The Role of Activity Awareness for Social Ability, Sense of Community and Satisfaction in Online Learning

James Laffey, University of Missouri, laffeyj@missouri.edu
I-Chun Tsai, University of Akron, ichuntsai1@gmail.com
Chris Amelung, Yale University, chris.amelung@yale.edu
Ran-Young Hong, Krista Galyen, Sean Goggins, University of Missouri
Email: rhe06@mizzou.edu, kgalen@gmail.com, outdoors@acm.org

Abstract

The purpose of this study was to explore the relationship and influence of enhanced activity awareness on the social nature of online learning. As part of a design research project we have been building an understanding of the construct of social ability in online learning and developing a system to support the use of activity awareness as a means to improve social ability in online learning. A survey including an instrument to measure social ability collected students' perceptions about their online learning experience across six online courses using the activity awareness support system. The results show that students' ways of accessing activity information and their appreciation of the usefulness of activity information toward their learning goals influences their social ability, sense of community, and satisfaction in online learning. Additionally, aspects of students' social ability differentially influence a sense of community and learning satisfaction. Perceptions of peers' and instructor's social presence and comfort in sharing personal information with others impacts sense of community, and perceptions of the instructor's social presence and sense of community impact learning satisfaction.

Keywords: Social Ability, Sense of Community, Technology Acceptance, Path Analysis

Objective

Online courses have great potential to improve access to higher education. Positive reports of online learning success show its impact and potential, such as relative equivalence in test-result outcomes with face-to-face learning courses (Talent-Runnels, Thomas, Lan, Cooper, Ahem, Shaw & Xiaoming, 2006). However, concerns remain about a diminished social experience in online courses that may be detrimental to both the student-to-instructor and student-to-student relationships needed for sufficient engagement and retention of online students. Hirschheim (2005) compared perceptions of students in a classroom-based course and in an internet-based course and found that 74% of students in the Internet class believed they "missed out" educationally because they took an Internet class. While results are mixed, studies have generally shown that students are more satisfied with face-to-face learning than online learning (Johnson, Aragon, Shaik, Palma-Rivas, 2000). This lower level of satisfaction with online learning can be seen in high frustration levels, difficulty developing student interaction, confusion about class requirements and high rates of attrition of online students. Carr (2000) showed that drop out rates in online courses are 10 to 20 percent higher than in traditional courses. Chyung (2001) found that online learners who dropped out perceived that their online learning environment was not engaging, lacked confidence while learning at a distance, and had low satisfaction with the instructional processes used in the online learning.

In the early 2000's a set of colleagues at the University of Missouri were beginning to teach online courses and began discussing a concept later referred to as social ability. The online educators and researchers saw variability in the way students and instructors were experiencing the social nature of the online courses. Some classes might be highly

engaged with students expressing an appreciation for working with their fellow students and other classes seemed much less powerful and rewarding as a social learning experience. Similarly within courses and across activities there was variability in engagement and interaction. From these early experiences in online learning the construct of social ability was formed and was characterized not as a trait of the individual, but rather as a characteristic of the individual with a task in a context where the context includes the tools for mediating human-to-human computer interaction. A systematic examination led to an articulation of social ability as comprising social navigation, presence and connectedness (Laffey, Lin & Lin, 2006). Further work (Yang, et al, 2006) refined the model to include five factors: peer social presence, instructor social presence, written communication skills (no doubt an artifact of using text-based learning systems such as discussion boards for social interaction), comfort with sharing personal information, and social navigation. In a general sense social ability is a perception of one's beneficial experience and interaction with the instructor and fellow students and one's belief in their capacity to sustain those positive social connections within the social, instructional and technological context.

Studies of social ability have shown that it can differ across instructional contexts (Laffey, Lin & Lin, 2006), is a predictor of sense of community and learning satisfaction (Laffey, Lin & Lin, 2006; Tsai, et al 2007), varies across time even for members of intact groups (Goggins, Laffey & Galyen, 2009) and is associated with self monitoring of interactions in learning (Cho, Shen & Laffey, in press). Given concern about the social nature of online learning, and our belief that improving social ability could contribute to a positive social experience and support learning with others, we considered ways of improving social ability. While there are potentially many meaningful ways to impact

social ability, we hypothesized that the availability of appropriate, timely and contextually relevant information about the activity of fellow members would impact social ability and in turn impact the social learning experience. For example, being aware of who is reading what discussion posts and when resources are uploaded would support a sense of presence with others and enable social navigation. Knowing that others are reading a message you posted provides feedback that you are in the learning environment with others and knowing that others are posting and reading may suggest posts for you to read based on a the concept of social navigation (using the behavior of others as a model for our own behavior, such as when we see others carrying umbrellas and then go get our own before leaving the building).

