Internet Research

Influence of wiki participation on transnational collaboration learning anxiety in middle school students: A case study of Google wiki

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Received 29 May 2014
Revised 23 August 2014
27 October 2014
27 November 2014
1 December 2014
Accepted 9 December 2014

Influence of wiki participation on transnational collaboration learning anxiety in middle school students

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Abstract

Purpose – The purpose of this paper is to investigate the Wiki and its influence on the anxiety produced during cross-cultural web-based collaborative learning sessions.

Design/methodology/approach – In total, 49 high school students participated in transnational collaborative learning and engaged in a one-month Google Wiki activity. A transnational collaborative learning anxiety inventory was used to measure the anxiety of the participants, which included the dimensions of social anxiety, foreign language anxiety, and computer anxiety. In addition, platform usage records were compiled using Google Wiki user records and participation process checklists. Relative data derived from these two items were compared with the questionnaire data.

Findings – The results indicated that participants who had experience with Wiki transnational collaborative learning exhibited significantly reduced SA and FLA. Participation process and user records revealed that embedding videos; responding to content created by others; proofreading and editing the content of others; updating layouts; underlining text, changing the font, and color coding; and increasing the number of edits reduced FLA. The number of times edits and responses were produced was correlated with decreases in SA.

Originality/value – The causes and effects of transnational collaborative learning have concurrently received attention. However, studies on Wiks and their impact on the anxiety produced during cross-cultural Web-based collaborative learning are limited. Therefore, Google Wiki was used in this study as the medium through which the effects of Wiki participation on anxiety resulting from transnational collaborative learning were explored.

Keywords Wiki, Google Wiki, Learning anxiety, Transnational collaborative learning

Paper type Research paper

1. Introduction

The arrival of new generations of digital technology has enabled the limitless application of networks to teaching. Learners can rapidly share information through networks, and can use various models as channels for exchanging information. The i2010 initiative promoted by the European Commission (2005) stated that current teaching methods are not limited to the classroom. The use of technology to transmit information enables learning to exceed the limitations of time and space by involving the internet. The Digital Agenda extended the digital development plan to 2020. Plans included in the Digital Agenda rely on fast internet service, and these plans have indicated that the future economy will be a web-based knowledge economy (European Commission, 2010).

Internet Research
Vol. 25 No. 5, 2015
pp. 794-810

1066-2243
DOI 10.1108/IntR-05-2014-0142

Namwar and Rastgoo (2008) proposed that during this new innovation wave, networks that provide space for integrating diverse messages and creating diverse collaborative learning opportunities can implement new elements in the long-promoted collaborative learning process. The Office of Educational Technology, US Department of Education (2010) emphasizes cross-cultural collaborative learning and has clearly indicated that this type of collaboration is beneficial for solving challenges and problems in contemporary society. Because of advances in technology, the Taiwan Ministry of Education's (MOE) White Paper for the use of information technology (IT) in K-12 Education 2008-2011 states that IT is a crucial link in participating with transnational groups and establishing partnership relationships, and encourages student participation in web-based collaborative learning.

Although the transnational collaborative learning model has received attention in various fields, numerous problems remain to be solved. In particular, using computer and communication technology is considered to be a factor that causes a high degree of anxiety (Hashim *et al.*, 2010). In addition, communication difficulties caused by different language and cultural backgrounds require participants to expend considerable effort in expressing themselves and avoiding misunderstandings (Cunningham *et al.*, 2010). Dahlgren *et al.* (2006) indicated that spelling and grammar mistakes produced anxiety in participants and further hindered two-way communication. Therefore, problems that occur in the process of transnational collaborative learning lead to anxiety in participants. The various dimensions and factors that affect anxiety are topics worthy of in-depth exploration.

