Why Do Some Students Become More Engaged in Collaborative Wiki Writing?
The Role of Sense of Relatedness

Wilson W.T. Law
School of Economics and Finance
Faculty of Business and Economics
The University of Hong Kong
Hong Kong
wilsonlaw@hku.hk

Ronnel B. King
Learning Sciences Laboratory
National Institute of Education
Nanyang Technological University
Singapore
ronnel.king@nie.edu.sg

Michele Notari
PHBern, University of Teacher
Education
Gerturd-Woker-Strasse 5
CH-3012 Bern, Switzerland
michele.notari@phbern.ch

Eddie W.L. Cheng
Department of Social Sciences
Hong Kong Institute of Education
Hong Kong
wlcheng@ied.edu.hk

Samuel K.W. Chu
Faculty of Education
The University of Hong Kong
Hong Kong
samchu@hku.hk

ABSTRACT

This study aims to investigate the role of sense of relatedness in students' engagement in using wikis in collaborative writing. Hong Kong secondary school students (N = 422) participated in the study and answered questionnaires about their sense of relatedness and their level of engagement when using wikis for open collaborative project work. Results from the regression analyses showed that students' sense of relatedness with their teacher and peers facilitated their engagement in the collaborative wiki writing environment. The results were also consistent with the educational psychology research findings in a traditional classroom setting. Most importantly, the result from this study showed the possible linkage between IT in education research and the educational psychology literature. Implications of psychological factors on students' learning in technologically-enriched learning environments are discussed.

Categories and Subject Descriptors

K.3.1 [**Computers and Education**]: Computer Uses in Education – *collaborative learning*.

General Terms

Human Factors, Measurement

Keywords

Wiki, Open collaboration, Engagement, Relatedness

1. INTRODUCTION

The use of wikis in the educational field has developed rapidly since the late 1990s [18]. Wiki can be regarded as "a system that allows one or more people to build up a corpus of knowledge in a set of interlinked web pages, using a process of creating and editing pages" [14]. It has extensive applications in student-based learning activities disciplines [5, 8], and one of the popular uses of wikis is collaborative writing [25, 35]. The use of wikis in collaborative writing has been shown to be beneficial for student learning [8, 25]. For example, it supports the co-construction of knowledge and helps students to develop their critical thinking and problem-solving skills [6, 7].

However, employing wiki technology in an educational context is not always a success story. Some findings suggested that it had little or no impact on student's interaction and learning [8, 9, 16]. It indicates that merely providing a technological platform does not guarantee students will learn. Moreover, the research which focused on the general impact of using wikis often overlooked the individual learning differences as well as the social dynamics in the collaboration. [13, 22]. This paper aims to shed some light on it by examining a question "why do some students become more engaged in collaborative wiki writing?". Through this, we can possibly gain some more understandings on the important factor that may account for students' learning in collaborative wiki writing.

In the coming sub-sections, we will introduce the notion of "engagement" and "relatedness" from the educational psychology literature for the analysis purpose.

1.1 Engagement

Over the last few decades, research has shown that children's long-term academic achievement and performance can be predicted by their active participation in the classroom [10, 11, 26, 27]. This enthusiastic participation can be conceptualized as "Engagement". Generally speaking, engagement is regarded as the aspect of "student's connection or involvement with the

endeavor of schooling and hence with the people, activities, goals, values, and place that compose it" [32]. The notion of engagement has proven generative among educational researchers because it reflects the interactions and participation which is important for achieving positive academic outcomes. Unless children become engaged in the classroom, physically attending a class would not promote any actual learning to them [32].

Engagement in the classroom has been construed to have three dimensions: behavioral, emotional and cognitive perspectives [15]: Behavioral engagement refers to "effort exertion, persistence and attention" during class activities [31]; Emotional engagement includes emotional state such as affection, interest and enthusiasm which influences their willingness to participate in the classroom [15, 32]; Cognitive engagement which is conceptually similar to deep learning [19] encompasses the "psychological investment in learning, comprehend, or master skills and knowledge" [23]. In this paper, the three-dimensions of engagement were used to understand the quality of students' learning in wikis.

