

# TOWARD A QUANTITATIVE ANALYSIS OF ONLINE COMMUNITIES

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## Abstract

*In flexible learning environments there has been an increased focus on developing resources that promote and facilitate the emergence of online communities. The formation of, and active participation in, a learning community has been suggested to facilitate the learning process (Rovai, 2002; Palloff & Pratt, 1999). Current literature examining the formation and development of online communities has predominantly centred on the qualitative analysis of posted messages (within an asynchronous discussion forum) as evidence for community attainment and sustainment (Brook & Oliver, 2003; Hew & Cheung, 2003). The search for key words and phrases is conducted regardless of timing and position within the threaded discussion. Hence, analysis of the postings often occurs in a manner that de-contextualises the discourse throughout the delivery of a subject (Misanchuk & Dueber, 2001). Furthermore, as analysis is limited to a few disparate units of study, an overall picture of the extent to which the online communities formed in individual units are supporting the strategic goals of the university is not formed.*

*Investment in online technologies and development of learning and teaching strategies is conducted at an enterprise level. However, current methodologies evaluating the development and sustainment of online communities have been focussed at a localised level. This paper proposes a scaleable quantitative approach to identify the degree of learner interactions occurring in specific subject-based forums for further qualitative analysis. It is proposed that the examination of data derived from the wider University context better positions and informs staff undertaking subject-based forums in order to align with University strategic goals.*

## Keywords

*Online learning, Community of practice, collaboration, Discussion forums*

## Communication leads to community.

Communication leads to community, that is, to understanding, intimacy and mutual valuing. (May, R)

The value of communication, collaboration and community has been celebrated in much scholarly work regarding education (Hutchings, 2002). Maxwell (1998) discusses the positive influence the formation of a community of learners has on both the socialisation and learning outcomes of students. The support networks developed through either personal face to face interaction or in an online environment provide an opportunity for initial socialisation to evolve towards the

construction of a knowledge discourse. Numerous authors note the importance of the development of an online community to support learners undertaking distance or distributed education (Brook & Oliver 2003; Lefoe, et al., 2002; Rovai, 2002, Salmon, 2000; Palloff & Pratt, 1999).

“In distance education, attention needs to be paid to developing a sense of community within the group of participants in order for the learning process to be successful” (Palloff and Pratt, 1999 p 29).

An important variable in the successful formation of a community of learners undertaking distance or distributed education (or other flexible delivery modalities) is the integration of effective communication strategies supported by sound online technologies (O’Sullivan & Miron, 2000). The promotion of teaching practices and technologies that enhance the facilitation of the formation and sustainment of an online community are of importance, not only for distance education providers, but also in all universities adopting a more flexible approach to delivery. The perceived benefits deriving from a community of learners has resulted in educational institutions investing in new communicative (collaborative) technologies and appropriate and linked staff development models.

## **Investment of Technologies**

Tertiary institutions have recognised the importance of collaborative learning and community development for the enhancement of student learning. This is reflected in the increased fiscal investment in online technologies and in the incorporation of collaborative teaching practices and community promotion in learning and teaching strategic plans (Curtin, 2002).

Technologies currently investigated and promoted by educational institutions include or contain Computer Mediated Communications (CMC) (Curtin, 2002; Kreijns, et al., 2002). CMC cater to flexible delivery demands (e.g. asynchronous communication) (Hutchings, 2000) and provide an opportunity for teaching staff to implement constructivist based activities to promote the formation of communities of practice.

The advantages in integrating CMC into subject curricula include a reduction in the degree of transactional distance (degree of psychological and communications space between learners and teachers) experienced, increased opportunities for reflection, development of ‘real world’ experiences, increased peer assistance, development of collaborative learning skills, and the general socialisation derived from a group discourse (Graham & Scarborough, 1999; Murphy, 1997; Rowntree, 1995). The interactive nature of CMC and the teaching strategies the technology supports can be seen to contribute significantly in the learning process through the development and formation of a community of learners.

