Building a Model Explaining the Social Nature of Online Learning

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ABSTRACT

Based upon a framework of social theory of learning, this research examines a model of how social constructs affect satisfaction within online learning using path analysis. The social constructs evaluated in this study include social ability, sense of community, perceived ease of use and usefulness of awareness tools, and self-reported participation in online courses. The results indicate that sense of community is a mediator of the relationships between social ability and satisfaction and between perceived usefulness and satisfaction as well as a moderator for the relationship between self-reported participation and satisfaction. Additionally, self-reported participation, social ability, and perceived usefulness of awareness tools are predictors of sense of community, while social ability is predicted by self-reported participation and perceived ease of use.

Introduction

Online learning has become a pervasive part of higher education. As indicated, online enrollment increased from 1.98 million in 2003 to 2.35 million in 2004, and approximately 74 percent of public institutions of higher education identified online education as a critical long-term strategy in year 2005 (Allen & Seaman, 2004). Many positive reports of online learning success show its impact and potential, such as relative equivalence in test-result outcomes with face-to-face courses (Talent-Runnels, et. al., 2006), broad implementation and rapid growth across higher education, and provision of access for many students who would otherwise have to forego higher education Although students appreciate the flexibility and convenience offered by online learning environments, students do experience a sense of isolation (Abrahamson, 1998; Bessar and Donahue, 1996; Rahm and Reed, 1998), and in general are more satisfied with face-to-face courses (Allen et al, 2002; Simonsen, 1997; Klesius, Homan, & Thompson, 1997). In her study, Carr (2000) found higher dropout rates for distance education (10-20%) over traditional programs. Reasons given for the high dropout percentage of distance learners include limited support and service of distance education, dissatisfaction with teaching methods, unfamiliarity with the technology used, and student feelings of isolation. Moreover, Hara and Kling (2000) found that online students were frustrated by the communication and technical difficulties that impeded interaction. Arbaugh (2000) found that the lack of social interaction was a factor that depressed student satisfaction in online learning. This dissatisfaction with online learning can be seen in high rates of attrition for online students (Chyung, 2001). Based upon beliefs of social theory of learning, learning occurs through social participation and interaction, which consequently plays a critical role in the development of cognition (Vygotsky, 1978; Wenger, 1996). The present study seeks to build a model of the elements that contribute to the social nature of the online experience and influence satisfaction in online learning environments.

Paper presented at the 2007 meeting of the American Educational Research Association, Chicago, IL.

Theoretical Perspectives

Advances in our understanding of how we learn show that contexts are highly influential in determining what we learn and how we will be able to use what we learn. Wenger (1998) indicates social participation as a process of learning and knowing is "not just to local events of engagement in certain activities with certain people but also more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities" (p.4). In a community of practice, people learn by socially negotiating meaning of the world with what they see, who they know, and what they do. Through negotiation people reflect what they know and what they learn into practice and learn from others' reflection or feedback as well. Their growth of knowledge depends on not only individual changes but also the shared values, relationships, networks, and knowledge reproduced when socially interacting to each other. Reciprocally, the reproduced growth, including changes of cognition, identity, and relationships determines how they participate in activities, interact and communicate with others.

Since learning is a social activity, the social nature of educational practices influences students' motivation to learn, ways of participating, negotiation of meanings in new knowledge and skills, and how new learning shapes self-identity and community membership. Online learning contexts are also social, but all social activities and contacts are mediated by technology tools within a specific networked environment. Researchers studying online learning environments explore relationships between social natures of learning separately, such as students' interaction with their usage of communication tools (Hara & Kling, 2000), social interaction with students' feeling of isolation (Abrahamson, 1998), students' perception of their performance with a sense of presence (Picciano, 2002), and students' feeling a sense of belonging and social interaction (Rovai, 2002c). Little is presented regarding interdependent and interconnected relationships among the social aspects of online learning. New knowledge is needed to understand how students experience the social aspects of their courses, and how the tools and methods of online learning can foster sociality and social interaction. To explicate the social nature of online learning and how it influences students' learning satisfaction, we draw upon four constructs of social life: participation, sense of community, social ability, and social awareness.