Among the diverse network technology used in contemporary society, Wiki participation is widely used in collaborative learning (Li *et al.*, 2014; Wang, 2014; Lykourentzou *et al.* 2012; He, 2011). The characteristics of this type of participation have prompted interest in exploring the role these characteristics play in information exchanges (Wang, 2014; Lin and Kelsey, 2009; Pae, 2007). Pae (2007) indicated that Wikis are one of the factors that increase anxiety; for example, the lack of an automatic spell check system in Wikis causes uneasiness in users. Lin and Kelsey (2009) indicated that participation functions that enable other people's work to be edited also make users feel highly anxious. Conversely, Cowan *et al.* (2009) indicated that the long-term use of Wikis effectively reduces anxiety. Furthermore, the highly effective use of Wiki platforms increases the reduction of anxiety.

In summary, Wikis affect anxiety during information exchanges. However, whether using Wikis increases or decreases anxiety in high school transnational collaborative learners and their influence on various dimensions of anxiety is unknown. Wiki participation concepts were integrated into transnational collaborative learning to explore the effects on various dimensions of anxiety. Furthermore, we provide specific recommendations for reducing anxiety based on the activity process and study results to improve the effectiveness of transnational collaborative learning. The objectives of this study are listed as follows:

(1) explore the influence of the Wiki participation model on transnational collaborative learning anxiety;

(2) explore the relationship between the Wiki participation activity process and changes in transnational collaborative learning anxiety; and

(3) propose specific recommendations for reducing transnational collaborative learning anxiety during Wiki participation.

2. Literature review

2.1 Transnational collaborative learning

In transnational network-exchange studies, inadequate foreign language capabilities are a prominent problem. When using non-native languages during exchanges, language barriers influence communication and hinder cultural exchanges (Jain and Krieger, 2011). Therefore, language is considered the greatest obstacle in transnational learning. Language limits learning opportunities, hinders the understanding of local culture, and creates transnational hurdles (Cowan *et al.*, 2009). In addition to foreign language concerns, interpersonal relationships are vital to the success or failure of transnational exchanges. During exchange activities, cultivating students to use sociocultural perspectives when conducting cross-culture exchanges and establishing interpersonal relationships is crucial to success (Corso, 2008; Engberg and Fox, 2011; Lee, 2009). Sizoo *et al.* (2007) emphasized the influence of cross-culture techniques, such as overcoming culturally different interpersonal relationships. If participants were permitted to use personal experiences to manage and realize interpersonal relationships during exchanges, the professional cross-cultural knowledge of participants would be enhanced. Although the amount of computer technology used has increased substantially, the use of overwhelmingly complicated computer devices and various interface designs could be potential obstacles in the learning process (Gunter, 2001). When using networks for cross-regional teaching, learner anxiety toward computers is a key factor that influences teaching efficacy (Hashim *et al.*, 2010). The Taiwan MOE's White Paper for IT in K-12 Education 2008-2011 indicated that most elementary and middle school students lack international exchange experience and possess inadequate knowledge of using IT in international exchanges. Therefore, applying IT as an internationalization tool is vital in public school information education (Taiwan Ministry of Education, 2008). In summary, problems encountered during transnational collaborative learning can be divided into the following three types: social interactions, foreign languages, and computers, which are central obstacles to the success of these activities. Therefore, we used categories of social interaction, foreign language, and computers to conduct an in-depth study of transnational collaborative learning anxiety problems.

2.2 Transnational collaborative learning anxiety

2.2.1 Social anxiety (SA). Peer factors play critical roles in juvenile SA, and the concept of social acceptance causes the most SA to occur. Juveniles tend to make decisions based on self-judged peer acceptance (Festa and Ginsburg, 2011). During the collaborative learning process, team members must communicate with and trust each other. If learners are unfamiliar with this type of teaching method, expressing themselves to others easily causes high levels of anxiety (Shiota, 2008). In web-based collaborative learning, team members are unfamiliar with each other during the early task-implementation phases. Furthermore, revising and editing peer work causes high levels of anxiety (Lin and Kelsey, 2009). Negative social performance expectations cause juveniles to avoid interacting with others. This clear SA response substantially reduces their acceptance of others (Erath *et al.*, 2007). SA in various dimensions of transnational collaborative learning is categorized as "unfamiliarity with new people and items," "concerns regarding peer acceptance," and "negative social expectations." These three factors form the primary SA dimensions in the transnational collaborative learning anxiety inventory (TCLAI).