The Fund for Improving Post Secondary Education (FIPSE) of the U.S. Department of Education provided a grant to develop our methods which we call a Context-aware Activity Notification System (CANS) for monitoring and reporting on social activity in course management systems (CMS). The purpose of the notification system is to increase and improve the flow of social information in an online course. The CANS System (Amelung, 2005; Amelung, 2007; Laffey, Amelung & Goggins, 2009) includes the CMS, in this case Sakai, and the CANS Server, which provides communication and database services for notification. CANS is licensed under the Educational Community License (1.0) version of the open-source license. CANS works by observing activity in the CMS, such as when a member logs in, reads a discussion board item, uploads a document, or enters a chat message. The records of all these observations are stored and matched with profiles for access to awareness information set by the members. Matches lead CANS to send information to members who want the information in a form they have selected. For example, a student in a group may want to know when the instructor has posted an

assignment and have that information immediately emailed or delivered via a desktop widget. The student may want to see who has posted new messages or read existing messages, but only want that information when they enter the course website. An instructor may want the same information but want it organized in a table to see who has contributed and how much to a discussion. Thus the awareness information is a resource for instructors and students in knowing when and how to act.

Theoretical Framework and Implementation Model

Wenger (1998) developed a social theory of learning based on an understanding of how cognition is situated in a social context. This theory provides a framework for identifying the importance of and understanding the influences upon the social nature of learning. The social theory of learning posits that learning takes place through participating in the practices of a community and moving from peripheral to central status. Wenger's account of the process by which someone is drawn into full membership shows the need for social information and rich interactivity. Wenger argues that learning is a reciprocal process of identity formation and meaning negotiation with and through active participation in a social practice. Participating in a social unit provides meaning to experiences and engagement in the world, and provides shared perspectives and resources for sustaining engagement in activity. Thus, the social nature of the experience is both a key motivation and a method for engagement.

We apply Wenger's social theory as a way to frame and understand the role of social information in the social nature of an online learning experience. Three constructs are used to assess the social nature of the online learning course: social ability, sense of community and learning satisfaction with the course. In prior research the authors (Laffey, Lin & Lin, 2006; Laffey, 2006; Yang, et al, 2006; Tsai, et. al., 2008; Lin, Lin, &

Laffey, 2008) developed a way to assess **social ability** as a reliable predictor of learning satisfaction and behavioral intentions in online learning. By social ability we mean a person's capacity to associate with fellow online group members and to use the members, resources and tools of the social context to achieve something of value. The instrument for assessing social ability was first developed from conceptual implications of social navigation, social presence and connectedness among members and later elaborated through empirical studies and factor analysis. **Sense of community** is an attribute of an online community that represents a feeling of belonging and having others to ask for support (Blanchard, 2000 and Wellman & Gulia, 1999). Having a high sense of community indicates a greater flow of information among members, availability of supports, commitment to group goals, and higher collaboration among members (Wellman, 1999; Dede, 1996; Bruffee, 1993; Tinto, 1993; Scott, 2004). **Learning Satisfaction** represents both the value held for learning outcomes and the fit of how learning is undertaken with the style or preferences of the students. In this sense learning satisfaction is the meaningfulness, importance and fit of objectives and methods of the course to the individual.

In our model the flow of social information is represented by how well the student appropriates the CANS tool. Carroll et al. (2003) studied activity awareness and identified three different types of awareness information for productive synchronous and asynchronous collaboration: social awareness ("who is around"), action awareness ("what is happening to objects"), and activity awareness ("how are things going on"). Activity awareness is implemented in our study through the use of an email digest delivered to each student in the course each morning. The digest lists the activity in the course management system from the previous day. We assessed appropriation of the tool using

TAM (Technology Acceptance Model). The Technology Acceptance Model (TAM) is a frequently used framework for exploring people's technology usage behaviors and assesses both ease of use and usefulness of the tool (Davis, 1989).

Research Question

The purpose of this study is to build new knowledge about the social nature of online learning, especially how students' social ability impacts and is impacted by other social constructs of online learning. First, the factors of social ability identified by Yang et al. (2006) are re-examined and the relationships among the social constructs of online learning (e.g. ease of use, usefulness, social ability, sense of community, and satisfaction) were explored. Additionally, the relationships among the factors of social ability and other social constructs of online learning were examined to understand how these social ability factors contribute to the social nature of online learning.

1. How do students perceive their social ability in online learning? (what are the factors of social ability?)

2. How do the factors of social ability relate to the social nature of students' online learning experience?

Research Method

To investigate the relationships among students' social ability and other social constructs of online learning, a survey was implemented to collect students' perceptions of their online learning experience. Reliability analysis was employed to examine the factors of social ability as well as path analysis was utilized to explore the relationships among

social constructs of online learning experiences and the relationships among the factors of social ability and other social constructs.