Participation

According to social theory of learning, students' participation is highly interconnected with how they feel about the people, tools, resources, and themselves as a member in the learning contexts. Wenger (1998) defines participation as "the social experience of living in the world in terms of membership in social communities and active involvement in social enterprises" (p.55). Wenger also presents that "Knowledge, belonging, and doing are not separable: What we know, who we are and what we do seamlessly come together in one experience of participation" (Wenger, 1996, p.22). During the learning process, students move from a novice learner peripherally to being a core party of a learning community, as well as how they perceive themselves in the learning community and how their identities perceived by others change (Wenger, 1998). Thus, learning and membership in a community are intertwined, and members' identities change through their participation in practice. Since learning is constituted through social activities, sense of community representing students' feeling sense of belonging and socially bonded with others has been identified to critically and positively influence the learners'

participation and interaction (Rovai, 2003; Carroll, 2001; Putnam, 2000). Also, the relationship between students' participation and sense of community seems to be reciprocal as well. Students' active participation is often seen as the critical element of the formation of a learning community and building a sense of community in online classes (Wang, Sierra, & Folger, 2003).

Additionally, researchers have identified several methods to encourage students' participation and interaction for online learning, such as instructional design for collaborative course activities (i.e. group work, debate, web polls, etc.), and the use of different types of synchronous and asynchronous communication tools (i.e. chat, discussion board, blog, etc) (Collins & Zane, 1996). Further, a qualitative study by Falvo and Solloway (2004) found that several factors including online learning format, technology used for supporting learning, instructional design, and various social activities and relationships contribute to a sense of community. Participants reported satisfaction with the format of online learning because the advantages of learning anytime and anywhere allowed students studying at their own pace and gave them the flexibility to learn from home. Moreover, students were interested in using different types of technology for interaction among students and the instructor. Thus, how well the technologies and tools support learners to accomplish what they are expected and want to do, how well they appropriate the tools to socially interact with others or participate in activities, and how learners feels about themselves and others are all tied together in building an online learning community.

Sense of community

Sense of community is an essential element of social interaction in online learning (Rovai, 2001). McMillan and Chavis (1986) define sense of community as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and shared faith that members' needs will be met through their commitment to be together" (p.9). Lave and Wenger (1991) argue "activities, tasks, functions, and understandings do not exist in isolation; they are part of broader systems of relations in which they have meaning. These systems of relations arise out of and are reproduced and developed within social communities, which are in part systems of relations among persons" (p. 53). Wenger implies the interrelationship between sense of community and social interaction and the importance of sense of community for students to be able to incorporate community membership within their personal identity.

Researchers report a variety of benefit of strong sense of community. In his observation with 20 graduate students, Rovai (2001) found that students' communication styles are important for building a sense of community. Students who wrote a message using a supportive, helpful, and connected voice were more likely to feel a strong sense of community than those with an impersonal, assertive, and independent voice. Additionally, Rovai (2001) reported a higher sense of classroom community at the end of five-week online course, and the significant classroom community was moderately and positively related to the number of messages posted to the discussion boards. He also indicated that comments posted by learners provide evidence that interaction promoted sense of community in class. This increased sense of classroom community was attributed to the lessened psychological distance due to interaction and involvement of online students in the course activities. Rovai's (2001) findings are aligned with previous research that found students with stronger sense of community tend to have a greater flow of information exchange among members, have higher availability of support, and have a higher commitment and satisfaction with group work and collaboration (Wellman, 1999; Dede, 1996; Bruffee, 1993) as well as a greater sense of well being (Rovai, 2002a). Specifically, Tinto (1993)

and Scott (2004) showed that students' satisfaction with online courses increases when they feel involvement and have strong relationships with members in the learning community. Sense of community has been positively associated with students' learning achievement (Bryk & Driscoll, 1988).

Sense of community is recognized as an important factor for fostering interactivity or interaction among participants in online learning environments; however, building and sustaining a sense of community in a virtual classroom is a substantial challenge. Rovai (2002a) argues that social integration alone may attract adults into the online program, but it is not strong enough to retain them. They need to feel involved and develop relationships with other students in the online course (Rovai, 2002a). According to Rovai (2002a), the key for building and sustaining a sense of community is facilitating interaction among students. He observed students reported better sense of community in class when they felt higher levels of interaction. Then, what can the online learning community do to foster interactivity or interaction among participants in online learning environment so that students can build a positive sense of community? Two types of interactions: task-driven interactions and socio-emotional interactions are identified from previous study. Wilson (2001) argues that collaborative learning opportunities will foster sense of community. He also points out the important of environmental supports (e.g. various means to facilitate communication and knowledge-sharing, group rules for interactions, etc.) for successful collaborative learning in creating a sense of community. Further, Rovai (2001) argues that task-driven interactions may not be enough to foster positive sense of community among participants and a supportive environment for socio-emotional interactions is critical for promoting a sense of community. Rovai (2002) found that helping students be aware of other members' activities is one way to support students' sense of community. Students need experience the existence of others and socially interact with others in the environment.

