

# Gender Differences of Knowledge Sharing in Online Learning Environment

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**Abstract.** Although online learning environments are perceived to facilitate knowledge sharing among individuals, various empirical studies find that participants do not log on frequently or are reluctant to share ideas with others. It is thus crucial for educators to understand when and how online knowledge sharing occurs. Prior model framework has been adapted to explore the motivational factors that drive knowledge sharing among individuals in online learning environments, esp. if there are any gender differences of online knowledge sharing. The hypothesized relationships between the identified motivational factors and online knowledge sharing behavior are then tested using a survey questionnaire administered to a sample of 333 undergraduate students. The results indicate that perceived attachment motivation (the need to form) and perceived relationship commitment (the need to main a relationship) are important determinants of online knowledge sharing. Further analysis on gender differences reveals that male participants rated the need to form relationships more highly than their female counterparts. Implications to ensure online learning environments to encourage knowledge sharing behavior are discussed.

**Keywords:** Gender differences, online knowledge sharing, perceived online attachment motivation, perceived online relationship commitment.

## 1 Introduction

The past decade or so has seen a rise in the adoption of web-based technologies for teaching and learning in higher education institutions. Previous studies have focused on how online learning environments can be designed to allow interactions among participants and to embed learning in social experiences, provide access to a wide range of resources, and support collaboration [1].

However, these benefits cannot be realized by design alone: they also require the active participation of individuals. Recent empirical studies have revealed low levels of participation and a reluctance to share knowledge in online learning environments [2] and studies of the motivational factors influencing participation in such

environments indicate that this issue remains unresolved [3-5]. More recent studies suggest that future research should consider “the wider social relations underpinning the relatively modest use of technology in higher education,” [1].

In response to this suggestion, this study aims to explore the motivational factors that affect knowledge sharing among individuals, with a specific focus on how interpersonal relationships influence knowledge sharing in online learning environments. The study also uses a framework to identify whether there are any gender differences in online knowledge sharing behavior. The way in which the study extends previous research and provides an alternative perspective to explain knowledge sharing in online learning environments is discussed, with particular reference to the need for interpersonal relationships among online learners.

## **2 Literature Review**

### **2.1 Knowledge Sharing and Online Learning Environments**

In online learning environments, collaborative online learning and online learning communities are observed to be the two main modes of knowledge sharing.

In collaborative online learning, learners form small groups that work together to solve problems or complete common tasks, aided by communication tools provided by the online learning environment [6]. Collaborative online learning, especially when facilitated by online discussion forums, stimulates deep learning and a high level of motivation through joint efforts to solve problems [7]. Individuals contribute by sharing and interacting with peer learners to solve problems and complete tasks [8]. In contrast, individuals who are passive and feel alienated are reluctant to share, avoid their peers, and have low levels of participation in online learning activities [3].

In online learning communities, informal learning takes place when pools of peer learners help each other and offer both intellectual and interpersonal support [e.g., 9]. Online learning community members who have a strong sense of belonging are committed, communicate extensively with each other, are willing to offer help, and share learning experiences [10]. Online learning communities promote mutual support, as members help other members who are experiencing isolation, loneliness, or distress in learning online [11].

### **2.2 Perceived Online Attachment Motivation (POAM)**

Several in-group studies provide explanations as to what makes individuals prepared to work together in small groups, even without additional rewards or specified conditions. For example, the discrimination of group identity has been identified through even simple and random categorizations of individuals into groups [12].

However, individuals may not always be accepted into a relationship, and may instead be ignored, excluded, or rejected by others. Ignored individuals feel bad and lose a sense of belonging, both in the physical world [13] and on the Internet [14]. These findings are consistent with the observations in online learning research of online participants who feel isolated or lonely [15].

Previous studies also reveal that relationships predict a sense of belonging [16], and that there is a direct link between a sense of belonging and academic outcomes [17]. Hence, interpersonal relationships have been widely applied to explain the sense of belonging and academic outcomes in various age groups and educational settings.

### **2.3 Perceived Online Relationship Commitment (PORC)**

Prior studies suggest that commitment explains why an individual persists in a relationship [18], and why satisfying relationships may not be sustained whereas unsatisfying links can sometimes persist for decades [19]. Overall commitment depends on the investment that has been made in the relationship, among other factors, and is inversely related to the quality of alternatives [20].