2.2.2 Foreign language anxiety (FLA). Cunningham *et al.* (2010) indicated that in a multilanguage environment, learners are more easily confused than in a single-language environment because using non-native and native languages increases confusion related to coherency and causes misunderstandings. FLA involves reading anxiety, which interferes with the cognitive system of readers, causing readers to express weak comprehension. Therefore, anxiety is perceived as an obstruction that influences the ability of learners to express themselves in English (Mohd. Zin and Rafik-Galea, 2010). Because the sentence structure of all languages differs among all international Wiki users using a foreign language, writing obstacles also cause writing anxiety (Macaro, 2010). When students write in a foreign language, grammatical errors made using foreign languages cause anxiety because students do not wish teachers or classmates to consider them as people who frequently make mistakes. This is especially critical when both sides have not yet established a close relationship (Dahlgren *et al.*, 2006; Hurd and Xiao, 2010). FLA factors involved in transnational collaborative learning are classified as "afraid to make mistakes," "knowing their personal foreign language skills are inadequate," and "lacking confidence when speaking in a foreign language with a person who is a native speaker of that language." These factors comprise the primary FLA dimensions in the TCLAI.

2.2.3 Computer anxiety (CA). If learners do not receive sufficient prior training, the use of information and communication technology in teaching causes serious anxiety problems (Hashim *et al.*, 2010). In addition, elements, such as network connection ownership, network command, and familiarity with networks, have significant correlations with the network anxiety level (Aydin, 2011). In this technologically developed age, the internet has been demonstrated to be safe, flexible, and stable; however, network users remain vulnerable to constant changes (European Commission, 2010). If users have extensively used certain technological tools, they may balk at learning how to use new technology or techniques. The acceptance of new technology requires additional time and experience (Varma, 2010). Factors of CA in transnational collaborative learning are classified as "insufficient related knowledge," "worry that the equipment is inadequate" and "rejecting computer or computer-related technology." These factors are the dimensions of CA in the TCLAI.

2.3 The Wiki participation model

2.3.1 Positive correlation studies on Wikis and anxiety. User anxiety caused by using Wikis is distinct from CA because the source of anxiety is not the computer, software, or hardware equipment but the Wiki platform (Cowan and Jack, 2011). At the early stages, team members may experience high levels of anxiety caused by communication difficulties and uncertainty about people or items. The reasons for this include participant concerns regarding copyrights and the potential lack of acceptance when editing peer articles (Lin and Kelsey, 2009). In studies on Wikis and increased anxiety, the participating subjects have comprised both learners and teachers who promote the use of Wikis. Kessler (2010) indicated that because their participants lacked familiarity with the theme under discussion, they exhibited fear toward the Wiki platform at the start of the discussion activity. The factors include negative user experiences (caused by poor platform design) and inadequate knowledge of the platform, which produce varying types of hazards.

2.3.2 Studies on negative correlations between Wikis and anxiety. In addition to increasing anxiety, Wikis also influence users in other manners. For certain users,

Wikis may be a source of enthusiasm (Kerr, 2009). Wiki users value cooperation and the sharing of messages, and using the platform to contribute information gives them a sense of achievement. When the articles that a user posts are valued by others, the user's self-esteem increases (Moore and Serva, 2007). Using the discussion function during Wiki participation stimulates student learning interests and enables them to express their thoughts with confidence (Bohemia *et al.*, 2009). Thus, Wiki models effectively enhance learner confidence. These factors include positive experiences associated with team participation and pride in the team's work (Ertmer *et al.*, 2011).

The influences and results of transnational collaborative learning have gradually been observed. Numerous studies on the learning advantages of Wiki use and the learning anxiety produced by using Wikis have been published. However, studies on the Wiki model and the influence on anxiety produced by cross-cultural web-based collaborative learning remain limited. Therefore, we used Google Wiki as the exchange platform of transnational collaborative learning and conducted an in-depth exploration of the various dimensions of anxiety after the conclusion of the participation activities.