Research Context and Participants

Students in six online courses in a college of education in a university in the United States were invited to participate in this study. All six courses had similar course structures (a typical unit included a set of learning tasks guiding students to work individually or collaboratively with peers to accomplish assignments), and were delivered fully online through the Sakai 2.0 course management system. A daily email digest reporting course members' posting activities (discussion boards, chats and resources) was delivered to students every day. The purpose of providing students the daily email digest was to support their social awareness of what others were doing in the course and explore how students' social experiences of online learning were influenced by access to social information.

Near the end of the semester, a recruiting email with a link to an electronic consent form and survey instrument was sent to 125 students who were enrolled in the six online courses. There was a 67.2% response rate resulting in 84 participants who completed the survey via the Internet. Table 1 presents the demographic information for the 84 subjects.

Table 1 *Demographic information for 84 cases*

Demographic Information		Number of Participants	Percentage (%)	Total
Gender	Male	29	34.5	84
	Female	55	65.5	
Age	Under 20	4	4.8	84
	21-30	38	45.3	
	31-40	22	26.2	
	41-50	14	16.6	
	> 50	6	7.1	
Academic Status	Undergraduate	23	27.4	84

	Graduate	59	70.2	
	Other	2	2.4	
Pervious Online Courses	0-1 courses	23	27.4	84
	2-5 courses	19	22.6	
	> 6 courses	42	50.0	
Hours Login(weekly)	< 5 hr.	34	40.5	84
	6-10 hr.	27	32.1	
	> 10 hr.	23	27.4	

Measures

The instruments employed in this study were adapted from the instruments used in Yang et al. (2006) which measured the social constructs of students' online learning experience. Below is a description of the items for each of the instruments.

Social Ability. The 30 items of social ability (SA) identified by Yang et al. (2006) via exploratory factor analysis were employed in this study. According to Yang et al. (2006), these 30 items were loaded into five factors, including perceived peer social presence (SPp, 10 items), perceived written communication skills (WC, 3 items), perceived instructor social presence (SPi, 8 items), comfort with sharing personal information (SI, 3 items), and social navigation (SN, 6 items). The Cronbach's α reliability values for the data of this study are .91 for SPp, .98 for WC, .93 for SPi, .87 for SI, .84 for SN, and .90 for social ability as a whole.

Sense of Community. The 20 items of sense of community (SOC) were originally adapted from the Classroom Community Scale (Rovai, 2002b). The Cronbach's α reliability value for sense of community for this study is .88.

Technology Acceptance. The 6 items of students' perception of ease of use (PEU) and 6 items of students' perception of usefulness (PU) were originally adapted from the Technology Acceptance Model (TAM; Davis, 1989). In this study, we identified the technology tool that these items measured as the daily email digest. The Cronbach's α

reliability values for these two primary constructs of students' technology acceptance in this study are .95 for PEU and .97 for PU.

Learning Satisfaction. The nine items of students' learning satisfaction of online learning were taken directly from the nine items used in Yang et al. (2006). These items were originally adapted from the Zone Experience Study Questionnaire developed by Lin (2005). The Cronbach's α reliability value for this construct is .93.

Data Analysis

Reliability analysis and path analysis were employed to analyze quantitative survey data of students' perceptions of their social ability and the social nature of online learning. Based on the factors identified by Yang et al. 2006, 30 items related to social ability were examined to determine the reliability of the five factors of social ability. Next, the relationships between social ability and other social constructs and the relationships among the factors of social ability and other social constructs were examined via path analyses.

Results

Reliability Analysis

Prior to the reliability analysis for the five factors of social ability (30 items) identified by Yang et al. (2006), 84 cases were examined for the assumptions of reliability analysis. Scatter plots for randomly selected pairs of the 30 social ability items were generated and generally indicated linearity. Normality was checked via the skewness and kurtosis of the 30 variables. Most of the variables have skewness and kurtosis values less than ± 3. Additionally, there were 9 univariate outliers found in the examination with criteria z

scores greater than 3.29 and less than -3.29 and one case of multivariable outliers was found with $X^2(30) = 59.70$ ($\alpha = .001$). Thus, a total of 74 cases were used for the reliability analysis. Also, multicollinearity assessed using Tolerance was satisfied because all the tolerance values were not close to 1.00 (between .025 and .35).

The results of reliability analysis are presented in Table 2. All factors had Cronbach's α values over .80 (Nunnaly, 1978) which satisfied the criteria for reliability. The high reliability coefficient indicates the factors identified in Yang et al. (2006) were confirmed as reliably represented in our data.