There is ample support for the relationship between interpersonal relationships and observed behavior in collaborative online learning and online learning communities. For example, students report that availability or lack of time is an important factor determining whether or not they will contribute to online discussion forums [5]. Students also report that participation in online learning activities is a low priority in their learning activities, as they perceive online conversation to be of little value [2]. The maintenance of successful communities requires that individuals recognize the value of participation and invest time and effort.

### **2.4 Gender Differences in Knowledge Sharing**

It has been suggested that there are gender differences in belief, attitude, and behavior in the formation and maintenance of relationships. Shaver and Buhrmester [21] argue that in general, males are less well suited to social life because of their tendency toward independence and their fear of social contact and relatedness.

Taking an alternative perspective, Cross and Madson [22] argue that there are significant gender differences in individual structures of the self, with men in the United States constructing and maintaining an independent self-construal and women constructing and maintaining an interdependent self-construal. Independent self-construal refers to representations of others who are separate from the self, whereas interdependent self-construal refers to others who are considered part of the self.

Extending this line of thought, Baumeister and Sommer [23] explore gender differences in terms of the size of the reference social spheres of belonging. They propose that men's behavior is directed toward the formation of relationships with others but in a broader social sphere, whereas women's sociality is focused on dyadic close relationships.

In the online learning context, Anderson and Haddad [24] find that female learners show greater social interdependence than male learners in online discussions, which leads to higher levels of perceived deep learning. They also find that females appear to express themselves more often in online than in face-to-face courses. Caspi et al. [25] examine participation in face-to-face versus web-based classroom discussions, and in comparing the actual participation ratio of men and women to the attendance (or login) ratio find that men speak much more than women in face-to-face discussions but that women post many more messages than men in web-based discussions.

### 3 Framework and Hypotheses Development

The following definitions would be used in the discussion of the relationships and hypotheses development in this study [26, 27].

**Online knowledge sharing behavior (OKSB)** is defined as *“the online communication of knowledge so that knowledge is learned and applied by an individual”*

**Perceived online attachment motivation (POAM)** is defined as *“the degree to which an individual believes that he or she can improve his or her social interaction and sense of communion with others on an online learning platform”*

**Perceived online relationship commitment (PORC)** is defined as *“the degree to which a learner tends to continue with an established relationship in an online learning environment”*

It is argued that the desire to form relationships is an important determinant of online knowledge sharing. If an individual perceives that an online learning environment is a good place to form relationships, then he or she will be motivated to approach and interact with other learners in that environment. He or she will also be more willing to engage in greater interaction with other members of the online learning community through various means, including small talk, certain forms of address, communicative norms, and self-disclosure. In online learning communities, all individuals share the common goal of learning, and thus sharing one’s knowledge is a good way to develop relationships. However, if an individual perceives that an online learning environment is not a good place to form relationships, then he or she will choose not to spend time and effort in that environment. Both external factors, such as the functions of the online learning environment, and internal factors, such as the composition of learners in the environment, affect an individual’s perception of an online learning environment. Perceived online attachment motivation (POAM) can thus be used to measure an individual’s overall evaluation of an online learning environment. This argument leads to the hypothesis H1.

Second, it is argued that in a learning community, individuals establish relationships with other members. Sharing is a means of establishing close relationships, and can be viewed as a kind of social support and a form of prosocial behavior. In the process of maintaining established relationships, individual learners become more willing to share with other members of the online community. Knowledge sharing then comes to be viewed as a positive act that benefits the sharing parties. This argument leads to the hypothesis H2a.

Third, concern about belonging is a powerful factor shaping human thought and behavior. People often interpret situations and events in terms of their implications for their relationships with others, and think more deeply about interaction partners than about other people. Thus, both actual and potential bonds have a substantial effect on the way in which people think [28]. It is thus likely that an individual’s perceived online attachment motivation is affected by his or her perceived online relationship commitment. Specifically, the greater the engagement of an individual in an online learning community, the greater his or her sense of belonging to that community. This

gives rise to switching costs, in that the more that the individual contributes to the community, the higher the cost of switching to another, as the individual will be left with nothing once he or she leaves. Thus, an individual will have a stronger attachment to an online learning community when he or she is more committed to that community. This argument leads to the hypothesis H2b.

Fourth, previous studies reveal that there may be gender differences in perception, affect, and behavior with regard to interpersonal relationships. If such differences exist, then the online knowledge sharing of females and males should also be different. Based on the different social spheres of males and females [23], it is argued that if males have a larger sphere of belonging than females, then they will have a greater motivation than females to form new relationships with peer learners. This leads to the hypothesis H3.