1.2 Relatedness
In general, sense of relatedness refers to the "sense of connectedness and belonging" to the persons or groups [28]. Relatedness is construed as a self-system process in psychology and springs from individual's basic psychological need to belong [17]. If this need for belongingness is fulfilled, individuals are likely to achieve more and show optimal functioning [3]. The thwarting of this psychological need for relatedness leads to various maladaptive outcomes such as depression and alienation. As such, relatedness is seen as malleable and is distinct from more trait-like variables which are assumed to be relatively fixed and less prone to change. An individual's sense of relatedness is dynamically constructed over multiple interactions with various social partners.

Recent studies in the educational setting have revealed that students' sense of relatedness to key social partners such as teachers, peers and parents can have positive effect on their engagement and school performance [17, 20, 24]. In particular, students who report a greater sense of relatedness to teacher and peers demonstrate more interest in class and usually perform better in academic work. In contrast, students who feel a lesser sense of relatedness to teacher and peers find it more difficult to constructively engage in classroom activities [17, 21].

We argue that sense of relatedness is especially relevant and important in collaborative wiki settings. One of the reasons is that there is great amount of interaction and social relationship involved in collaborative writing. If a student is close to her peers, she may find it easier to work with them; if a student is close to her teacher, she would probably be more engaged in the class and raise questions when encounters a problem. Moreover, the students' relatedness with the teacher is also important given the open-ended nature of work in wiki. Teachers have to guide students when doing their wiki projects but at the same time have to provide enough space and freedom for the students to express their ideas. A conflicted relationship with the teacher might lead to students feeling being too tightly controlled by the teacher. This loss of autonomy which accompanies a controlling teaching strategy is not conducive to learning [33]. Thus, in this paper, we particularly examine the students' relatedness to teacher and peers, and investigate how these could influence student engagement.

1.3 Linking Sense of Relatedness and Engagement in Wiki
The main focus of this study is to understand how students' sense of relatedness may affect their engagement in collaborative writing using wikis. This can be further broken down into three key research questions:

RQ1: To what extent does sense of relatedness predict students' behavioral engagement in collaborative wiki writing?

RQ2: To what extent does sense of relatedness predict students' emotional engagement in collaborative wiki writing?

RQ3: To what extent does sense of relatedness predict students' cognitive engagement in collaborative wiki writing?

2. METHODOLOGY
2.1 Participants and Research Settings
Participants in the study comprised 422 secondary school Year 1 to Year 3 students, whose ages ranged from 13 to 15 on average. All students were recruited from one co-educational government secondary school, which is regarded as one of the most academically competitive schools in Hong Kong.

The wiki platform named PBworks (http://www.pbworks.com) was used in the study. This platform was designed mainly for team collaboration and knowledge sharing. To facilitate students in the inquiry group project work in Liberal Studies (LS) course, a standard PBworks template was created. Under this template, students could easily add or edit the files and pages. They could also leave comments for internal group discussions on each PBworks page. The widget "Recent Activity History" would inform all the group members any latest changes on the page.

The group size was around 4. The students generally took 4 to 5 months to complete the whole online project. A closer investigation on the activity history and discussion history from some of the groups revealed that there was a large variation of active working time among students – while some students preferred to work on daytimes, others tended to work in evenings or midnights. This observation suggested that the online collaboration platform facilitated students to work at any time.

2.2 Procedures and Measures
Students were invited to respond to a questionnaire at the end of the inquiry group project work after having used the wikis. The questionnaire consists of 23 questions in total. This instrument attempted to measure students' perception on five main factors – behavioral engagement, emotional engagement, cognitive engagement, relatedness to teacher and relatedness to peers. Details of these factors are presented in Table 1.

Table 1. Five main factors used in the questionnaire on using wikis for collaborative writing

Factor	Focus of Assessment
Behavioral Engagement	Students' effort, persistence and mental effort such as attention and contribution
Emotional Engagement	Students' perception of interest, enjoyment and involvement in course
Cognitive Engagement	Students' thoughtfulness and willingness to spend extra time in learning, exert the effort necessary to comprehend complex ideas
Relatedness	Students' perception of connectedness with

to Teacher	teacher, by investigating criteria such as feeling accepted or important with the teacher			
Relatedness to Peers	Students' perception of connectedness with peers, by investigating criteria such as feeling accepted or important with the peers			

The behavioral engagement and emotional engagement subscales were based on Skinner's Engagement and Disaffection Questionnaire [32]; the cognitive engagement subscale was based on Biggs' deep learning subscale [4]; the relatedness to teacher and peers subscales were based on the Sense of Relatedness Scale developed by Furrer and Skinner [17].