Table 2 *Reliability of social ability factors*

Constructs	Overall		Reliability
	M	**SD**	**(# of items)**
F1: Perceived peers social presence	**5.40**	**.79**	**.91 (10)**
F2: Perceived written communication skills	**5.15**	**2.07**	**.98 (3)**
F3: Perceived instructor social presence	**5.55**	**.99**	**.93 (6)**
F4: Comfort with sharing personal information	**5.15**	**1.65**	**.87 (3)**
F5: Social navigation	**5.50**	**.90**	**.84 (6)**

Note. N=74

Preliminary Analyses for Path Analysis

Prior to the path analysis of social constructs (e.g. SA, SPi, SPp, CS, SI, SN, SOC, PEU, PU, S), 74 cases were examined for the assumptions of multivariate analysis. Scatter plots for randomly selected pairs of the 10 social constructs were generated and generally indicated linearity. Normality was checked via skewness and kurtosis (less than ± 3) was found satisfactory, and significant Kolmogorov-Smirov (K-S) values (> .05) indicate the data of most of the social constructs are normally distributed. Additionally, there were no univariate outliers found (criteria: z scores greater than 3.29 and less than -3.29) and no multivariable outliers were found with $X^2(10) = 29.59$ ($\alpha = .001$). The multicollinearity assessed using Tolerance was satisfied because all the tolerance values were not close to

1.00 (between .32 and .57). Thus, a total of 74 cases were used for the path analysis.

Table 3 presents the descriptive statistics and reliability for the 10 social constructs involved in path analysis. In addition to the 5 social ability factors, the rest of the social constructs had Cronbach's alpha values over .80, indicating a high level of reliability (Nunnally, 1978).

Table 3 *Descriptive statistics and reliability of social constructs*

Constructs	Overall		Reliability
	M	**SD**	**(# of items)**
Social ability (SA)	5.56	1.04	.90 (30)
F1: Perceived peers social presence (SPp)	5.40	.79	.91 (10)
F2: Perceived written communication skills (WC)	5.15	2.07	.98 (3)
F3: Perceived instructor social presence (SPi)	5.55	.99	.93 (6)
F4: Comfort with sharing personal information (SI)	5.15	1.65	.87 (3)
F5: Social navigation (SN)	5.50	.90	.84 (6)
Perceived ease of use (PEU)	5.25	1.40	.95 (6)
Perceived usefulness (PU)	4.50	1.68	.97 (6)
Sense of Community (SOC)	5.00	.78	.88 (20)
Learning Satisfaction (S)	5.56	1.04	.93 (9)

Note. N=74

Prior to the path analysis, a correlation analysis was conducted to gain a sense of how social constructs correlated directly to each other. Table 4 shows the correlation matrix for the 10 social constructs.

Table 4 *Correlation of social constructs*

Variables	SA	SPp	WC	SPi	SI	SN	PEU	PU	SOC	S
SA	-									
SPp	.522**	-								
WC	.613**	-.193	-							
SPi	.571**	.674**	-.080	-						
SI	.802**	.216	.513**	.200	-					
SN	.422**	.706**	-.282*	.620**	.102	-				
PEU	.167	.307**	-.126	.267*	.118	.239*	-			
PU	.107	.342**	-.263*	.361**	.035	.305**	.678**	-		
SOC	.694**	.673**	.144	.618**	.509**	.505**	.231*	.168	-	
S	.448**	.578**	-.038	.597**	.243*	.433**	.414**	.345**	.617**	-

Note. ** P<.01, *P<.05

Primary Path Model

In the path analysis, the Wald test for dropping parameters was employed, and paths were dropped if they were not statistically significant ($z < 1.96$, $p < .05$) and the chi-square ($\chi 2$) change was smaller than 3.84 ($\chi 2(0) = 3.84$; Kline, 2005) or if the relationship did not make sense based on our theoretical perspective. During the process of Wald tests, four paths, including PU to S, PU to SA, PEU to SOC, and SA to S were dropped because of not achieving significance. After discarding the four non-significant paths, a final path model with best model fit was found. According to the criteria for a good model fit (non-significant $\chi 2$ value, CFI and TLI >.95, SRMR<.10, and RMSEA<.06) suggested by Hu and Bentler (1999), all of the criteria were met, suggesting that overall the data fit the model well. Table 5 presents the fit indices of goodness for this over-identified model (10 unique pieces of information – 8 estimated parameters = 2). Additionally the final model with R^2 values is presented in Figure 1.

Table 5 *Model Fit Indices*

Model	χ^2	P	CFI	TLI	SRMR	RMSEA	RMSEA 90% C. I.
Criteria	N/A	>.05	>.95	>.95	< .10	< .06	
Results of the Final Model	1.713	.788	1.000	1.042	.022	.000	.000 ~ .114

Note. N=74 (Hu & Bentler, 1999)