However, although females have a smaller sphere of belonging than males, they are likely to spend more time and effort than males in maintaining established relationships. This leads to the hypothesis H4.

Therefore, four hypotheses are employed to examine the online knowledge sharing and the gender differences:

- H1:** *The perceived online attachment motivation of an individual regarding an online learning environment has a positive effect on his or her knowledge sharing behavior in that environment.*
- H2a:** *The perceived online relationship commitment of an individual to an online learning environment has a positive effect on his or her knowledge sharing behavior in that environment.*
- H2b:** *The perceived relationship commitment of an individual to an online learning environment has a positive effect on his or her perceived online attachment motivation regarding that environment.*
- H3:** *The perceived online attachment motivation of a male learner (versus a female learner) regarding an online learning environment has a stronger positive effect on his knowledge sharing behavior in that environment.*
- H4:** *The perceived online relationship commitment of a female learner (versus a male learner) to an online learning environment has a stronger positive effect on her knowledge sharing behavior in that environment.*

## 4 Methodology

**Background:** The subjects in this study were all undergraduate students using an online learning environment, “HKNews,” to support their learning about news writing in the Department of Journalism and Communication of a local university in Hong Kong. HKNews is based on MediaWiki ([www.wikipedia.org](http://www.wikipedia.org)), and allows students to post news articles at any time and edit previously posted articles as often as they wish. The platform is open to all, and learners can read each other’s articles. As of November 2009, there were 27,628 articles, 1,667 photos, 184,446 instances of article editing, and 2,435 registered users recorded in HKNews.

**Subjects:** Among the 389 journalism students in the department, 333 (83 men, 247 women, 3 gender unreported) took part, yielding a response rate of 85.60%. Of the

389 students, 152 were in Year 2, 122 were in Year 3, and 115 were in Year 4. The average age of the participants was 21.79 years. The proportion of respondents to the total number of students in each year was similar: in Year 2 it was 39.1%, in Year 3 31.5%, and in Year 4 29.4%. On average, the participants had been using HKNews for approximately two and a half years (mean = 2.56; SD = 0.708).

**Table 1.** Gender and course distribution of respondents in the sample

	Male	Female	Not reported
Year 2	30	99	1
Year 3	30	74	0
Year 4	23	74	2
Subtotal	83	247	3
Total (N)	333		

**Data collection:** Near the end of the semester, the investigator distributed a paper questionnaire in class for students to complete. The respondents were reminded that their cooperation was purely voluntary, and that they could stop at any time without penalty. They were also told that their participation would be appreciated, as it would provide valuable information for the improvement of the online learning environment. On average, the respondents took about 10 minutes to complete the survey questionnaire, and all completed it within 20 minutes. Upon collection of the completed questionnaires, the respondents were given a small gift of a highlighter costing HKD1.00 as a token of appreciation. The data collection process took two weeks to complete.

**Measures:** The questionnaire was divided into two parts. Part A solicited information about the demographic characteristics of the participants and their use of the online learning environment, including age, gender, year of study, years of experience and self-reported skill in using an online learning environment, self-reported subject knowledge in news writing, and the frequency and duration of their usage of the online learning environment. Part B included statements asking for their opinions about forming and maintaining relationships and knowledge sharing behavior. The scale for the constructs was developed based on previously validated instruments whereas wordings were revised to reflect the online learning context. The questionnaire was adapted from previous validated scale [26] and included five items about perceived online attachment motivation (POAM1 – POAM5), five items about perceived online relationship commitment (PORC1 – PORC5), and five items about online knowledge sharing behavior (OKSB1 – OKSB5). The full scale is presented in the Appendix. All of the question items were measured on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Additional statements for another study were also included in the questionnaire. The statements were randomly arranged to reduce a potential ceiling or floor effect that might induce monotonous responses.

## 5 Findings

### 5.1 Descriptive Summary and Validity Testing of the Observed Variables

The descriptive statistics of the measurement items are listed in Table 2. The table shows that the respondents had generally positive perceptions toward of relationships in online learning environments. The mean values for POAM, PORC, and OKSB range between 3.54 and 3.98, 3.42 and 3.99, and 4.08 and 4.24, respectively.

Validity is the degree to which a measure accurately represents what it is supposed to represent, whereas reliability is the degree to which an observed variable measures the “true” value and is “error free” [29].

