Teachers' Self-Perception versus Actual Use: A Science Online Learning Community

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Abstract. During the ongoing development of a teaching science as inquiry professional development series, we explore whether there is a relationship between the teachers' self-perceived use of an online learning community and the amount of use categorized as required by course facilitators and moderators. Using social network analysis, we noted that the level of engagement with the site increased in the first preliminary cohort of teachers (N_P=15) from 5% of posts being self-directed to 36% of posts being self directed with the subsequent cohort of teachers (N_S=19). In addition on a 7-point Likert scale, where the preliminary cohort indicated a disagreement with a statement that they would continue using the online learning community after the course (*M*=3.67), the subsequent cohort indicated the likelihood to continue (*M*=4.47). We will continue to engage in social network analysis with the remaining cohorts.

Introduction

Since the days of Aristotle, the training of teachers has been a traditionally college-centered effort where those pursuing education careers came to centers of academic discourse and scholarship. However, with the advent of the Internet into mainstream society, the locus of information flow is no longer from older to younger generation (Welbourne, 1979) or centered around universities (Kuiper, Volman, & Terwel, 2005; Lambooy, 2004), but flow readily from our fingertips or a vocal command to digital devices to our appease our curiosities and inquiries. Teachers are not immune to this need for information and in fact crave information as most consumers in society do (Herman & Nicholas, 2010).

In addition to their students, it is not uncommon for teachers to seek richer multimedia enhancements to their lessons from digital resources available via the World Wide Web. The resources, formerly not widely available in schools, are now available to most teachers. A recent US Department of Education (USDOE, 2010) report states, "Today, low-cost Internet access devices, easy-to-use digital authoring tools, and the Web facilitate access to information and multimedia learning content, communication, and collaboration. They provide the ability to participate in online learning communities that cross disciplines, organizations, international boundaries, and cultures." Since 2008, it is estimated that 100% of public schools have internet access at one or more instructional computers (USDOE National Center for Education Statistics, 2010). The USDOE has also stated "a crucial element of an infrastructure for learning is a broadband network of adequate performance and reach, including abundant wireless coverage in and out of school buildings" (2010, p.52). However, seventy-eight percent of teachers in public schools indicated that independent learning prepared them best for effective use of educational technology (Gray, Thomas, and Lewis, 2010), which causes many institutions of higher learning to question professional development effectiveness.

Purposes and Objectives

In this paper, we turn our lens to the teachers' use of an online learning community embedded within a professional development workshop geared for teaching science as inquiry. Research has shown that the teachers' role and engagement are critical in a successful online learning community (Maor, 2003; Palloff, 2007; Loucks-Horsley, 2003; Wilson, Ludwig-Harman, Thornam, 2004). Our research question explores if there is a relationship between the teachers'

self-perceived of use of an online learning community and the amount of use categorized as user prompted (not required by course facilitators and moderators).

Perspectives/Theoretical Framework

Communities of practice, whether they are formally recognized or not, have existed in every organization and industry throughout the history of their existence (Wenger, McDermott & Snyder, 2002). According to Wenger et al. (2002), a community of practice is a "group of people who interact, learn together, build relationships, and in the process develop a sense of belonging and mutual commitment" (p. 34). Another phrase used in conjunction with communities of practice is professional learning communities, "a strategy to increase student achievement by creating a collaborative school culture focused on learning" (Feger & Arruda, 2008, p.1). In trying to leverage modern digital technologies with the notion of communities of practice and professional learning communities, social networking sites may have established means for teachers to interact more readily and in a more timely manner outside of their isolated classrooms (Lieberman, 2000).

Online learning communities have naturally provided a source for professional development (PD) for teachers (Duncan-Howell, 2010). It would also provide a "meaningful form of PD" (p. 338) in a way that it is relevant to the their practice. If the activities were relevant and core to the learner's job, then online participation and engagement for professional development could be easily attained without any problems (Macdonald, 2011). Macdonald has shown that tutors have valued a combination of the activity-based approach and online discussions in which they are able to participate in the activity and reflect with other tutors. In addition, Tsai, Laffey & Hunuscin have found that teachers gained valuable insights from other teachers as well as emotional support, therefore improve their teaching confidence (2010).