As a result of the ubiquitous integration of CMC within subjects to facilitate the formation of a community of learners, posted messages (dialogue) are a useful indicator of the presence or absence of the formation of a community of practice. Therefore, qualitative analyses of discussion transcripts are often conducted to derive indicators for the establishment of a community.

## **Evaluation of Online Communities**

As a result of the increased financial investment in and widespread promotion of online technologies and community development through strategic plans, evaluation methodologies must be able to be applied to both discrete subject learning episodes and across the broader delivery of courses to ascertain the alignment with the stated course and broader University goals. The ability to conduct qualitative analyses across a large number of subject forums is impinged by a lack of software that can cope with such necessarily high quantities of data; and the associated ethical considerations.

## Qualitative Analysis

Currently the majority of literature that examines the learning that occurs within asynchronous discussion forums relies upon codifying posted messages as indicators of the formation of a community (Brook & Oliver, 2003; Hew & Cheung, 2003; Misanchuk & Dueber, 2001). The use of asynchronous discussion forums provides easily accessible, measurable indicators of the formation of a community of practice. However, educators are then faced with difficulties in codifying specific forum transcripts into 'pre-defined' characteristics of community, such as McMillan and Chavis's (1987) Sense of Community Index (SCI). The analysis of the forum postings often occurs in a manner that de-contextualises the transition of learner discourse throughout the delivery of a subject (Misanchuk & Dueber, 2001). Tu and Corry (2001) raise additional concerns regarding current research methodologies used to assess online community development. The authors note that methodologies focus on an end product to determine community development rather than the individual. Furthermore, the authors note that the majority of derived data is collated from short term disparate subjects. Evaluation data and subsequent conclusions are formed in an unrelated context to the broader strategic goals of the university.

The adoption of a quantitative methodology can be utilised to identify forums that exhibit both high and low degrees of indicators of the formation and sustainment of an online community of learners. After these subjects have been identified it is then feasible to analyse how these learning engagements have been supported. The types of teaching and learning activities, demographics, sessional length, etc. will subsequently inform staff development models, the design of learning activities and curricula and the derivation of a strategic plan for developing and sustaining an institutional focus with regards to a community of learners. An ensuing benefit of the informed staff development activities, designs and institutional focus, is an academic community of practice that transcends faculty distinctions is also promoted.

## A 'New' Quantitative Model

As the qualitative analysis of discussion forums across an enterprise level is not practical the development of a quantitative approach that is scaleable and can be used to identify specific areas for further qualitative investigation is required.

Burr (2003) proposes a three-tier model of interaction whereby students participating in CMC progress from a system interaction, through content interaction and finally to a learner interaction. System interactions involve interaction with the delivering technology and are a necessary familiarisation phase. Content interactions entail interaction with the learning materials presented (learner to moderator). Lastly, learner interactions necessitate engagement with other peers regarding the content delivered. Palloff and Pratt (1999 p31), note that active student participation is required to facilitate the community-building process. A dialogue between learners is essential for the establishment of a community of practice. Analysis of the types of interactions that have occurred in a forum can therefore provide a rapid indication of the presence or absence of a community. High percentages of learner to learner interactions may indicate a greater sense of community as a result of increased learner engagement, in contrast to discussion forums exhibiting high system and content interactions.

The interactions exhibited provide valuable insights into the achievement and progress of an established University strategic plan and the assessment of CMC software design. Quantitative analysis of all subject forums offered provides an indication of the time spent in various activities. A high percentage of system interactions may indicate a requirement for increased staff development and student support relating to technical use. Salmon (2000) proposes a five step model regarding the use of CMC and the e-moderator. Salmon's (2000) first 2 stages can be seen to be akin with a system interaction whereby students and staff undertake a familiarisation phase (Burr & Dawson, 2003). High percentages in the system phase may indicate that staff and students are spending extended periods of time familiarising themselves with the technology.