3. Research methods

3.1 Research participants

The Taiwanese transnational collaborative learning participants in this study comprised 49 high school students from a private school in Taipei City. The participants were between the ages of 15 and 18 years. The learning task was to complete an activity proposal for a three-day, two-night homestay in Taiwan. The transnational participants were divided into two groups and each group made online arrangements to travel in Taiwan. These arrangements were discussed online by using the Wiki participation model for a month. The itinerary for traveling in Taiwan was planned according to the discussion results produced by the two exchange groups. By receiving normalized computer course training, the participants in both study groups learned the basics of using the Wiki participation model. In addition, we selected a French-American international school in the USA as the partner school for this exchange; the proportion of students whose native language was French or English was equal.

3.2 Research design

A quasiexperimental single-group pretest-posttest design was employed for this study, the Wiki participation activity was the independent variable, and transnational collaborative learning anxiety was the dependent variable. The results were obtained using a Wiki participation activity pretest and posttest involving the TCLAI developed in this study. During the Wiki participation activities, the Google Wiki user records and transnational collaborative learning participation process checklist (PPC) were used to collect learner participation experiences.

3.3 Google Wiki platform

We used Google Wiki as the network tool for conducting transnational collaborative learning activities. Small groups were assigned to be platform editors based on the Wiki participation model. Each group shared a collaboration platform. To prevent competition among groups from interfering with the study results, group members could not see the content used by other groups. The Google Wiki page was designed based on the two collaboration tasks used in this study: recognizing and exchanging information with others and arranging the Taiwan travel itinerary. The main interface

selections included the home page categories "About us!" (a self-introduction page for the members in each group) and "Our Schedule" (the Taiwan travel itinerary arrangement page).

3.4 Research tools

3.4.1 The TCLAI. We developed the TCLAI based on a summary of the referenced literature. The questionnaire consisted of the following sections: basic information and SA, FLA, and CA items regarding transnational collaborative learning anxiety. The SA and FLA sections contained 13 related items each and the CA section contained 15 items. The pretest for this questionnaire was completed by 110 eighth to 12th grade students. Overall, 105 valid questionnaires were obtained for analysis. The overall Cronbach's α-value for reliability reached 0.914. The three dimensions obtained α values of 0.861, 0.871, and 0.881.

3.4.2 Google Wiki user records. The user results were obtained from Google Wiki, and the revised user data were arranged in order according to time. In addition, a function that compared new and previous versions of the edited content displayed the changes users made in the most recent version. After the activity, we used this function to compile each record of changes as a reference for examining the activity process.

3.4.3 Google Wiki PPC. According to the listed functions of Google Wiki, we divided the transnational collaborative learning participation process into the domains of technological capability, collaborative capability, editing capability, posted content, and editing volume. After organizing the specific participation items that corresponded to each domain, we developed the Google Wiki PPC (Appendix). Except for the number of edited words, which were obtained by using the word count function in Microsoft Word, the remaining domains were measured based on the editing records included in the Google Wiki user records and observations made at each stage of the activity. The results were compared with the TCLAI test results.

3.5 Data processing and analysis

We used the TCLAI and Google Wiki PPC results as the source of data. SPSS statistical software was used to conduct data analysis. The data in this study were collected from the pre and posttest questionnaires. A dependent sample *t*-test was used to analyze the three anxiety dimensions in the questionnaire. The results from the pretest and posttest were compared to understand the influence of the participation activity on transnational collaborative learning anxiety. In addition, changes in the three anxiety dimensions of the pre and posttest and the platform PPC records were used to analyze the relationship between the Wiki participation process and changes in transnational collaborative learning anxiety.

4. Research results

4.1 Changes in transnational collaborative learning anxiety

The standard deviation of the participant FLA and CA pretest results was 4.809 and 5.544, respectively. The posttest standard deviation was 6.628 and 6.22, respectively, indicating that the posttest standard deviations of these two anxiety dimensions possessed higher discreteness than those derived from the pretest. However, the SA items did not produce this result. In addition, the means of these three dimensions revealed that the CA pretest mean was lower than the means of the SA and FLA pretest results.