Cronbach’s alpha is generally the most appropriate type of reliability measure for survey research that involves a range of possible answers for each item [30]. The Cronbach’s alpha values for each of the constructs exceeded the suggested threshold value of 0.7 [31], with a range from 0.83 to 0.88. This indicates that the constructs were internally consistent.

The measurement model and constructs were assessed by confirmatory factor analysis using LISREL 8.5 and a sample correlation matrix for scale validation. The measured factor loadings of the construct items were all significant ( $p < 0.001$ ), which means that they were explained more by the hypothesized construct than by error [29] (see Table 2).

**Table 2.** Descriptive statistics for the observed variables ( $N=333$ )

POAM	Mean / StdDev	Factor Loadings	PORC	Mean / StdDev	Factor Loadings	OKSB	Mean / StdDev	Factor Loadings
POAM1	3.54 (1.12)	0.59***	PORC1	3.78 (1.15)	0.80***	OKSB1	4.24 (1.15)	0.79***
POAM2	3.67 (1.07)	0.68***	PORC2	3.86 (1.17)	0.80***	OKSB2	4.11 (1.10)	0.72***
POAM3	3.76 (1.01)	0.83***	PORC3	3.49 (1.14)	0.76***	OKSB3	4.08 (1.05)	0.74***
POAM4	3.93 (1.01)	0.80***	PORC4	3.42 (1.17)	0.72***	OKSB4	4.19 (1.13)	0.76***
POAM5	3.98 (1.08)	0.74***	PORC5	3.99 (1.15)	0.69***	OKSB5	4.18 (1.11)	0.80***
Reliability Alpha	0.83			0.85			0.88	

### 5.2 Model Testing Results

The corresponding hypotheses were examined using structural equation modeling. The results of the model testing produced a list of goodness-of-fit indices, including a Root Mean Square Residue (RMR) of 0.038 ( $< 0.1$ ), a Root Mean Square Error of Approximation (RMSEA) of 0.062 ( $< 0.1$ ), and a Goodness of Fit Index (GFI) of 0.94. All of these and the other indices exceeded the suggested values, indicating that the model fit the data well [29] (see Table 3).

**Table 3.** Summary of the hypothesis testing results of overall model

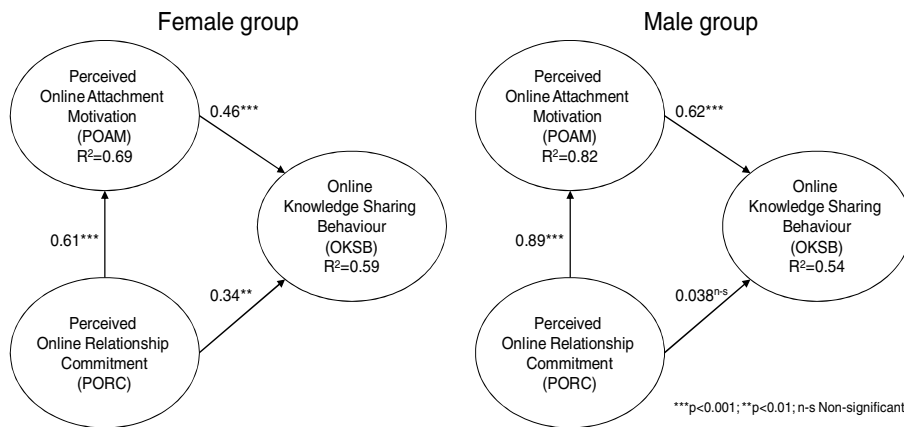
Causal Paths	Path Coefficients	Hypothesis
POAM → OKSB	0.49***	H1: supported
PORC → OKSB	0.31**	H2a: supported
PORC → POAM	0.87***	H2b: supported
R <sup>2</sup> : OKSB (0.54, in reduced form); POAM (0.76).		*** <i>p</i> < 0.001; ** <i>p</i> < 0.01.

**5.3 Model Testing Results by Gender**

It was hypothesized that the framework would fit the data for both gender groups, but that there would be significant differences in the estimated parameters or the means in explaining online knowledge sharing. Post hoc analysis was employed to test these hypotheses.

As noted, three of the respondents (3/333 = 0.9%) did not disclose their gender, and their records were thus removed from the dataset for this part of the analysis. The sample (*N* = 330) was then split into two subsamples, female (*n* = 247) and male (*n* = 83). The gender ratio was similar to the distribution of the whole Department of Journalism and Communication.