Social network sites (SNS) have become immensely popular in the past decade with hundreds of SNSs existing and accessed with today's emerging technologies, supporting a broad scope of interests, activities and practices (boyd & Ellison, 2007). boyd defines social network sites as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (p. 211). Although, there is lack of experimental and longitudinal studies on SNSs, there may be opportunities to research its uses on learning communities or communities of practice.

The Social Networking Analysis (SNA) provides a "visual graph and quantitative representations of patterns and density of interaction" and assist in understanding how the students interact with each other in class, therefore proving to be a very useful method to investigate interaction in online learning environments. (Shen, Nuankhieo, Huang, Amelung, & Laffey, 2008, p. 32). Shen et al. discovered through SNA and traditional statistical analysis that students in an online course realized a greater sense of community through higher interaction frequency. This supports "the thesis that interaction plays a crucial role in forming student's sense of community in the online course" (p. 30). Limitations in the study revealed that the data collected/gathered does not account for the communication outside of the course management system including other communication tools such as email, outside SNSs, and instant messengers. With this limitation, it may not show complete data to represent all of the students' interaction (Shen et al., 2008).

In a study that investigated the relationship between communication styles, social networks and learning performance in a computer-supported learning community (CSCL), the learners' communication styles and their previous involvement in social networks were a major influence on how distributed learners perform in networked learning environments. The learners' performance is a direct result of a developing collaborative social network environment (Cho, Gay, Davidson, & Ingraffea, 2007). Educators may consider looking at each learner's communication style (CSCL) and pre-existing SNS in order to design an effective CSCL that is supported by active participation among learners. For example, seamless collaboration can be achieved between all members in the CSCL environment by matching individuals with low willingness to communicate with those that have high willingness to communicate, once the educator administers a personality survey to the learners (Cho et al., 2007). In another study, the learners' perceptions of self-efficacy were supported through appropriate communication strategies, collaboration, interaction with each other and frequent participation through the learning environment (Gabriel, 2004).

Background

In our work, we undertook development of an online learning community in which science teachers trained in various science curricula of the Curriculum Research & Development Group (CRDG) can interact and support each other without CRDG faculty and staff continuously present. In this current project called Teaching Science as Inquiry-Aquatic Science (TSI-A), an online learning community has been designed outside of a course management system tied to the structure of the university. Instead, the course management system is its own entity and is not blocked by the extensive firewalls at K-12 schools. The development of the online learning community (OLC) was part of a larger project whose purpose was to promote teaching science as inquiry (TSI). The OLC was designed to enhance communication and collaboration amongst the participating teachers, as well as provide a mechanism by which resources could be shared.

The Curriculum Research & Development Group (CRDG) is an organized research unit in the College of Education at the University of Hawai'i. Since 1966, CRDG has served the educational community locally, nationally, and internationally by conducting research and creating, evaluating, disseminating, and supporting educational programs that serve students, teachers, parents, and other educators in grades preK–12; and contributing to the body of professional knowledge and practice in teaching and learning, curriculum development, program dissemination and implementation, evaluation and assessment, and school improvement. Recently, CRDG has delved into developing online learning communities within professional development research and have encountered various issues technology in K-12 teaching and learning including teacher experience, comfort in online environments, integration of technology into teaching, and expectations of technology. CRDG's online work is guided by research that has shown that effectiveness of online learning communities are increased by factors such as community building among participants, use of an online facilitator, and blending work and training (Palloff & Pratt, 2011).

Research Methods

This study used social network analysis (Knoke & Yang, 2008), a growing field in social psychology that explores the structural relations and patterns of connections that actors make to one another on levels of importance. The actors in this study are the teachers and the structural

relations are activity comments online. The study was designed to identify comments that are activity comments, or directed, and teacher-to-teacher comments, or nondirected where mutuality such as conversing occurs. In this study, we are seeking the communication relations amongst the teachers.

In the TSI-A professional development series, the online learning community was established for participants and facilitators to share experiences and advice with one another. For this study, we extracted participant activity comments from the period of October 2010 to April 2012. The 30 participating teachers made a total of 433 comments during the time frame. We were seeking evidence that teacher's took on the role of frequent users of the site and that there were interaction with other teachers. To determine if activity comments were activity, user teacher-to-teacher, or technical in nature, three project staff read the posts independently and gave of the 117 posts a designation. An interrater reliability analysis using the Kappa statistic was performed to determine consistency among the raters. We then compared the number of designations against the required activity comments versus teacher-to-teacher comments.