We used the dependent sample *t*-test to understand whether the participants in the Wiki participation activities experienced significant changes in transnational

collaborative learning anxiety between the pre and posttest, and understand the influence of Wiki participation on the collaborative learning anxiety of participants who use transnational networks. The results indicated that the SA and FLA pre and posttest results exhibited significant changes in transnational collaborative learning anxiety, but the CA test results did not reveal a significant change. Regarding the SA dimension, the posttest *t*-test result subtracted by the pretest *t*-test result was $M = -2.163$, $p = 0.001$, which indicated that a significant difference existed between the pretest and posttest results for the Wiki activity participants regarding the SA dimension. The SA posttest results were significantly lower than those of the SA pretest. Regarding the FLA dimension, the *t*-test results were $M = -2.02$, $p = 0.007$, which indicated that the posttest results for the FLA dimension were significantly lower than those obtained from the pretest. Furthermore, the *t*-test results for the CA dimension were $M = 0.49$, $p = 0.574$, which indicated that the participants did not exhibit a significant difference in the CA dimension between the pre and posttest results (Table I).

4.2 Anxiety changes in the Google Wiki participation process

To explore the relationship between the Google Wiki platform participation process and dimensions of transnational collaborative learning anxiety, we used the Google Wiki PPC to record the user participation process on the Google Wiki platform. The checklist was divided into the following five domains: technological capability, collaborative capability, editing capability, posted content, and editing volume. To explore the relationship between SA, FLA, and CA and the user participation process used in transnational collaborative learning activities further, Pearson's correlation coefficient statistical analysis was conducted. This analysis was performed to explore whether a significant relationship existed among the user participation records stored on the Google Wiki platform, and the pre and posttest differences in the anxiety dimensions. These results can be used to explain the influence of the Google Wiki platform exchange activity on the transnational collaborative learning anxiety of users.

4.3 The relationship between the Google Wiki participation process and anxiety in the technological capability domain

The PPC items related to technological capability in the platform participation process included the following: embedding images, embedding sound, embedding

	M	SD	*t*	df	Sig (two-tailed)
Pair 1					
SA pretest SA posttest	−2.163	4.455	−3.399**	48	0.001
Pair 2					
FLA pretest FLA posttest	−2.020	5.052	−2.800*	48	0.007
Pair 3					
CA pretest CA posttest	0.490	6.059	0.566	48	0.574

Notes: *$p < 0.01$; **$p < 0.001$

Table I.
The dependent sample *t*-test for transnational collaborative learning anxiety

videos, and embedding web links. In the technological capability domain, the act of embedding videos and differences in the FLA pre and posttest results ($r = -0.683$) exhibited a significant moderate negative correlation (Table II), thereby indicating that embedding videos multiple times on the exchange platform lowered the corresponding FLA. However, other technological capabilities (e.g. embedding images and embedding web links) exhibited no significant correlation with the difference between the pre and posttest results for the three anxiety dimensions.

4.4 The relationship between the Google Wiki participation process and anxiety in the collaborative capability domain

Because the Google Wiki platform was used, responses to external content, proofreading and editing the content of others, and proofreading and editing personal content were the primary collaborative actions constituting the collaborative capability domain. In the collaborative capability domain (Table III), platform actions related to responding to content and proofreading and editing the content of others exhibited a moderate negative correlation with the FLA pre and posttest differences ($r = -0.516$ and -0.634, respectively). The first indicated that a high number of learner responses

	SA pre-posttest difference	FLA pre-posttest difference	CA pre-posttest difference
Embedding images			
Pearson correlation	−0.007	−0.229	−0.058
Sig. (two-tailed)	0.964	0.114	0.690
Embedding videos			
Pearson correlation	−0.065	−0.683**	0.056
Sig. (two-tailed)	0.657	0.000	0.703
Embedding web links			
Pearson correlation	−0.149	−0.085	−0.238
Sig. (two-tailed)	0.306	0.562	0.099