Structural equation modeling analysis of group differences was employed to test for the equality of the factor structures and to estimate the parameters for the relationships in the two gender groups [32]. The measurement factor structures were assumed to be the same for the two groups, but the coefficients for the hypothesized gender differences were estimated independently. The model testing results generated two solutions, one for each group (see Figure 2). The resulting global goodness-of-fit indices reflect the measure of fit for all of the models in all of the groups, and show only a mildly acceptable fit (chi-sq/df = 2.74; RMR = 0.081; GFI = 0.72). This is probably due to the small sample size in the male group (*n* = 83). Structural equation modeling requires a large sample size for analysis, and the chi-square test is very sensitive to sample size.



**Fig. 1.** Model testing for the gender groups

## 6 Discussions

### 6.1 Interpersonal Relationships and Online Knowledge Sharing

The first hypothesis posited a direct, positive, and significant relationship between perceived online attachment motivation (POAM) and online knowledge sharing behavior (OKSB). The data analysis revealed the existence of this relationship, and thus Hypothesis 1 is supported.

The second hypothesis posited a direct, positive, and significant relationship between perceived online relationship commitment (PORC) and online knowledge sharing behavior (OKSB). The findings confirm the existence of this relationship exists, and thus Hypothesis 2a is supported.

The third hypothesis posited a direct, positive, and significant relationship between perceived online attachment motivation (POAM) and perceived online relationship commitment (PORC). The findings indicate the existence of this relationship exists, and thus Hypothesis 2b is supported.

### 6.2 Gender Differences in Knowledge Sharing

The fourth hypothesis posited a direct, positive, and significant relationship between the perceived online attachment motivation (POAM) of learners and their online knowledge sharing behavior (OKSB), and that this relationship would be stronger for male than for female learners. The results reveal a positive significant effect for both genders, but the effect for the male learners is much greater than that of the female learners by nearly a third. Hence, Hypothesis 3 is supported.

Consistent with the results of previous studies [23], the findings of this study indicate a stronger desire among males than females to form relationships in online environments. Thus, male learners care more than female learners about whether an online learning environment supports relationship formation and offers a wider social sphere [23].

Both males and females evaluate an online learning environment to see whether it supports relationship formation. If they perceive that it does, then they will engage in a higher level of online knowledge sharing in that environment. The findings reveal that, regardless of gender, learners' evaluations of whether an online learning environment can meet their need to form relationships strongly predict their level of online knowledge sharing.

The fifth hypothesis posited a direct, positive, and significant relationship between the perceived online relationship commitment (PORC) of learners and their online knowledge sharing behavior (OKSB), and that this relationship would be stronger for female than for male learners. The results reveal that such a relationship exists for female learners, whereas for male learners the relationship is strong and significant but indirect, being mediated by perceived online attachment motivation (POAM). The direct path from perceived online relationship commitment (PORC) to online knowledge sharing behavior (OKSB) is non-significant, which means that perceived

online attachment motivation (POAM) fully mediates the relationship between perceived online relationship commitment (PORC) and online knowledge sharing behavior (OKSB) among male learners. Thus, Hypothesis 4 is supported.

Consistent with the suggestion of previous work [23], the findings of this study indicate a stronger desire among female learners to maintain established relationships. The findings support the theory of the need to belong, but show that men and women place a different emphasis on belonging. Compared with females, males have a higher level of approach motivation to form new relationships with peers, whereas females have a greater need to both form and maintain relationships. Male and female learners thus use different strategies and have different criteria in the pursuit of belonging through interaction with peers in online learning environments.

Various implementation strategies could be applied to meet the different needs of female and male learners in online learning environments. For example, instructors could help individuals to form small voluntary study groups, which would allow female learners to engage in closer and more frequent interaction in smaller social circles. At the same time, instructors could establish an activity update list to organize and display input from all individuals. This would give learners the opportunity to find out more about what is going on in the wider social sphere and interact with a greater number of peers, which would cater to the needs of male learners.

### **6.3 Limitations and Future Research**

This study has several limitations. First, the generalization of the findings depends on the wider application of the framework to different online learning domains, different learning disciplines, and different subjects. Out of convenience, the current study applied the instrument to a specific group. Future studies should apply the framework to validate the findings in different online learning contexts and subjects. Second, the small sample size of the male participants may have diminished the validity of the analysis results. Future studies should thus apply the framework to a larger data sample to validate the results. Third, this study adopted a self-reported measure of knowledge sharing behavior, rather than an objective measure, which may have resulted in self-reported bias and halo-effects. However, this measurement method is not without support [33], and it is appropriate to measure knowledge sharing by asking individuals whether it really occurs.