In the final path model, the correlation coefficients of the most direct paths ranged from .31 to .83 and are statistically significant at $p < .05$ or .001. The only two non-significant direct paths are the relationships of PU to SOC and PEU to SA. These two paths were not dropped because they related to expectations identified in previous studies. The R^2s means indicate that approximately 45% of the variance of satisfaction is explained by students' perception of ease of use and sense of community. Also, members' perception of social ability and usefulness of the daily email digest explain

approximately 49% of the variance of members' sense of community. Of note is that perceived ease of use of the daily email digest accounts for only 3% of the variance in members' social ability. Lastly, students' perception of ease of use of the daily email digest directly accounted for about 46% of variance of perceived usefulness of the daily email digest. This model indicates that the level of usefulness and the ease of use of the notification tool moderately impact learners' sense of community and course satisfaction. This model also suggests that ease of use, in this situation is not related to social ability, which may be partially due to a relatively high, compared to usefulness, ease of use score. Efforts to improve usefulness of notification may in turn improve social ability, sense of community and satisfaction. The variance of SA explained by the model is only 3%. It is possible the PEU and PU of email digest can not really present how members use the Sakai tools and email digest to learn, which might be because the Sakai tools are still the primary methods for students to use when learning online.

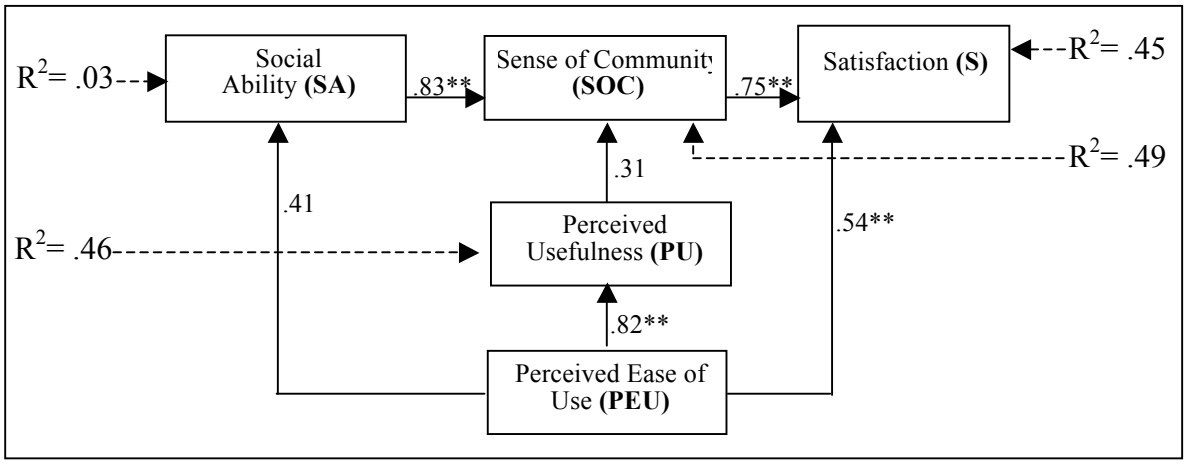

Figure 1. Primary Path Analysis Model with R^2 Values (* $z > 1.96$, $p < .05$; ** $z > 3.29$, $p < .001$ statistically significant; ⟶ represents significant path, ⇢ represents variance explained)

Additionally, the mediating relationships among the variables: social ability, sense of community and satisfaction in the final path model were examined. According to Frazier, Tix, and Barron (2004), a mediator is defined as a variable that accounts for the

relation between a predictor and a dependent variable. Following the steps prescribed in Frazier, Tix, and Barron (2004), sense of community is a full mediator for the relationship between social ability (a predictor) and satisfaction (a dependent variable). The significant direct relationship between SA and S becomes non-significant after adding SOC (the mediating variable). The procedures for establishing the full mediating relationship is illustrated in Figure 2.