Note: **Correlation is significant at the 0.01 level

Table II. Summary of the relationship between the Google Wiki participation process and anxiety regarding the technological capability

	SA pre-posttest difference	FLA pre-posttest difference	CA pre-posttest difference
Responses to external content			
Pearson correlation	0.182	−0.51**	0.066
Sig. (two-tailed)	0.212	0.000	0.650
Editing personal content			
Pearson correlation	0.056	0.011	−0.157
Sig. (two-tailed)	0.705	0.941	0.281
Editing the content of others			
Pearson correlation	0.111	−0.634**	−0.148
Sig. (two-tailed)	0.447	0.000	0.312

Note: **Correlation is significant at the 0.01 level

Table III. Summary of the relationship between the Google Wiki participation process and anxiety regarding the collaborative capability

to other people's content on the platform increased the reduction of individual FLA. Second, the high numbers derived for learners who proofread and edited the content of others indicated reductions in individual postactivity FLA. However, the pre and posttest scores for CA and SA and the participation process in the collaborative capability domain did not present significant relationships. Proofreading and editing personal content exhibited no significant correlations with the difference between the pre and posttest results obtained for the three anxiety dimensions.

4.5 The relationship between the Google Wiki participation process and anxiety in the editing capability domain

In the editing capability domain, the platform editing actions were divided into updating layouts; using headings to classify content; using tables; underlining text, changing the font, and color coding content; and creating novel web sites. These actions were used to recreate the original text or increase the attractiveness of images or reading convenience. In the editing capability domain (Table IV), the platform action of updating layouts and the differences in the pre and posttest results regarding FLA exhibited the highest significant negative correlation ($r = -0.674$). These two actions exhibited a moderate negative correlation relationship, which indicated that increased layout-update activities conducted by participants prompted increased postactivity FLA reductions. Underlining text, changing the font, and color coding content also presented a significantly negative correlation ($r = -0.366$) with the FLA pre and posttest result differences. This indicated that increased instances of underlining text, changing the font, or color coding on the platform substantially reduced participant FLA. In addition, creating a novel web site exhibited a low positive correlation ($r = 0.31$) with the FLA pre and posttest result differences.

Table IV. Summary of the relationship between Google Wiki participation process and anxiety regarding the editing capability

	SA pre-posttest difference	FLA pre-posttest difference	CA pre-posttest difference
Updating layouts			
Pearson correlation	−0.209	−0.674**	−0.253
Sig. (two-tailed)	0.149	0.000	0.080
Using headings to classify content			
Pearson correlation	0.116	0.219	0.191
Sig. (two-tailed)	0.426	0.130	0.189
Using tables			
Pearson correlation	0.093	0.052	0.143
Sig. (two-tailed)	0.524	0.723	0.326
Underlining/font/color			
Pearson correlation	0.082	−0.366**	−0.015
Sig. (two-tailed)	0.574	0.010	0.918
Linking external web pages			
Pearson correlation	0.078	0.310*	0.209
Sig. (two-tailed)	0.595	0.030	0.150

Note: *,**Correlation is significant at the 0.01 and 0.05 levels, respectively

4.6 The relationship between the Google Wiki participation process and anxiety in the posted content domain

The posted content domain was divided into the following six evaluation items: spelling errors, grammatical errors, incorrect word selections, punctuation errors, receiving responses from others, and the number of times a document is edited. In the posted content domain, the differences in the number of times a document was edited between the CA pre and posttest results exhibited the most significant negative correlation ($r = -0.671$; $p = 0.000 < 0.01$), which was moderate. This indicated that the increased number of times the content written by the participants was edited reduced postactivity CA. In addition, the differences in the number of times user content was edited had a low but significant negative correlation ($r = -0.386$) between the SA pre and posttest, which indicated that the high number of times user content was edited was correlated with the reduction in SA. Furthermore, receiving responses from others and the SA and FLA pre and posttest result differences exhibited a significant and moderate negative correlation ($r = -0.634$ and -0.306, respectively). Receiving responses from others exhibited a significant negative correlation with SA, which indicated that a high number of responses from others prompted reductions in SA. Similarly, receiving responses from others exhibited a negative correlation with FLA, thereby demonstrating that a high number of responses from others enhanced the reduction of SA. Finally, spelling errors and FLA pre and posttest differences exhibited a low but significantly positive correlation ($r = 0.319$; Table V).