For the questionnaires, respondents used a 5-point Likert-type scale: ranging from 1 (strongly disagree) to 5 (strongly agree). Negatively worded items were reverse coded. Then all items in each scale were averaged. The average scores ranged from 1 to 5, with higher scores indicating more of the respective conducts.

Table 2 contains Cronbach's alphas, means and standard deviations for all variables. Average scores for all factors were above 3, which was the midpoint for the scale used. Internal consistency reliabilities were tested and found to be acceptable. The Cronbach's alphas for all of the factors were at least 0.6, while the alphas for behavioral engagement and emotional engagement were above 0.8.

Table 2. Descriptive statistics for students' overall responses to the questionnaire

Factor	Number of items	α	Mean	SD
Behavioral Engagement	5	.82	3.63	0.58
Emotional Engagement	5	.84	3.59	0.59
Cognitive Engagement	5	.79	3.38	0.59
Relatedness to Teacher	4	.60	3.60	0.59
Relatedness to Peers	4	.64	3.73	0.63

3. RESULTS

3.1 Preliminary Analysis
Table 2 shows the descriptive statistics as well as the internal consistency reliabilities of the various scales that were used. Results showed that the scales had adequate internal reliabilities.

Next, we examined the bivariate correlations between engagement and sense of relatedness. As can be seen in Table 3, all correlations were moderate or moderately high, and all were in the expected directions – that is, the sense of relatedness to teacher was positively correlated to behavioral engagement ($r = .381$, $p < .05$), emotional engagement ($r = .339$, $p < .01$) and cognitive engagement ($r = .246$, $p < .01$) in using wikis respectively. Sense of relatedness to peers was positively correlated to behavioral engagement ($r = .320$, $p < .01$), emotional engagement ($r = .277$, $p < .01$) and cognitive engagement ($r = .202$, $p < .01$) in collaborative writing using wikis correspondingly.

Table 3. Correlations among factors

	Variable	1	2	3	4	5
1	Behavioral Engagement	-				
2	Emotional Engagement	.792**	-			
3	Cognitive Engagement	.714**	.756**	-		
4	Relatedness to Teacher	.381*	.339**	.246**	-	
5	Relatedness to Peers	.320**	.277**	.202**	.602**	-

Note: *$p < .05$, **$p < .01$

For other correlations, behavioral engagement and emotional engagement were highly correlated ($r = .792$, $p < .01$) in the open collaborative environment. Cognitive engagement was positively correlated to behavioral engagement ($r = .714$, $p < .01$) and emotional engagement ($r = .756$, $p < .01$). The correlation between relatedness to teacher and relatedness to peers was also positive ($r = .602$, $p < .01$).

3.2 Regression Analysis
To answer the main research questions, a series of regression analyses were conducted.

3.2.1 RQ1: To what extent does sense of relatedness predict students' behavioral engagement in collaborative wiki writing?
The first goal was to examine the relationship between students' sense of relatedness and their behavioral engagement level in collaborative wiki writing. We regressed behavioral engagement in collaborative wiki writing on sense of relatedness to one's teacher and peers.

This regression model had the highest coefficient of determination ($R^2 = .159$, $p < .001$) compared with the other two regression models. Results showed that sense of relatedness with one's teacher ($\beta = .296$, $p < .001$) and with one's peers ($\beta = .143$, $p < .05$) positively predicted behavioral engagement. As can be seen, relative to students' relatedness to peers, students' relatedness to teacher was a stronger predictor of their behavioral engagement in collaborative writing

3.2.2 RQ2: To what extent does sense of relatedness predict students' emotional engagement in collaborative wiki writing?
The second goal was to establish the relationship between students' sense of relatedness and their emotional engagement level in collaborative wiki writing. Similar regression model was conducted with emotional engagement level as a dependent variable instead.