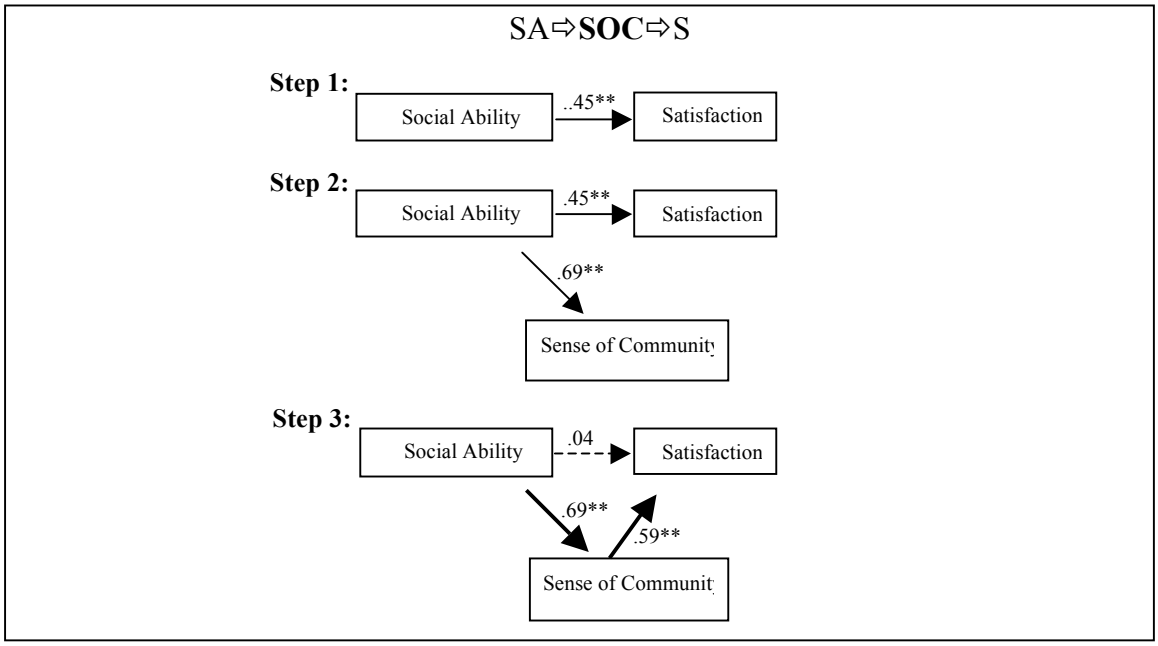

Figure 2. Mediator Identification (* z > 1.96, $p < .05$; ** z > 3.29, $p < .001$ statistically significant; ⋯▶ represents weaken path with significant value, ----▶ represents non-significant path, ——▶ represents significant path without decreasing strength)

Constituent Elements Path Model

To what extent do the constituent elements of Technology Acceptance (PEU and PU) explain the social ability factors? A path analysis of the relationships among PEU, PU, and factors of social ability including SPi, WC, SPp, SI, and SN was implemented. In the path analysis, the Wald test for dropping parameters was employed and five paths, including PEU to SPi, PEU to SN, PU to SI, PEU to WC, and PEU to SPp did not achieve significance. After discarding the five non-significant paths, a final path model

with best model fit was found. According to the criteria for a good model fit suggested by Hu and Bentler (1999), all of the criteria were met, suggesting that overall the data fit the model well. Table 6 presents the indices of goodness of fit for this over-identified model. Additionally the final model with R^2 values is presented in Figure 3.

Table 6 *Model Fit Indices for First Path Model*

Model	χ^2	P	CFI	TLI	SRMR	RMSEA	RMSEA 90% C. I.
Criteria	N/A	>.05	>.95	>.95	< .10	< .06	
Results of the Final Model	1.703	.889	1.000	1.074	.021	.000	.000 ~ .075

Note. N=74 (Hu & Bentler, 1999)

In the path model shown in figure 3, the correlation coefficients for most direct paths range from .20 to .77, and are statistically significant at $p < .05$ or .001. The only non-significant direct path is the relationship of PEU to SPp. This path was not dropped from the model because the chi-square (χ2) change would be greater than the standard of 3.84 ($\chi^2(0) = 3.84$; Kline, 2005) for comparative paths. The R^2s means indicate that approximately 13% of the variance of SPi, 12% of variance of SPp, 9% of variance of SN, and 6% of variance of WC are explained by students' perception of usefulness of the daily email digest. Additionally PEU accounts for 46% of variance of PU. These findings show that learners who find the social information provided in the notification tool useful have a stronger sense of presence with the instructor and peers and a better ability to use social information to make choices about what to do (social navigation). Additionally the learners who find the social information useful also have less concern for their own written communication skills.