	SA pre-posttest difference	FLA pre-posttest difference	CA pre-posttest difference
Number of times a document is edited			
Pearson correlation	−0.386**	−0.224	−0.671**
Sig. (two-tailed)	0.006	0.122	0.000
Spelling errors			
Pearson correlation	−0.121	0.319*	−0.056
Sig. (two-tailed)	0.407	0.025	0.703
Grammatical errors			
Pearson correlation	0.138	0.138	0.218
Sig. (two-tailed)	0.343	0.346	0.133
Incorrect word selections			
Pearson correlation	0.163	0.281	0.019
Sig. (two-tailed)	0.263	0.051	0.895
Punctuation errors			
Pearson correlation	0.149	−0.273	0.036
Sig. (two-tailed)	0.306	0.058	0.805
Receiving responses from others			
Pearson correlation	−0.634**	−0.306*	−0.165
Sig. (two-tailed)	0.000	0.033	0.257

Note: *,**Correlation is significant at the 0.5 and 0.01 levels, respectively

Table V.
Summary of the relationship between Google Wiki participation process and anxiety regarding the post content

4.7 The relationship between the Google Wiki participation process and anxiety in the editing volume domain

The editing volume domain was divided into the number of edits and the number of words edited. Regarding the number of edits, the editing history obtained from Google Wiki was transferred to a Microsoft Excel spreadsheet in order to sort and determine the number of participation edits. The number of words edited was determined by the word count function in Microsoft Word. In the editing volume domain (Table VI), only the number of edits and the FLA pre and posttest result differences exhibited a significant and low negative correlation ($r = -0.296$). This indicated that a high number of participant edits facilitated reductions in postactivity FLA.

In summary, components of the platform domain activities in the Google Wiki PPC were related to changes in the pre and postactivity transnational collaborative learning anxiety dimensions. Among these dimensions, FLA presented the highest correlation with platform activities, including embedding videos, responding to external content, proofreading, editing the content of others, updating the layout, and underlining text, changing the font, and color coding content. These activities all exhibited a significant negative correlation with the FLA pre and posttest result differences, thereby indicating that increased opportunities for conducting activities on the Google Wiki platform significantly reduced user anxiety related to these activities. Items related to SA included the number of times user content was edited and receiving responses from others. Both exhibited a significant negative correlation with the SA pre and posttest result differences. Only the number of times user content was edited had a significant negative correlation with CA. The anxiety pre and posttest differences exhibited only a significant negative correlation and not a positive correlation. This indicates that the Google Wiki model used in transnational collaborative learning processes is correlated with anxiety reduction in participating learners, and enables the greatest reduction in FLA.

5. Conclusion and future research

5.1 Influence of the Wiki participation activity model on transnational collaborative learning anxiety

The results indicated that learner SA and FLA exhibited a significant difference after the Wiki platform transnational exchange activities were completed. The questionnaire posttest results regarding these two types of anxieties indicated significantly lower

Table VI. Summary of the relationships between Google Wiki participation process and anxiety regarding the editing volume

	SA pre-posttest difference	FLA pre-posttest difference	CA pre-posttest difference
Number of edits			
Pearson correlation	0.076	−0.296*	−0.108
Sig. (two-tailed)	0.603	0.039	0.461
Number of words edited			
Pearson correlation	0.084	−0.140	0.006
Sig. (two-tailed)	0.567	0.336	0.966

anxiety than that reported in the pretest results. This indicated that the Google Wiki model reduced SA and FLA in transnational collaborative learners. However, the CA dimension demonstrated no significant difference.