Social ability

Social ability represents how able members are in using the resources of the social context to achieve important goals (Laffey, Lin, & Lin, 2006, p. 166). Social ability in online learning environments is determined by the fit among people, tools, and activities. For example an instructor may be capable to work with a project group in a face-to-face classroom, but if the task is mediated by a chat tool which is unfamiliar or awkward for the instructor, the group may not advance as effectively as it could be in a face-to-face context (Laffey, Lin, & Lin, 2006) due to the poor fit between the instructor and the chat tool. Through several exploratory studies with online students, five components of social ability were explicated: peer social presence, instructor social presence, written communication skills, comfort with sharing personal information, and social navigation (Laffey, Lin, & Lin, 2006; Yang, Tsai, Cho, Kim, and Laffey, 2006; Lin, et. al., 2006; Tsai, et. al., 2007). In other words, students who have higher social ability in online courses tend to be more capable to be aware of and act upon peer and instructor's actions, to share personal information, and to communicate with others in the written format. These capabilities have been shown have great impacts on students' online learning processes and outcomes. First of all, written communication skill matters! Written skill is a necessity in online environments since the synchronous and asynchronous communication channels are still primarily text-based, such as discussion board, email, chat, etc. Students who have poor written skills may experience difficulties to express opinions and build relationship in online courses.

Additionally, Lin et. al. (2006) showed that social ability was a significant predictor for students' online learning satisfaction and was a critical construct for explaining students' changes from the peripheral into central role in a community. Garrison and Anderson (2003) also argued that the formation of community requires a sense of social presence among members in the online environments. In addition to sense of community that is developed through socio-emotional interactions, social ability is the glue that connects and keeps people engaged in interpersonal relationships developed among the members. Sharing personal information has been shown to foster the formation of sense of community by facilitating deeper and more meaningful interpersonal relationships in online communities (Swinth, Farham, Davis, 2002). Moreover, the notion of social navigation in social ability is related to the use of indirect information sharing for guiding others' action and decisions making. Thus, it can be argued that the capability of students' observing others' footprints and making decisions can improve the efficiency and effectiveness of online learning and contribute the sense of community during the socially observed process.

According to social theory of learning (Wenger, 1998), learners appropriate communication and social awareness tools to interact with others and engage in activities. Students' participation and interaction is determined by the affordance of tools supporting their interactive needs and their appropriation the tools to achieve learning goals. Social ability as an indicator of the fit among person, task and tool is highly affected by the affordance of technology in a context. Connell, Mendelsoh, Robins and Canny (2001) pointed out that means of communication differ by media richness and social presence. They showed that people are more likely to act like themselves – to act authentically – in computer mediated communication and telephone conversations than they are face-to-face. This research suggests that in some ways, counter to commonly held views that computers diminish social experience, social ability may actually be enhanced through computer mediation. Reidl (2001) posited a classification framework for social systems that includes synchronicity of communication, directness of communication and social presence. Reidl stated that social presence was the degree of salience of another person in a social interaction. Wyse, Chang, Duffy and DelValle (2004) pointed out the distinction between how community is defined in the sociological literature as a grouping that is sustained over time, while explicating social presence as the feeling that others are participating with you.

Social awareness

Gallini and Helman (1995) found that in order to learn successfully online learners need to be more effective in communicating information and being aware of and others' actions. However, establishing and maintaining social awareness in online courses has been reported to be difficult without appropriate tools (Gutwin, 1997; Gutwin & Greenberg, 2002). In order to improve effectiveness of online learning, researchers have examined how synchronous and asynchronous computer mediated communication tools deliver social awareness. Particularly, they found social awareness contributes to sense of community through maintaining work relationships and informal communication (Dourish & Bly, 1992). Utilizing technology tools to support social awareness not only influences the ways members socialize, appropriate, and adopt tools for interacting with one another and participating in online learning (Tu & Corry, 2003; Lavooy & Newlin, 2003; Tu & McIsaac, 2002; Kearsley, 2000) but also enhances users' awareness of people and workspace without increasing cognitive load (Carroll et. al. 2003).