Results

Teachers have given OLC a positive rating in terms of retaining their interest (M=6.8 out of 9) and being a worthwhile of their time (M=6.9). Twenty-two teachers are members of any online group for personal reasons (e.g. hobby) and twelve teachers are part of a professional online group that is not a requirement by their schools.

In a previous study, we found an average of about 13 posts per person (M=12.69, SD=4.03) over the span of 10 months. We also looked at due dates for professional development workshops and found that postings corresponded with workshop expectations in February, April, and July.

Comments were coded to determine if they were required responses to activities (coded "activity), self-directed responses to other teachers (coded "teacher-teacher"), or technical questions about the OLC (coded "technical"). Three raters A, B, and C determined that of the coded comments (N=433), 64% were activity comments, 35% were teacher-teacher comments, and 1% were technical, suggesting that teachers have not yet engaged fully in the OLC. As seen in Figure 1, the interrater reliability for rater A and B was found to be Kappa = .834 (p<.000), 95% CI (0.781, 0.887). The interrater reliability for rater A and C was found to be Kappa = .893 (p<.000), 95% CI (0.850, 0.936). The interrater reliability for rater B and C was found to be Kappa = .827 (p<.000), 95% CI (0.772, 0.882). According to Landis & Kock (1977), raters A and B, raters B and C and raters A and C were in almost perfect agreement.

Since the study is ongoing and we are still in the process of collecting data, we compared two groups of teachers using the activity comments posted in the first two modules. In Table 1, the preliminary group of comments (N_P=192), 95% of the comments were activity and 5% teacher-teacher. In the subsequent group of comments (N_S=241), 48% were activity, 36% teacher-teacher and 16% technical. The teacher-teacher comments were all about specific short cuts or tips in conducting actual experiments with K-12 students or advice on questioning strategies.

Table 1.

Activity comment comparisons between preliminary and subsequent groups.

Type of Comment	Preliminary Group	Subsequent Group
First 2 modules	N_P=192	N_S=241
Activity	95%	48%
Teacher-teacher	5%	36%
Technical		16%

Rater A * Rater B Crosstabulation

		Rater B			
		Activity	Teacher-Teacher	Technical	Total
Rater A	Activity	258	24	0	282
	User Prompted	5	139	2	146
	Technical	1	2	2	5
Total		264	165	4	433

Rater A * Rater C Crosstabulation

		Rater C			
		Activity	Teacher-Teacher	Technical	Total
Rater A	Activity	276	6	0	282
	Teacher-Teacher	11	135	0	146
	Technical	1	3	1	5
Total		288	144	1	433

Rater B * Rater C Crosstabulation

		Rater C			
		Activity	Teacher-Teacher	Technical	Total
Rater B	Activity	260	4	0	264
	Teacher-Teacher	28	137	0	165
	Technical	0	3	1	4
Total		288	144	1	433

Figure 1. Rater designations.

With our preliminary findings, there is an increase of teacher-to-teacher comments between the preliminary group and the subsequent groups due to modification with workshops and online learning community. The subsequent groups' feedbacks were more favorable in certain areas as seen in Table 2.

Table 2.
OLC mid course feedback results

Statement 1=Strongly Disagree, 7=Strongly Agree	Preliminary Groups N_P=15		Subsequent Groups N_S=19	
	M	*SD*	*M*	*SD*
The OLC is organized.	4.73	1.87	5.39	1.29
Posting my responses to the OLC is easy.	4.93	1.44	5.00	0.88
The OLC is enjoyable.	4.13	1.64	5.37	1.50
I will continue using this OLC after these TSI-Aquatic workshops.	3.67	2.06	4.47	1.71

Educational and/or Scientific Importance

As schools of education move more towards providing a means by which their graduating teachers and teachers in the field can share experiences, support one another, and provide a link to promising practices, we need to keep in mind that teacher choice and engagement are key factors to success of an online learning community. Giving teachers assignments to complete in a workshop environment may work against building a sense on community. Few studies have followed the teacher's perspective in participating in a online learning community embedded within a professional development workshop. Although this study is of only one science program, its results can be beneficial in that it informs schools of education and curriculum providers by providing information about community outreach efforts and supports for teachers in schools.

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