The regression model on predicting emotional engagement in collaborative writing had a fairly acceptable coefficient of determination ($R^2 = .124$). The standardized beta coefficients of relatedness to teacher and relatedness to peers were .270 ($p < .001$) and .116 ($p < .05$) correspondingly. Similar to the first regression model on behavioral engagement, students' relatedness to teacher was a stronger predictor of their emotional engagement in collaborative writing.

3.2.3 RQ3: To what extent does sense of relatedness predict students' cognitive engagement in collaborative wiki writing?

The third goal of this study was to examine whether students' sense of relatedness predicts cognitive engagement in collaborative writing. The third regression analysis was conducted based on this. Result of the regression model showed that the coefficient of determination (R^2 = .065) in the cognitive engagement model was relatively low when compared to the other two regression results.

Although the sense of relatedness to teacher and peers both positively predicted students' cognitive engagement in open collaboration writing work, the two former variables differed in their impact levels on the latter variable. The students' relatedness to teacher was a significant predictor of cognitive engagement (β = .195, p < .001), while the standardized beta coefficient of relatedness to peers albeit positive (β = .085) was not significant (p > .05).

Table 4. Regression Results for sense of relatedness as predictors in collaborative wiki writing

	Behavioral Engagement (β)	Emotional Engagement (β)	Cognitive Engagement (β)
Relatedness to Teacher	.296***	.270***	.195***
Relatedness to Peers	.143*	.116*	.085
Total R^2	.159***	.124***	.065***

Note: Standardized beta coefficients were shown

*p < .05, **p < .01, ***p < .001

4. DISCUSSION

The results of this study showed that students' sense of relatedness to teachers and peers predicted their engagement level in collaborative writing using wikis. This result is consistent with other research findings on how sense of relatedness plays an important role in traditional classroom settings [1, 24, 30, 34]. The sense of relatedness to key social partners is important to trigger children's enthusiasm and willingness to participate in the classroom activities. They may find it easier to be engaged in activities if they are surrounded by people they feel close to [17]. It also shows the importance of bringing the concept of relatedness to the IT in education research; especially as there is a large amount of interaction and social relationship involved.

The results in regression models also suggested that students' sense of relatedness to teachers and peers independently contributed to students' engagement in open collaborative work. In all three regression models conducted (see Table 4), the sense of relatedness to teachers acted as a stronger predictor (all are significant at α = .001 level) than relatedness to peers. This result indicated the importance of sense of relatedness to teachers, which is generally consistent with other research findings [17, 29].

On the other hand, the students' relatedness to peers also contributed to their engagement in open collaborative work, but to a lesser extent compared to relatedness to teacher. There is still some debate on the unique effects of relatedness to peers on engagement and academic outcomes. For example, some research

findings suggested that relatedness to peers made no significant contribution to engagement after taken the effects of relatedness to teacher and parents into account [29]. Closer examination of the relatedness profiles, particularly the effect on engagement in open collaborative learning environment, is therefore recommended

Most importantly, the students' relatedness to teachers and peers all positively predicted their level of engagement in collaborative writing using wikis. It indicated that the students' connectedness to key social partners was possibly essential to their long-term learning in open collaborative learning environment which may not be limited to the use of wikis only.

5. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

The main limitation of this study was the lack of generalizability of the sample. The participants were all from the same school, which implied that they may have similar background. In this exploratory study, one of the best schools in Hong Kong in terms of academic performance was recruited. As expected, the mean levels of the variables (see Table 2) reflected that the majority of students were doing well - the students reported high relatedness to teachers and peers, and showed active engagement in open collaborative environment. In future studies, a sample of lower performing students should also be targeted. The role of relatedness may act as a more crucial role to those students who are in a lower-ability school [2]. Thus, the current results drawn from this study has certain limitations.

Moreover, this study used a quantitative approach to understand the association between relatedness and engagement in wiki collaborative writing. These findings could be enriched by using a qualitative approach which could serve as a form of triangulation.