Technology Acceptance Model (TAM) has been one of the most influential models in predicting and explaining usage and acceptance of a new technology, and is being used in this study to assess how members accept social awareness tools. In TAM, perceived usefulness and perceived ease of use are the two major factors affecting users' acceptance behaviors. According to Davis (1989), perceived usefulness is defined as "the degree to which an individual believes that using a particular system would enhance his or her job performance" (p.320) and perceived ease of use refers to "the degree to which an individual believes that using a particular system would be free from physical and mental effort" (p.320). Davis argues that users accept and use a technology primarily because of the functions it performs for them, and secondarily how easy they can get the technology to perform the tasks. Adapting TAM to examine students' online learning behavior, Lin (2005) found that students' intention to use technologies affected their usage behavior in online learning environments.

Previous literature about online learning has shown that failure to achieve a sense of community and feelings of isolation negatively affect acceptance of online learning (Vonderwell, 2003; Woods, 2002). The current study seeks to test and build a model of social factors that are hypothesized to influence sense of community and further to see if this model also explains satisfaction with online learning.

Methodology

Research questions

This study explores a model of how the social nature of online learning experiences influences students' satisfaction. Path analysis was used to investigate the extent to which key constructs, including self-reported participation, social ability, perceived ease of use and usefulness of social awareness tools, and sense of community explain satisfaction with online learning. The research questions of this study are:

(1) How does students' sense of community associated with their social ability, self-reported participation, and perception of technology acceptance? To what extent does sense of community influence students' overall learning satisfaction of online learning?
(2) How well does the final path model explain the relationships among social nature from based a social theory of learning?

Participants

Recruiting emails with links to an electronic consent form and the survey instruments were sent to students who were enrolled in five online courses. The online courses mainly targeted learning to use technologies or learning to design learning systems. There were a total of 52 participants who filled out the survey over the Internet. After initial data screening, one case was eliminated as a univariate outlier. Table 1 presents the demographic information for those 51 cases.

Table 1. Demographic information for 51 cases

Demographic Information		Number of Participants	Percentage (%)	Total
Gender	Male	23	45.1	51
	Female	28	54.9	
Language	Native Speaker	40	78.4	51
	Non-native Speaker	11	21.6	
Academic Status	Undergraduate	4	7.8	51
	Graduate	47	92.2	
Previous Online Courses	0-1 courses	9	17.6	51
	2-5 courses	17	33.3	
	> 6 courses	25	49.0	
Hours Login(weekly)	< 5 hr.	20	39.3	51
	6-10 hr.	17	33.3	
	> 10 hr.	14	27.5	

Context

The data were collected from five online courses offered in a college of education in a mid-west university during Spring semester 2006. All five courses were delivered fully online through the Sakai 2.0 course management system. These five courses had similar course structures with a typical unit comprising a set of learning tasks that directed students to work individually or interactively with peers to accomplish assignments. Besides the course management system, two types of awareness tools were implemented using CANS (Amelung, 2005). An email digest and a desktop widget were made available to increase student awareness of others' action and to facilitate interaction and learning in the course. An email digest is a daily email summary with detailed information about all the previous days activity for the course, and it was automatically sent out to all students. The desktop widget was a synchronous notification tool sitting on a students' computer desktop. The widget was designed to help students keep track of course activities and actions in a timely matter without logging in to Sakai.

Instruments

Sense of Community. To measure students' sense of community, 20 items with a 7-point Likert scale from the Classroom Community Scale (Rovai, 2002b). The Cronbach α reliability estimates from our data were .93 for the sense of community.

Social ability. An Online Learning Experience Study Questionnaire (OLESQ; Author, in press) consisting of 30 items that measure students' perceived social ability in online learning environments was used in this study. Results from the OLESQ show that five factors accounted for 61.86% of the variance in the measure: perceived peer social presence (10 items, α = .93), perceived written communication skills (3 items, α = .90), perceived instructor social presence (8 items, α = .910), comfort with sharing personal information (3 items, α = .83) and social navigation (6 items, α = .88). The Cronbach α reliability estimates from our data were .92 (30 items) for the social ability.

Satisfaction. Four learning satisfaction questions were taken directly from the Zone Experience Study Questionnaire (ZESQ; Lin, 2005). One question of learning interest and four course

evaluation questions were adapted from ZESQ to be the five course evaluation items in OLESQ. These nine OLESQ questions measured students' learning satisfaction and satisfaction with course materials and teaching in the online learning environments. The Cronbach α reliability estimates from our data were .87 for learning satisfaction and .89 for course evaluation.