High percentages of content interactions may indicate that learning activities implemented are more focussed towards an individual learner as opposed to collaborative learning exercises. The interaction between learners (learner to learner) is essential in the formation of a community. Consequently if strategic plans are focussed towards the support, formation and sustainment of these communities of practice then the identification of the types of interactions specific forum exhibit as a result of the integrated teaching and learning activities provides an overview of the relative 'success/progress' of the implemented University plan.

Furthermore, by describing the interactions within this framework, not only can data be mined which indicates the frequency and types of interactions, but may also identify whether or not the implemented discussion forum interface is enabling or inhibiting the development of these communities. If low levels of learner to learner interactions are exhibited it may not be a direct result of the learning activities implemented, but may be a result of poor interface/software design for the adopted CMC technology.

Further analysis of the derived data may provide additional insights when collated into established criteria such as – course, gender, year level, demographics academic skill profiles, etc. Refinement of the data can only be achieved as a result of the analysis of all interaction types that occur at the university level. For example collation of interaction types into year level may indicate whether learner to learner interactions are increasing as students' progress through University. Alternatively the data may indicate that students are spending large proportions of course time in a familiarisation phase (System interactions) regardless of year level. Consequently, examination of software design, support services, offered and learning activities implemented could be further scrutinised. Codification schemas can be developed and tailored by staff involved in the evaluation process at a faculty course or unit level and aligned with articulated University and faculty strategic goals.

Although the quantitative approach provides an overall snapshot of the formation and development of communities of practice within all subject areas it does not provide adequate information relating to the Sense of Community experienced by the participants. Once the codification of interaction types is achieved subject forums exhibiting high and low learner to learner interactions may be selected for additional qualitative analysis. The identification of specific forums for qualitative analysis provides an alignment with the derived quantitative data. The lower percentage of subject forums selected for qualitative analysis ensures that the codification of posted messages is more feasible and achievable and the associated ethical requirements are more likely to be met.

The proposed evaluation methodology examines forum interactions as a means of providing an indicator of community and how forums are used in teaching and learning practices. The examination of contributions is placed within the notion that these interactions are not the only indicators available to evaluate communities. Once specific subject forums are identified the interactions may be examined in conjunction with an analysis of:

- Frequency and length of time between posting and replies;
- enrolled number of students in a particular subject e.g. large cohorts with high percentages of unique postings falsely indicate a sustained dialogue; and
- the delivery modality adopted by the facilitator and/or institution e.g. completely online or hybrid delivery modes.

## **Initial Phase of Case Study**

In order to provide a specific example of the quantitative methodology, an initial examination of data analysed at the QUT online environment from 1657 Forum pages, 8832 subsequent forums & 16767 associated discussion topics was conducted over the time frame of 2003 – 2004. Figure 1 illustrates the hierarchical nature of the OLT discussion forum resource noting the relationship between forum pages, forums and topics.

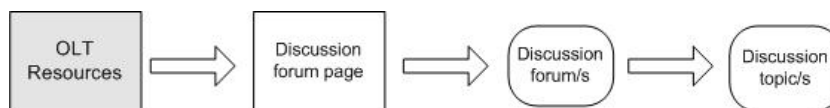


Figure 1 Hierarchy of discussion – Forum page – forum – topic each a subset of the previous

Contributions (posts and replies to posts) were analysed over four, monthly periods: June 2003, July 2003, February 2004 and April 2004. In general it was found that the number of contributions rose over that period indicating a maturing of the communities (Table 1).

<b>Average number of total contributions per unit (containing a forum page)</b>				
	<b>2003-June</b>	<b>2003-July</b>	<b>2004-February</b>	<b>2004-April</b>
Mean	102.4	107.4	109.2	121.4
Standard error	18.7	19.0	19.9	21.2
<b>Average number of contributions: Posts only</b>				
Mean	58.3	61.2	61.8	68.2
Standard error	9.7	9.8	9.8	10.4
<b>Average number of contributions: replies only</b>				
Mean	43.9	46.0	47.2	53.1
Standard error	9.9	10.1	10.9	11.7

Table 1: Average number of contributions, posts, and replies calculated from all forums across an enterprise level

Specific examination of faculty data can provide insights into the types of interactions that are occurring *within* the discussion spaces. Within the OLT system, contributions to the discussion forum resource are “tagged” as either a post or as a reply to a previously posted message. Interrogation of this data provides a snapshot of the degree of discussion occurring within a forum. Table 2 shows the average number of contributions and percentage of posts and replies occurring across the faculty (data averaged over the time frame examined).