## **7 Conclusion**

This study offers an alternative explanation of knowledge sharing in online learning environments. Previous studies provide empirical evidence of the importance of interpersonal relationships in explaining social interaction and knowledge sharing, but few studies have given details of the relevant mechanisms in online learning environments. The findings of this study provide significant insights that can be translated into practical strategies, especially in terms of the design and implementation of online learning environments to promote knowledge sharing.

## References

1. Selwyn, N.: The use of computer technology in university teaching and learning: A critical perspective. *Journal of Computer Assisted Learning* 23, 83–94 (2007)
2. Carr, N., Chambers, D.P.: Teacher professional learning in an online community: The experiences of the National Quality Schooling Framework Pilot Project. *Technology, Pedagogy and Education* 15, 143–157 (2006)
3. Ng, K.-C.: Using e-mail to foster collaboration in distance education. *Open Learning* 16, 191–200 (2001)
4. Xie, K.U.I., Debacker, T.K., Ferguson, C.: Extending the traditional classroom through online discussion: The role of student motivation. *Journal of Educational Computing Research* 34, 67–89 (2006)
5. Cheung, W.S., Hew, K.F., Ling Ng, C.S.: Toward an understanding of why students contribute in asynchronous online discussions. *Journal of Educational Computing Research* 38, 29–50 (2008)
6. Hiltz, S.R., Coppola, N., Rotter, N., Turoff, M., Benbunan-Fich, R.: Measuring the importance of collaborative learning for the effectiveness of ALN: A multi-measure, multi-method approach. *Journal of Asynchronous Learning Networks* 4 (2000)
7. Moreno, L., Gonzalez, C., Castilla, I., Gonzalez, E., Sigut, J.: Applying a constructivist and collaborative methodological approach in engineering education. *Computers & Education* 49, 891–915 (2007)
8. Zhang, J., Scardamalia, M., Lamon, M., Messina, R., Reeve, R.: Socio-cognitive dynamics of knowledge building in the work of 9- and 10-years-olds. *Educational Technology Research and Development* 55, 117–145 (2007)
9. Moller, L.: Designing communities of learners for asynchronous distance education. *Educational Technology, Research and Development* 46, 115–122 (1998)
10. Thurston, A.: Building online learning communities. *Technology, Pedagogy and Education* 14, 353–369 (2005)
11. Rovai, A.P., Wighting, M.J.: Feelings of alienation and community among higher education students in a virtual classroom. *The Internet and Higher Education* 8, 97–110 (2005)
12. Tajfel, H., Billig, M.G., Bundy, R.F., Flament, C.: Social categorization and intergroup behaviour. *European Journal of Social Psychology* 1, 149–178 (1971)
13. Smith, A., Williams, K.D.: R U there? Ostracism by cell phone text messages. *Group Dynamics: Theory, Research, & Practice* 8, 291–301 (2004)
14. Williams, K.D., Cheung, C.K.T., Choi, W.: Cyberostracism: Effects of being ignored over the Internet. *Journal of Personality & Social Psychology* 79, 748–762 (2000)
15. Löfström, E., Nevgi, A.: From strategic planning to meaningful learning: Diverse perspectives on the development of web-based teaching and learning in higher education. *British Journal of Educational Technology* 38, 312–324 (2007)
16. Levett-Jones, T., Lathlean, J., Higgins, I., McMillan, M.: Staff - student relationships and their impact on nursing students belongingness and learning. *Journal of Advanced Nursing* 65, 316–324 (2009)
17. Furrer, C., Skinner, E.: Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology* 95, 148–162 (2003)
18. Rusbult, C.E., Farrell, D.: A longitudinal test of the investment model: The impact on job satisfaction, job commitment, and turnover of variations in rewards, costs, alternatives, and investments. *Journal of Applied Psychology* 68, 429 (1983)