Self-Reported Participation. The OLESQ includes four self-report items that ask students to estimate their participation through the use of tools in the course management system, such as discussion board, chat, etc. The Cronbach α reliability estimates from our data were .73.

Technology Acceptance Model. Two main constructs, perceived ease of use and perceived usefulness, were selected from the Technology Acceptance Model (TAM; Davis, 1989) to measure students' acceptance of the awareness tools. A total of 12 items, including six items per construct, were modified to fit the research context of this study. The participants were asked to answer these items based upon their use of awareness tools, including email digest and desktop widget. The Cronbach α reliability estimates from our data were .96 for perceived ease of use and .98 for perceived usefulness.

Data analysis

To explore the relationships among social constructs of online learning, a correlation analysis is implement and found insignificant correlation between Perceived usefulness and social ability, perceived ease of use and self-reported participation, and perceived usefulness and self-reported participation. Further, research questions were addressed through path analysis which helped us determine the casual relationships among social constructs. Based upon the literature review, an initial path model of direct and indirect relationships among critical constructs was examined. When exploring the casual relationships, four correlated path were discarded because their path coefficients indicated insignificant correlation ($p<0.05$). A final model with best model fit is presented in Figure 1 to demonstrate the casual relationships among social constructs of online learning.

Results

Descriptive statistics for the research constructs are presented in Table 2. The findings indicate that students had positive perceptions of sense of community, social ability, perceived ease of use, perceived usefulness, satisfaction, and self-reported participation. Additionally, all constructs satisfied the criteria for reliability. Most constructs had Cronbach's alpha values close to or over .80 (Nunnaly, 1978), while "self-reported participation" was the only construct showing only a moderate level of reliability (α = .73).

Table 2. Descriptive Statistics and Reliability (N=51)

	Overall		Reliability
Constructs	**M**	**SD**	**(# of items)**
Sense of Community	4.75	.94	.93 (20)
Social Ability	5.21	.76	.92 (30)
Perceived ease of use	4.49	1.28	.96 (6)
Perceived usefulness	4.09	1.45	.98 (6)
Satisfaction	5.49	1.07	.92 (18)
Self-reported Participation	5.00	1.11	.73 (4)

Table 3 presents a correlation matrix of all critical constructs. Students' sense of community, social ability, satisfaction, and self-reported participation have highly significant positive intercorrelations. Students' perceived ease of use of notification tools has significant positive correlation with sense of community, social ability, and satisfaction, while students' perceived usefulness of notification tools only has significantly positive correlations with sense of community and satisfaction. Self-reported participation does not have significant correlations with students' perceived ease of use or usefulness. To summarize, the results show that students' perception of use of the awareness tools is associated with sense of community, social ability, and satisfaction but has no significant relationship with the self-reported participation using tools in the Sakai system.

Table 3. Intercorrelations among All Critical Constructs

Variables	SOC	SA	PEU	PU	S	SRP
Sense of community (SOC)	-					
Social ability (SA)	.609**	-				
Perceived ease of use (PEU)	.358*	.324*	-			
Perceived usefulness (PU)	.340*	.011	.570**	-		
Satisfaction (S)	.786**	.573**	.316*	.303*	-	
Self-Reported Participation (SRP)	.516**	.313*	- .069	- .040	.563**	-

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

The research path model was analyzed by Mplus@. In the model of path analysis, the correlated paths of a prior path model were constructed based upon the significance of correlation coefficients. In the prior path model, self-reported participation, social ability, perceived ease of use, perceived usefulness were hypothesized to predict students' sense of community and overall satisfaction of online learning, as well as self-reported participation, perceived ease of use, and perceived usefulness were hypnotized to predict social ability. When the correlations of prior path model were examined, four direct correlation paths (PEU to SOC, PEU to S, PU to S, and SA to LS) were discarded because of insignificant correlation coefficients (P<.05). When dropping these 4 paths, chi-square change was not greater than χ^2 (0)=3.84. After discarding the four non-significant paths, a final path model with best model-fit was found. The final model with R^2 values is presented in Figure 1. According to the criteria recommended by Hu and Bentler (1998), the chi-square value (χ^2) for the model was 7.89 (p>.05) suggesting that the data fit the model well. The comparative fit index (CFI) was .99 and the Turker-Lewis Index (TLI) was .97, which also suggested that the data fit the model well. However, the root mean square error of approximation (RMSEA) was .08 and the confidence interval of RMSEA is from .00 to .21 (include .05), which suggest a marginal fit of the model. The fit indices of goodness are presented in Table 4. Overall, the data fits the final model well.