<b>Faculty</b>	<b>Average contributions</b>	<b>percentage posts</b>	<b>percentage replies</b>
Built Env. Eng.	41.66	53.33	46.52
Business	136.72	42.41	57.56
Creative Industries	166.46	65.88	33.91
Education	121.14	60.82	39.10
Health Human Services	250.16	47.85	52.07
Health	127.01	57.48	42.44
IT	83.01	62.98	36.97
Law	97.05	57.66	42.33
Science	50.63	68.99	30.76

Table 2: Average contributions, percentage of posts and replies a comparison across faculties

By determining the frequency and ratio of postings versus replies, it is possible to estimate how the faculty is predominantly utilising discussion forums. In Table 2, the Business and Humanities and Health Services (HHS) faculties possess a higher reply percentage than posts within a forum. This indicates that the teaching practices within these faculties regarding the use of discussion forums are generating a greater degree of discussion amongst staff and students than in faculties, such as Information Technology and Science.

As previously stated the percentage of posts and replies provides an indication of how the faculty teaching staff are utilising discussion forums in teaching and learning contexts. For example the percentage of posts and replies in the faculty of Built Environment and Engineering (BEE) are approximately 53% and 46% respectively. This indicates that the discussion forums are centred around one post and a subsequent reply. Consequently, it can be hypothesised that the forums are potentially being used as a resource for students to seek clarification from teaching staff. In contrast the faculty of Science has 69% of all contributions as posts. The usage in this faculty

would be more closely aligned with direct content statements and directions for students rather than the development of social discursive environments. Further qualitative investigations are required to ascertain the exact nature of integration of discussion forums.

Further analysis of the contributions to gauge the role of the author (staff/student) of each post/reply provides an insight into the types of interactions that are occurring within each forum. Burr and Dawson (2002) analysed a large number of forums over a teaching term at a large rural university. Each contribution was codified as either a system, content or learner interaction. Whilst it could be argued that there is a degree of overlap between system and content interactions, learner interactions are quite tightly defined as any interactions occurring between students within a forum. Again the deepness and richness of these interactions is not being analysed but rather a quantitative indicator has been developed in order to highlight the degree of learning interactions and thus student dialogue for further qualitative analysis.

Within this analysis (n = approximately 70,000 contributions) it was found that 30% of all contributions were by academic staff members and 70% of contributions were made by students. Of those 70% of contributions, only 20% (approximately) constituted learner to learner interactions. Thus it is hypothesised that the forum resource was predominantly used as a medium for content delivery / content discussion.

Further it was found that the level of learner to learner interaction is directly related to the number of contributions. This may well be as a direct result of the formation and maturation of the learning community. As the forum develops and contributions increase, it is more likely that learners engage with each other rather than with academic staff even though the teaching strategy may not necessarily be student centred.

## Conclusion

The development of effective large scale quantitative measures permits a more focussed approach to the analysis of community development, use of discussion forums and the establishment of university wide "benchmarks". Reflection and comparison between the varying levels of operation (Enterprise, Faculty, Course, Unit) allows for identification of specific Unit/s and faculties operating above and below the benchmark. Thus, units operating above the benchmark may be isolated to further investigate how discursive environments are embedded within the unit to aid in staff development programs and resources. Units operating below the University and faculty benchmark may be targeted for specific assistance.

The incorporation and enculturation of reporting processes and methodologies will not only enhance current teaching practices through reflection and targeted staff development, but also facilitate the promotion of experimentation and research.

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