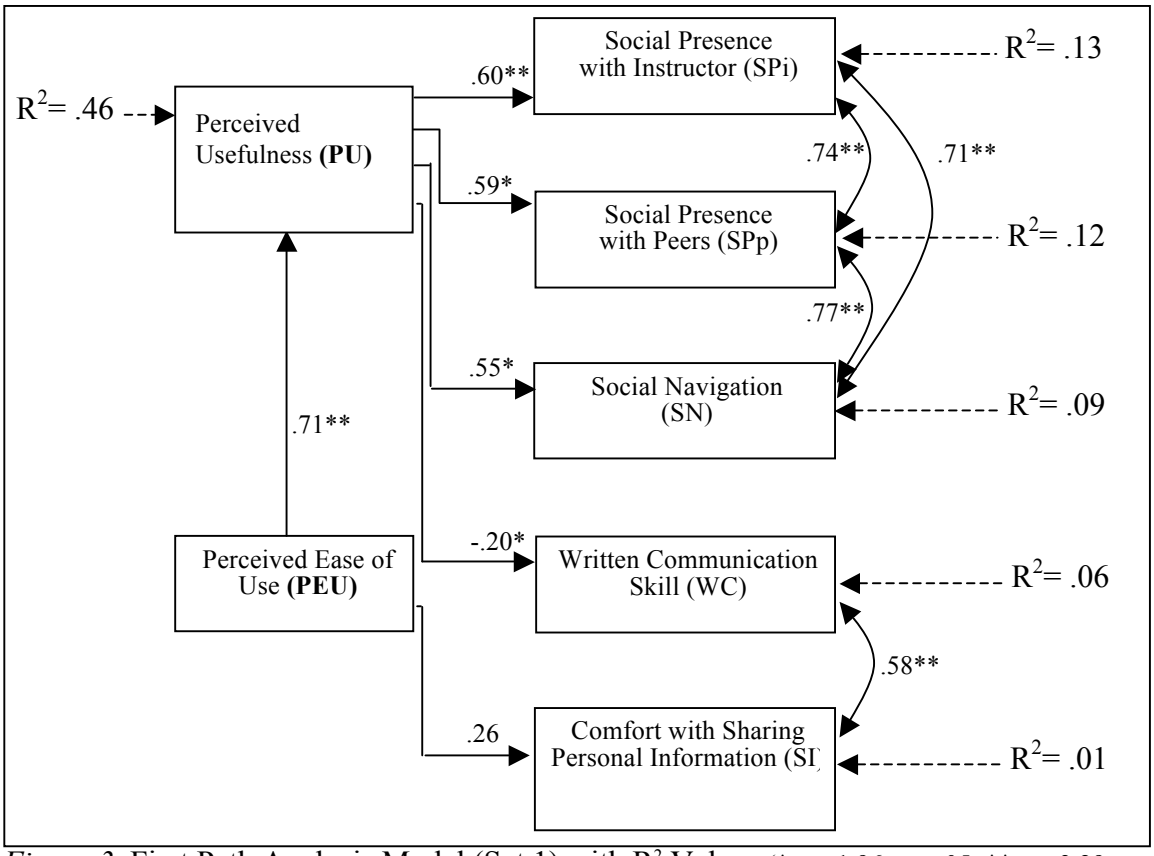

Figure 3. First Path Analysis Model (Set 1) with R^2 Values (* z > 1.96, $p < .05$; ** z > 3.29, $p < .001$ statistically significant; ⟶ represent significant direct path, ⟷ represents significant correlation paths, ⟶ represents variance explained)

Factors of Social Ability Model

The next analysis explored the influence of social ability factors on sense of community and learning satisfaction. In the path analysis, the Wald test for dropping parameters was utilized, and four paths, including SI to S, SN to SOC, WC to S, and SPp to S were dropped because of not achieving significance. Two non-significant direct paths (SN to S and WC to SOC) were not dropped because the chi-square ($\chi 2$) change is greater than the standard of 3.84 ($\chi^2(0) = 3.84$; Kline, 2005) between comparative paths. After discarding the four non-significant paths, a final path model with best model fit was found. According to Hu and Bentler's (1999) criteria for a good model, all of the criteria were

met suggesting the data fits the model well. Table 7 presents the fit indices of goodness for this over-identified model (21 unique pieces of information – 4 estimated parameters = 17). Additionally the final model with R^2 values is presented in Figure 4.

Table 7 *Model Fit Indices for Second Path Model*

Model	χ^2	P	CFI	TLI	SRMR	RMSEA	RMSEA 90% C. I.
Criteria	N/A	>.05	>.95	>.95	< .10	< .06	
Results of the Final Model	2.345	.672	1.000	1.041	.019	.000	.000 ~ .137

Note. N=74 (Hu & Bentler, 1999)

In the final path model, the correlation coefficients of direct paths range from .15 to .79, and most are statistically significant at $p < .05$ or .001. The R^2s means indicate that approximately 46% of the variance of satisfaction is explained by students' perception of SPi, SOC, and SN. Also, members' perception of SPi, SPp, WC, and CS contribute to explaining approximately 64% of the variance of members' sense of community. However, the variances of SOC explained by WC and the variance of S explained by SI were non-significant. These results indicate that the role of SPp in S is at least partially moderated through the relationship of SPp with SOC and that SPi (within this model) has a strong influence on S. Overall the model provides significant explanatory power for both SOC and S in online courses.