Table 4. Goodness of Fit Indicators

Model	χ^2	P	CFI	TLI	RMSEA	RMSEA 90% C. I.
Criteria	N/A	>.05	≧.90	≧.90	≦.10	
Results of the Final Model	7.89	0.25	.99	.97	.08	.00 ~ .21

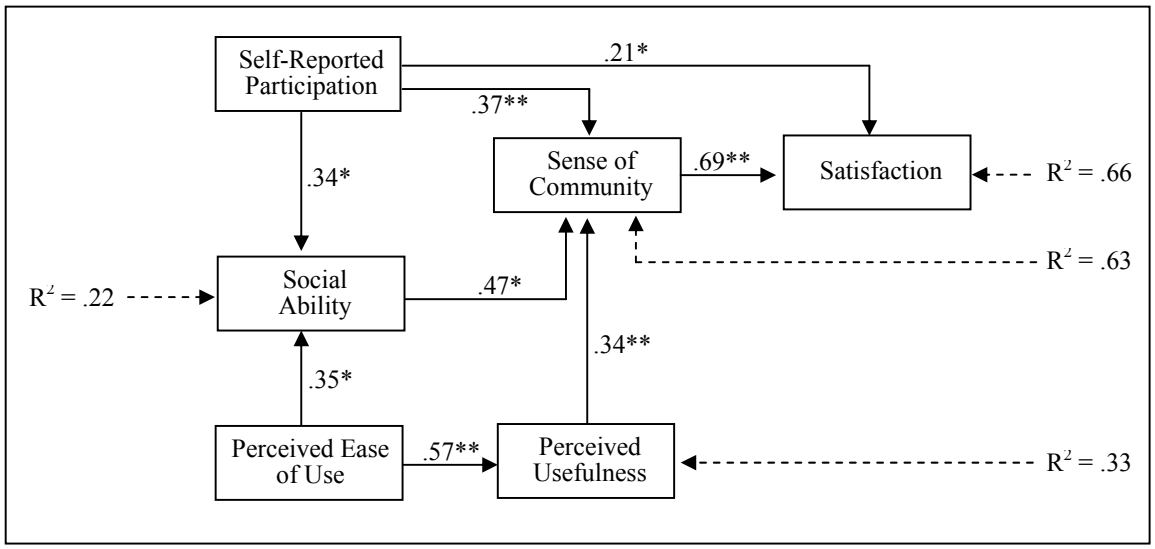

Figure 1. Final Path Analysis Model with R^2 Values (* $z \geqq 1.96$, $p<0.05$; ** $z \geqq 3.29$, $p<0.001$ statistically significant; ⟶ represents significant path, - - ▸ represents variance explained)

In the final path model, students' overall satisfaction with learning in online courses is significantly explained by students' self-reported participation, social ability, and sense of community. Additionally, self-reported participation, social ability, and perceived usefulness of awareness tools were predictors of sense of community, which in turn predicted satisfaction. Moreover, perceived social ability is predicted by self-reported participation and perceived ease of use. Interestingly, students' perceived ease of use of awareness tools is a direct predictor of social ability and perceived usefulness but not sense of community, while perceived usefulness of awareness tools is a direct predictor of sense of community but not social ability. Except for the correlation coefficient between self-reported participation and satisfaction (significant at $P<0.05$), the correlation coefficients range from .34 to .97 and are statistically significant at $p<0.001$. The R^2 s means indicated that approximately 66% of the variance in satisfaction is accounted by self-reported participation and sense of community, 63% variance of sense of community is accounted by self-reported participation, social ability, and perceived usefulness, 22% variance of social ability accounted by self-reported participation and perceived ease of use, and 33% variance of perceived usefulness of notification tools accounted by perceived ease of use.