The effects of gender and grade level were not included in this study, but they could also be important predictors. Besides the relatedness to teachers and peers, relatedness to parents has also been revealed as another important variable in a traditional classroom setting [12, 17]. Further investigation of constructs closely related to relatedness such as social belonging and attachment are also suggested.

6. CONCLUSION

Taken together, results of the current study showed that students' sense of relatedness with their teacher and peers were important predictors of engagement in a collaborative wiki environment. This study has important theoretical implications for bridging the educational psychology literature with IT in education research.

IT in education researchers have traditionally been interested in how technologies such as wikis can be used for learning. However, they have paid insufficient attention to the role of psychological factors in affecting the quality of learning in technologically-enriched environments.

On the other hand, educational psychology researchers have mostly focused on how psychological factors affect the quality of learning outcomes in traditional classroom settings. However, they have not investigated how these psychological variables would play out in new types of learning environments such as wiki platforms. It is important for educational psychologists to look into these new types of learning environments given the use of ICT in educational contexts are on the rise.

This study showed the possible synergies that could emerge by linking IT in education research with the educational psychology

literature. This study also showed a more nuanced perspective by shedding light on how psychological factors such as sense of relatedness with one's teachers and peers could influence the quality of learning in an open collaboration environment.

Several practical implications for schools which introduce and advocate open collaboration settings in the classroom can be drawn from this study. Apart from guiding students in the use of open collaboration platforms, teachers should also pay more attention to teacher-student relationships as well as students' relationships among each other. Through developing stronger connectedness with students, teachers can facilitate students' engagement and ultimately enhance students' learning in open collaborative work. In addition, teachers can adopt approaches which focus on "conveying warmth, caring, and respect to students" [24]. Meanwhile, students will become more engaged in an open collaborative work if they have a better relationship with their classmates.

7. REFERENCES

[1] Anderman, L. H. and Anderman, E. M. Social Predictors of Changes in Students' Achievement Goal Orientations. *Contemporary Educational Psychology*, 24(10), (1999), 21-37.

[2] Battistich, V., Solomon, D., Kim, D.-i., Watson, M. and Schaps, E. Schools as communities, poverty levels of student populations, and students' attitudes, motives, and performance: A multilevel analysis. *American Educational Research Journal*, 32(3), (1995), 627-658.

[3] Baumeister, R. F. and Leary, M. R. The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 3 (1995), 497-529

[4] Biggs, J., Kember, D. and Leung, D. Y. P. The revised two-factor study process questionnaire: R-SPQ-2F. *British Journal of Educational Psychology*, 71, (2001), 133.

[5] Caverly, D. C. and Ward, A. Techtalk: Wikis and Collaborative Knowledge Construction. *Journal of Developmental Education*, 32(2), (2008), 36-37.

[6] Chu, S. K.W. TWiki for knowledge building and management. *Online Information Review*, 32(6), (2008), 745-758.

[7] Chu, S. K.W. *Developing upper primary students' 21st century skills: inquiry learning through collaborative teaching and web 2.0 technology*. Hong Kong: Centre for Information Technology in Education, University of Hong Kong, Hong Kong, (2012).

[8] Chu, S. K.W. A journey of teaching and learning with wikis. In *Proceedings of the The 7th International Conference on Knowledge Management (ICKM2010)* (Pittsburgh, Pennsylvania, U.S.A., 22-23 October 2010), (2010)

[9] Cole, M. Using Wiki technology to support student engagement: Lessons from the trenches. *Computers & Education*, 52(1), (2009), 141-146.

[10] Connell, J. P., Halpem-Felsher, B. L., Clifford, E., Crichlow, W. and Usinger, P. Hanging in There: Behavioral, Psychological, and Contextual Factors Affecting Whether African American Adolescents Stay in High School. *Journal of Adolescent Research*, 10(1), (1995), 41-63.

[11] Connell, J. P. and Spencer, M. B. Educational Risk and Resilience in African-American Youth: Context, Self, Action, and Outcomes in School. *Child Development*, 65(2), (1994), 493-506.

[12] Connell, J. P. and Wellborn, J. G. Competence, autonomy, and relatedness: A motivational analysis of self-system processes (1991).