19. Rusbult, C.E.: Commitment in close relationships: The investment model. In: Peplau, L.A., Sears, D.O., Taylor, S.E., Freedman, J.L. (eds.) *Readings in Social Psychology: Classic and Contemporary Contributions*, pp. 147–157. Prentice-Hall, Englewood Cliffs (1988)
20. Rusbult, C.E., Martz, J.M., Agnew, C.R.: The investment model scale: Measuring commitment level, satisfaction level, quality of alternatives, and investment size. *Personal Relationships* 5, 357–391 (1998)
21. Shaver, P., Buhrmester, D.: Loneliness, sex-role orientation, and group life: A social needs perspective. In: Paulus, P. (ed.) *Basic Group Processes*, pp. 259–288. Springer, New York (1983)
22. Cross, S.E., Madson, L.: Models of the self: Self-construals and gender. *Psychological Bulletin* 122, 5–37 (1997)
23. Baumeister, R.F., Sommer, K.L.: What do men want? Gender differences and two spheres of belongingness: Comment on Cross and Madson. *Psychological Bulletin* 122(1997), 38–44 (1997)
24. Anderson, D.M., Haddad, C.J.: Gender, voice and learning in online course environments. *Journal of Asynchronous Learning Networks* 9 (2005)
25. Caspi, A., Chajut, E., Saporta, K.: Participation in class and in online discussions: Gender differences. *Computers & Education* 50, 718–724 (2008)
26. Ma, W.W.K., Yuen, A.H.K.: Understanding Online Knowledge Sharing: An Interpersonal Relationship Perspective. *Computers & Education* 56, 210–219 (2011)
27. Ma, W.W.K., Yuen, A.H.K.: Understanding online knowledge sharing: An exploratory theoretical framework. In: Tsang, P., Cheung, S.K.S., Lee, V.S.K., Huang, R. (eds.) *ICHL 2010. LNCS*, vol. 6248, pp. 239–248. Springer, Heidelberg (2010)
28. Baumeister, R.F., Leary, M.R.: The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin* 117, 497–529 (1995)
29. Hair, J.F., Black, B., Babin, B., Anderson, R.E., Tatham, R.L.: *Multivariate Data Analysis*. Pearson Prentice Hall, Upper Saddle River (2006)
30. McMillan, J.H., Schmacher, S.: *Research in education: A conceptual introduction*. HarperCollins Publishers, New York (1989)
31. Nunnally, J.C., Bernstein, I.H.: *Psychometric theory*. McGraw-Hill, New York (1994)
32. Jöreskog, K.G., Sörbom, D.: *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Lawrence Erlbaum Associates, Hillsdale (1993)
33. Ko, D.-G., Kirsch, L.J., King, W.R.: Antecedents of knowledge transfer from consultants to clients in enterprise system implementations. *MIS Quarterly* 29, 59 (2005)

## Appendix

### Instrument Items (Adapted from [26])

Constructs	Items
Perceived Online Attachment Motivation (POAM)	<ol style="list-style-type: none"> <li>1. If I feel unhappy or depressed in learning news writing, I usually try to be around other members using HKNews to make me feel better.</li> <li>2. I usually have a great need to have other members using HKNews around me when I feel upset in learning news writing.</li> <li>3. I often have a strong need to be around other HKNews users who are impressed with what I am like and what I do in news writing.</li> <li>4. I mainly like to be around other HKNews users who think I am an important, exciting person when learning news writing.</li> <li>5. I often have a strong desire to get other HKNews users around to notice me and appreciate what I am like when learning news writing.</li> </ol>
Perceived Online Relationship Commitment (PORC)	<ol style="list-style-type: none"> <li>1. I am committed to maintaining my relationships with other members using HKNews.</li> <li>2. I want my relationships with other members using HKNews to last for a very long time.</li> <li>3. I feel very strongly linked to my relationships with other members using HKNews.</li> <li>4. I would feel very upset if my relationships with other members using HKNews were to end.</li> <li>5. I tend to the long-term future of my relationships with other HKNews members.</li> </ol>
Online Knowledge Sharing Behavior (OKSB)	<ol style="list-style-type: none"> <li>1. The advice that I receive from other HKNews members has increased my understanding of news writing.</li> <li>2. The advice that I receive from other HKNews members has increased my knowledge of news writing.</li> <li>3. The advice that I receive from other HKNews members will allow me to complete similar news writing tasks more efficiently in the future.</li> <li>4. The advice that I receive from other HKNews members will help me to improve the quality of similar news writing work in the future.</li> <li>5. The advice that I receive from other HKNews members will allow me to conduct similar news writing tasks with greater independence in the future.</li> </ol>