According to the steps for testing mediators and moderators described in Cokley (2006), sense of community mediated the relationships between social ability and satisfaction and perceived usefulness and satisfaction, and it also moderated the relationship between self-reported participation and satisfaction. Figure 2 indicates how sense of community was identified as a mediator for these three constructs. When the model only included paths from social ability to satisfaction and social ability to sense of community, there were significant relationships between social ability and satisfaction (b=.57**) and social ability and sense of community (b=.61**). However, after adding the path from sense of community to satisfaction (b=.76**), the relationship between social ability and satisfaction (from b=.57** to .15) decreased and became insignificant. Similarly, for the perceived usefulness and self-reported participation models, the relationships between perceived usefulness and satisfaction (from b=.30* to .04) and

self-reported participation and satisfaction (from b=.56** to .21*) decreased when the path between sense of community and satisfaction was added.

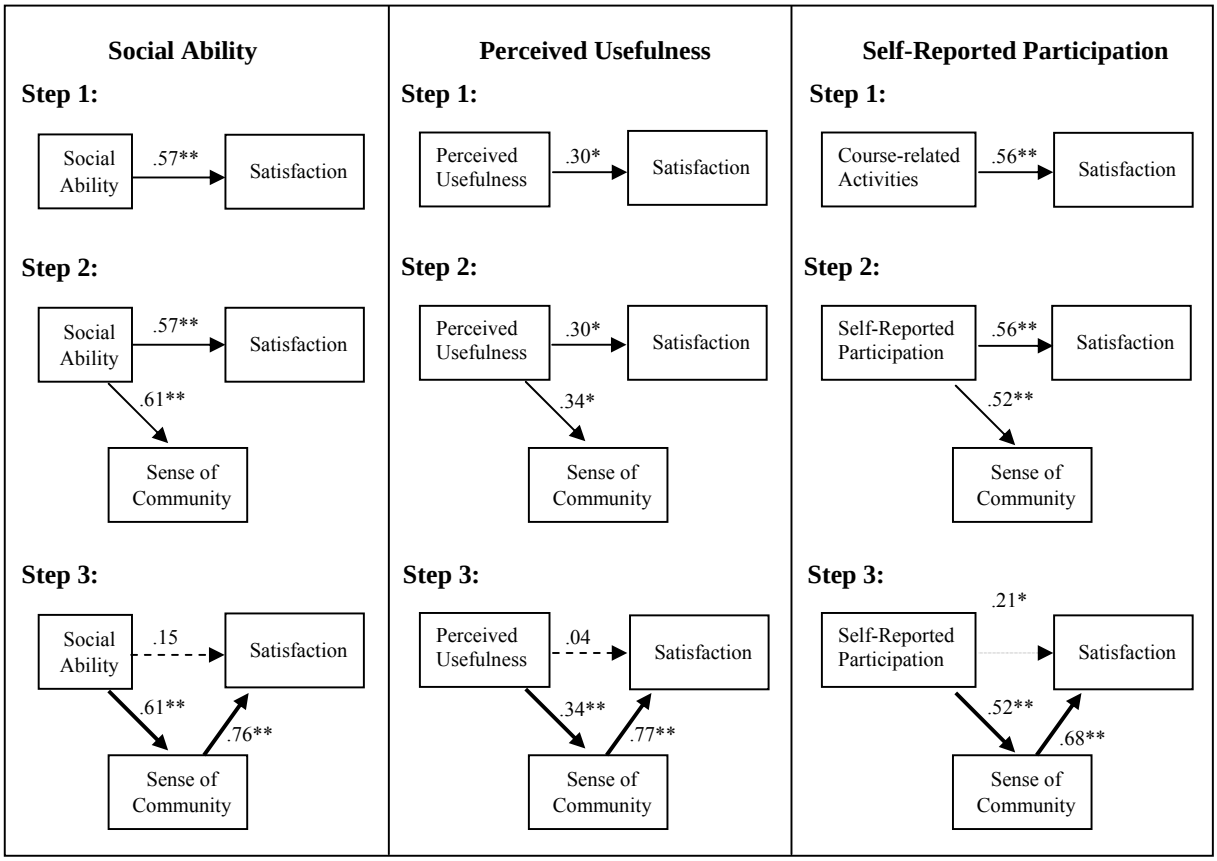

Figure 2. Mediator & Moderator Identification (* z≧1.96, p<0.05; ** z≧3.29, p<0.001 statistically significant; - - - - → represents insignificant path, ⋯⋯→ represents weaken path with significant value, ⟶ represents significant path without decreasing strength)