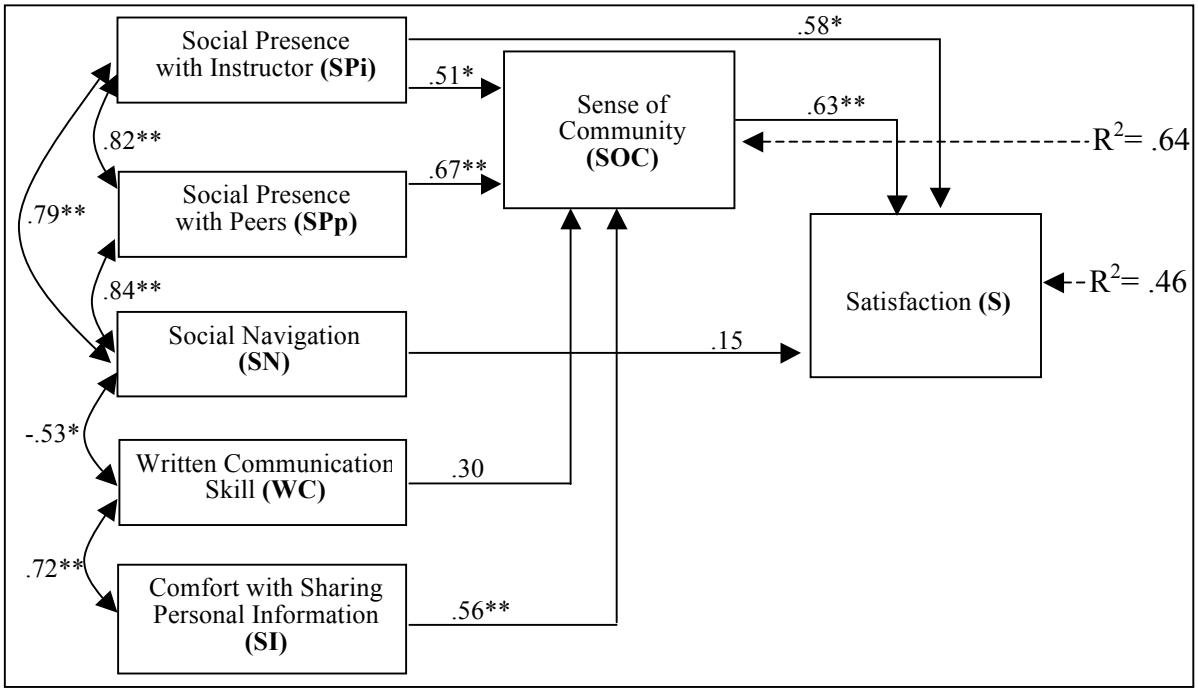

Figure 4. Second Path Analysis Model (Set 2) with R^2 Values (* $z > 1.96$, $p < .05$; ** $z > 3.29$, $p < .001$ statistically significant; represent significant direct path, represents significant correlation paths, represents variance explained)

Discussion

The rapid increase in the use of online tools as well as fully online courses in higher education creates a dependence for many faculty and students upon these new systems. While some evidence suggests that these systems can be equally effective as traditional classroom courses, little is known about the learning activities of students and how they experience these online courses. Additionally in a very profound way education is a social activity, but in some very important ways online systems change the social experience. Social Ability and Sense of Community have been shown to be key elements of the social nature of online learning and prior research has linked these constructs to positive and successful online learning experiences (Yang, et. al., 2006; Tsai, et. al., 2008; Lin, Lin, & Laffey, 2008). In this study we tested and extended this model of the social nature of online learning. The data from this study support (as shown in figure 1) that

social ability contributes to sense of community which in turn supports learner satisfaction. One extension of this model is to examine the contribution of social information to the social nature of online learning. The findings from the current study show a moderate impact of introducing a specific tool to support awareness of activity in the online system. The email digest provided a daily notice about activity from the prior day. The perceived ease of use of this digest for maintaining awareness has a significant relationship with satisfaction and along with sense of community explains 45% of the variance of satisfaction. Also, members' perception of the usefulness of the daily email digest and their own social ability explain approximately 49% of the variance in members' sense of community.

A further extension of the model is to look at the role the constituent elements of TAM play in social ability and the role that the individual factors of social ability play for sense of community and satisfaction. Figure 3 shows that ease of use supports the ability of the digest to be useful and this usefulness is associated with presence with the instructor and with peers along with an appreciation for using information about the activity of others to guide your own behavior (social navigation). In turn, these factors (as shown in figure 4) illustrate how social ability contributes to sense of community and satisfaction. The CANS project sees these findings as promising for the use of social information to improve the social nature of online learning. First of all the devices of social awareness must be easy to use. This makes sense because the use of social information is rarely a requirement of any lesson or assignment in the course. The information may be useful in completing work especially when some attempts at cooperative or collaborative learning are tried, but rarely is the information itself a part of the assignment or work to be assessed. Thus, the information must come in fairly natural

and informal ways, so that the user is informed without extending too much effort. Similarly social information may be more or less useful depending on the nature of the course assignments. Therefore, improvements to the usefulness of the notification device may come from allowing it or them to be customized to the course requirements. For example, when a student is working on a group project, information about what the group members are doing should take priority over what other members of the class are doing.

Importance

The results of this study show that improving access to social information is related to social ability, sense of community, and learner satisfaction in online learning. This result may mean that providing social information in an easy to use and useful format improves the social nature of online learning or that students with a high sense of social ability and sense of community value social information. Further research and model building are needed but the findings of strength for the model suggest that tools such as the notification tool are supportive of the social nature of online learning, and that improvements to the social nature of learning influence satisfaction with online learning.

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