[13] Désilets, A. and Paquet, S. Wiki as a tool for web-based collaborative story telling in primary school: A case study (2005).

[14] Franklin, T. and Van Harmelen, M. Web 2.0 for content for learning and teaching in higher education. JISC *www.jisc.ac.uk/media/documents/programmes/digitalrepositories/web2-contentlearningand-teaching.pdf* (2007).

[15] Fredricks, J. A., Blumenfeld, P. C. and Alison, H. P. School Engagement: Potential of the Concept, State of the Evidence. *Review of Educational Research*, 74(1), (2004), 59-109.

[16] Fu, H., Chu, S. and Kang, W. Affordances and Constraints of a Wiki for Primary-school Students' Group Projects. *Journal of Educational Technology & Society*, 16(4), (2013), 85-96.

[17] Furrer, C. and Skinner, E. Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, 95(1), (2003), 148-162.

[18] Guzdial, M., Rick, J. and Kehoe, C. Beyond Adoption to Invention: Teacher-Created Collaborative Activities in Higher Education. *The Journal of the Learning Sciences*, 10(3), (2001), 265-279.

[19] Ke, F. and Xie, K. Toward deep learning for adult students in online courses. *The Internet and Higher Education*, 12(3), (2009), 136-145.

[20] King, R. B. and Ganotice Jr, F. A. The social underpinnings of motivation and achievement: Investigating the role of parents, teachers, and peers on academic outcomes. *The Asia-Pacific Education Researcher* (2013), 1-12.

[21] King, R. B. and McInerney, D. M. The work avoidance goal construct: Examining its structure, antecedents, and consequences. *Contemporary Educational Psychology*, 39(1) (2014), 42-58.

[22] Kirschner, P., Strijbos, J.-W., Kreijns, K. and Beers, P. Designing electronic collaborative learning environments. *ETR&D*, 52(3), (2004), 47-66.

[23] Newmann, F., Wehlage, G. and Lamborn, S. The significance and sources of student engagement. *Student engagement and achievement in American secondary schools* (1992), 11-39.

[24] Niemiec, C. P. and Ryan, R. M. Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education*, 7(2), (2009), 133-144.

[25] Parker, K. and Chao, J. Wiki as a Teaching Tool. *Interdisciplinary Journal of E-Learning and Learning Objects,* 3(1), (2007), 57-72.

[26] Pierson, L. H. and Connell, J. P. Effect of grade retention on self-system processes, school engagement, and academic performance. *Journal of Educational Psychology*, 84(3), (1992), 300-307.

[27] Pintrich, P. R. and de Groot, E. V. Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82(1), (1990), 33-40.

[28] Ryan, R. M. and Deci, E. L. Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1), (2000), 54-67.

[29] Ryan, R. M., Stiller, J. D. and Lynch, J. H. Representations of Relationships to Teachers, Parents, and Friends as Predictors of Academic Motivation and Self-Esteem. The *Journal of Early Adolescence*, 14(2) (1994), 226-249.

[30] Skinner, E., Furrer, C., Marchand, G. and Kindermann, T. Engagement and disaffection in the classroom: Part of a larger motivational dynamic? *Journal of Educational Psychology*, 100(4), (2008), 765-781.

[31] Skinner, E. A. and Belmont, M. J. Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology*, 85(4), (1993), 571-581.

[32] Skinner, E. A., Kindermann, T. A. and Furrer, C. J. A Motivational Perspective on Engagement and Disaffection: Conceptualization and Assessment of Children's Behavioral and Emotional Participation in Academic Activities in the Classroom. *Educational and Psychological Measurement*, 69(3), (2009), 493-525.

[33] Soenens, B., Sierens, E., Vansteenkiste, M., Dochy, F. and Goossens, L. Psychologically controlling teaching: Examining outcomes, antecedents, and mediators. *Journal of Educational Psychology*, 104(1), (2012), 108.

[34] Wentzel, K. R. Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology*, 90(2), (1998), 202-209.

[35] Woo, M., Chu, S., Ho, A. and Xuanxi, L. Using a Wiki to Scaffold Primary-School Students' Collaborative Writing. *Journal of Educational Technology & Society*, 14(1), (2011), 43-54.