Discussion

According to social theory of learning (Wenger, 1998), students learn by participating in course activities and socially interacting with other members in online courses. Previous studies have found students' feeling a sense of belonging, communication styles, ways of appropriating tools, and having relationships with others influence their intentions of participating in course activities and interacting with others. To deeper understand how social factors impact on students' learning interdependently in online learning environments, one research question of this study addressed the influence of social constructs on satisfaction with online learning experience. Our study followed the approach to measuring satisfaction found in other studies of distance education and online courses (Lin, 2005; Alavi et al., 1995). We assessed students' satisfaction by measuring students' perception of course evaluation and learning satisfaction. The first question of this study concerned the influence of social constructs on satisfaction in online learning simultaneously. Consistent with previous study, students' perceived sense of community had a strong and positive influence on their overall satisfaction with online learning (Rovai, 2002a). In his other study, Rovai (2002c) found that the online learners who had a stronger sense of community and perceived higher cognitive learning felt less isolated and had greater

satisfaction with their academic program. Moreover, Dawson (2006) found that students who have more interaction with their peers as well as their instructor had higher degrees of sense community, and it influences them to have higher levels of satisfaction with their courses.

Additionally, we found that sense of community mediates the influence of social ability and perceived usefulness of awareness tools on satisfaction with online learning, and it also moderates the relationship between self-reported participation and satisfaction. In contrast with one previous study (Lin et. al., 2006) we identified social ability as an indirect predictor of satisfaction with online learning, and determined that sense of community is a directly stronger predictor of satisfaction than social ability. Lin et. al. (2006) examined the relationship between social ability and satisfaction without considering the interaction effects from other social constructs; however, we found the social constructs are interdependent and intertwined which shows the existence of sense of community makes the relationships change. Rather than examining the relationship between social constructs separately, it is crucial to study the intertwined relationships simultaneously.

Further, the result of final path model shows what contributes to build a sense of community in online courses and how sense of community mediates and moderates the causal relationships between the social constructs and students' satisfaction with online learning experiences. It also reveals the importance of social awareness tools on social ability and sense of community. Students' acceptance of social awareness tools as easy to use contributes to their social ability and the perceived usefulness of these tools. Similar to Hara and Kling's (2000) findings that students' interaction of online learning was prohibited because of experiencing difficulties when appropriating tools, we found students' social ability of appropriating the tools and resources of the learn context is affected by their perceptions and feelings of the design of the tools. Students need to feel that the tool is easy to use before they judge whether the tool is useful for their learning. Also, perceived ease of use was found to directly and positively influence students' social ability of using resources in social contexts. Students' perception of tool usefulness played a direct role in their sense of community, indicating that students appreciate the social awareness tool as they discover it is beneficial to their learning and increases connectivity among community members. However, even if students appropriate tools well to interact with others in class, without feeling a sense of community their participation and interaction of activities tends to be restrained. This founding confirms the theoretical insights of social theory of learning where students' growth not only includes the cognition changes but also how they feel of belonging which also influences students' further participation and interaction. It also reminds system designers that a system needs to be developed beyond the ease of use and usefulness by considering how to support socio-emotional interactions for promoting a sense of community.

Last, our findings illustrate the positive, direct impact of participation on both social ability and sense of community. This suggests that the more students use the communication tools in online learning, the more they benefit in the development of social ability and sense of community. Therefore, in order to increase social ability and sense of community, it is important for online instructors to thoughtfully encourage greater use of communication tools in their instructional designs. Although our findings extend previous literature on online learning by revealing complex relationships among key constructs related to the social nature of online learning, these findings should be applied with care, as more research is required. We have three specific cautions. First, the sample used in this study is a convenience sample and is relatively small. We believe having larger sample size will allow us to add more parameters in path

analysis and examine interdependent relationships among social nature of online learning deeper. Second, only self-reported data were used to measure key constructs used in the model. Third, there are still course related variances not explained by this study.

Educational Importance of the Study

Our study contributes to online education research in several ways. First, our findings support literature that shows sense of community is highly and positively related to student online learning satisfaction. Second, we have built new knowledge that advances the theory of how sense of community develops in online environments, which in turn provides guidance to foster and sustain students' sense of community. Our findings illustrate that sense of community is built through high students' participation in online activities, positive perceptions toward others in the course, and positive attitudes toward awareness tools. These findings provide online instructors with an improved sense of how to best support students. Last, our findings also identified the impact and needs of social awareness supports on students' online learning satisfaction, which provides guidance for systems developers to improve mechanisms that provide awareness information. Future research will consider how the sub-factors associated with social ability might relate with other constructs in the model and how different task types might affect their social ability and sense of community.

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