be identified. Disassociating Twitter names and email addresses with Tweets enabled this anonymity.

4.3 Coding the Data

The Tweets were collated using NVivo and coded manually. Only Tweets classed as representing Social Presence were coded. For this dataset, one researcher made modifications to the framework and then coded an entire set of tweets for a particular student, then afterwards corroborated their coding with the other researcher. Any cases of disagreement were discussed until both researchers came to an agreement. Through this process, an agreed set of classes for the Tweets was developed.

5. RESULTS AND DISCUSSION

The total number of Tweets captured was 508. Of these, 279 were classified as denoting social presence. The average number of Tweets for the week was 72.57 Tweets per day, with an average of 21.17 Tweets per participant. Most of the Tweets occurred between 12PM and 4PM, and 8PM and midnight. The top five words used in Tweets were: 'rt', '#uclan', 'ha', 'today', and 'computing'. Tuesday had the highest number of Tweets, quite possibly because the class tutorial was held on this day.

Table 1 below offers a catalogue of the markers in each classification, a brief clarification of what they mean, and an instance of each. Table 2 depicts the breakdown of Tweets for each class.

Table 1: Codifying of Tweets

Class	Clarity	Illustration
(A-e)	expression of emotions	People that walk up and down escalators piss me off
(A-h)	use of humour	When life gives you lemons get the tequila and salt ready
(A-d)	self-disclosure	Wow my room is a mess today
(I-r)	continuing/reply	hahahah I'd expect nothing less mate. Nothing less.
(I-t)	quoting/retweet	Revision put off another 15mins whilst I read this thought I'd share http://www.fastcompany.com/3008359/3-ways-tackle-your-procrastination-problem … Deborah G via @FastCompany
(I-m)	direct messaging	hahahaha I did that on the motorway the other day :D
(I-q)	asking questions	What do you think of this? Should all lectures be compulsory or is it better learning from home? http://www.guardian.co.uk/education/mortarboard/2013/mar/14/should-university-lectures-be-compulsory …
(I-c)	complimenting, expressing appreciation	I love uni!! My homework for this week tweet about Masters courses.
(I-a)	expressing agreement	OG that's sooooo true!
(C-v)	vocatives	hahahahaha Ellers I could deffo go for KFC and a film on your big screen right about now :D
(C-i)	addresses or refers to the group using inclusive pronouns	CO2604 Check out "Internet Archive" on Vimeo http://vimeo.com/59207751 Everything Everywhere, the New Religion of Information
(C-p)	phatics, salutations	See you all at the 9am lecture tomorrow, bright and early!

Table 2: Tweet Breakdown by Class

Class	Number of Tweets
(A-e)	68
(A-h)	34
(A-d)	43
(I-r)	15
(I-t)	21
(I-m)	18
(I-q)	13
(I-c)	17

(I-a)	13
(C-v)	11
(C-i)	11
(C-p)	15

Out of the total of 279 Tweets, 145 were classified as affective, 97 as interactive and 37 as cohesive.

The results for the affective category are slightly surprising; as it is not necessarily an outcome directly related to the specific tasks assigned the participants, which was to discuss marketing techniques as part of the module. However, students clearly interacted well with other members of the group and as they got became more confortable with each other over Twitter, emotions were used regularly and they expressed themselves and their feelings more easily.

Throughout the week, as momentum built, students became more interested in talking with each other and sharing opinions, comments, and information.

There were few cohesive indicators found, perhaps due to the nature of the tool itself. When using Twitter, students perhaps did not feel the need to address the class as a group or to use individual names (since one can reply directly to another). In one instance a student addressed the entire group by using the mention symbol (@Everyone who's out in Source Bar tonight? #2604) but generally students would reply to an individual person. In addition, because of the character limit (which is even more restrictive when using a hashtag), there may have not been enough space to refer to individual names.

The results are inconclusive as to the validity of the framework. Additionally, only one part of the framework has been developed and applied. The small number of participants, taken from a narrow sample, also limits this research. It could be said that as Computing students, they were readily willing to adopt the use of Twitter in the classroom, however, this readiness may not be so prevalent in students of less technical subjects. A limitation of the data gathered was the fact that the Tweet collecting occurred over a short period of time, thus creating many factors that could affect the results.

The coding method applied is only the first stage of the framework for the analysis of Tweets, and further work needs to be done in order to reach that triangulated educational experience.

6. CONCLUSIONS AND FUTURE WORK

Based on the data we collected and analyzed, we can conclude that a sense of community was established through the Twitter interactions. Community was built, of course, via classroom session, but Twitter was able to facilitate further community building quickly and in a fun and interactive way. The data also shows that there is potential for further exploration into how Twitter can be incorporated into the classroom to benefit the learning experience.

Social presence was demonstrated largely through affective and interactive indicators, with fewer indicators of cohesion. The affective indicators were the highest and in particular showed a high presence of emotion, something that needs to be explored further. Interactive indicators were readily apparent as well, as students typically replied to others and asked questions. Cohesive indicators were low probably because of the lack of space to offer salutations, and the fact that the reply feature did away with the need to use names.

Preliminary results show that Twitter, as a tool, is adept at allowing participants to create community and to build social presence. Nonetheless, at this moment in time, the proposed framework is not robust enough to verify these results, nor is it finished in a way that the data can be fully analysed for elements of other types of presence aside from social interaction. The work has resulted in notions for further investigation in this specific field.

Whilst a complete analysis of Tweets is beyond the scope of this paper, future work will address the further development of the TReACLE framework to incorporate coding for the cognitive presence and the teaching presence of the Community of Inquiry model.

However, much work remains to be completed before an understanding of how worthwhile this framework can truly be in measuring and evaluating the educational experience. By using the complete Tweet as the measure of analysis, the aim is to obtain a full circular understanding of Twitter and how it can be used in education.

There are other directions that can be pursued as an extension of this research. Exploring the influence of social networking on online versus conventional student academic performance and motivation could be interesting. Also, research into whether academic performance has any impact on student behaviour in the social media space both inside and outside the classroom could be noteworthy.

This is all very early work, and there is still much to do in order to develop the TReACLE framework to a stage where it is testable. Once it reaches a testable point, it can be applied to an appropriate sample of participants, for validation and further development. This is the next stage of this work, before any other directions are followed.

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