5.2 Relationship between the Google Wiki participation process and changes in transnational collaborative learning anxiety

Changes in all three anxiety dimensions regarding transnational collaborative learning exhibited a correlation with the five participation process domains comprising the Google Wiki platform (technological capability, collaborative capability, editing capability, posted content, and editing volume). Among these domains, embedding videos in the technological capability domain was correlated with reduced FLA. Embedding videos reduced FLA in editors. In the collaborative capability domain, the number of times learners responded to external content and proofread and edited the content of others on the platform also were also correlated with reduced FLA. Responding to others' content and editing the content of others enabled learners to enhance their confidence in their English abilities, which reduced learner anxiety associated with English use. In the editing capabilities domain, updating the layout and underlining text, changing the font, and color coding also exhibited a significant correlation with postactivity FLA reduction. The use of the platform to update the layout and the ability to underline text, change the font, and color code enabled Google Wiki participants to arrange and write content according to personal preferences, which bolstered confidence and lowered FLA.

Regarding the posted content domain, the number of times that content was edited was correlated with reductions in CA. If the participants were unfamiliar with the Google Wiki functions, having their content edited by members of the same group was considered as assistance provided to the person whose content was being edited, which effectively reduced CA. In addition, the number of times personal content was edited and responses from others were received was also a key element in reducing SA. When written content was noticed by members of the same group, it was viewed as socially positive encouragement, which reduced SA. In the editing volume domain, the number of edits was related to significant reductions in postactivity FLA.

These descriptions indicate that the application of the Wiki model in transnational collaborative learning had the highest correlation with reducing FLA in the anxiety dimensions of various domain participation processes. Platform actions that reduced FLA included embedding videos; responding to external content; proofreading; editing the content of others; updating layouts; underlining the text, changing the font, and color coding; and the number of edits. The SA anxiety dimension also was significantly correlated with the Google Wiki model participation process. The number of times personal content was edited by others and responses from others were received was correlated with reduced SA. Reductions in CA were related to only the number of times content was edited. These results fulfilled the study objectives, and indicated that applying the Google Wiki model collaboration platform to transnational collaborative learning significantly reduces SA and FLA, but not CA.

5.3 Specific recommendations for reducing transnational collaborative learning anxiety by using the Wiki participation model

Based on the study results, we offer specific recommendations for applying similar collaboration platforms to transnational collaborative learning that we expect will

effectively reduce the SA, FLA, and CA of participants. Because embedding videos reduces FLA, and video or image usage enables editors to express confidence, learners should be introduced to collections of related videos, pictures, or other materials prior to the start of activities. This can reduce the anxiety in participants that is produced during the idea exchange process. In fact, encouraging students to use translation tool or grammar checking tools to verify their own works may also reduce FLA significantly. The collaboration model used for the exchange is different among small groups, and members in each group easily influence one another. Therefore, creating some explicit rules to guide the group activity will help reduce anxiety such as a group leader can be selected at the beginning of the group discussions to prompt input from other members through active participation in editing. In addition, when encountering inactive exchanges with their foreign counterparts, teachers can observe collaboration platform exchanges and remind the foreign team to verify whether problems with platform operation or other problems that are causing passive participation exist. These actions prevent increases in SA caused by exchanges in which poor participation occurs or few responses from others are provided.

5.4 The practical model for future transnational collaboration learning

Based on the results of the study, we layout a three-stage (planning, preparation, and execution) model for the future internet transnational collaboration learning. Hopefully it can improve the effect of learning and reduce the possible anxiety of learners. The "planning" stage includes "group members arrangement," "exchange participations arrangement" and "tasks arrangement" three major tasks which is the framework of the entire exchange program. The second stage is the "preparation" stage which includes "task providing," "content thinking," "language preparing," and "computer skill preparing" four major tasks. The key point is to allow learners to understand the major tasks and prepare themselves for the challenge. The preparation stage also is the critical stage to reduce the possible anxiety of learners. The third stage is the "execution" stage. It is the show time. Learners have to truly execute the plan and preparation from the previous stages. We recommend the teacher who acts as the facilitator to watch the communication and interaction carefully from both sides and provide the timely guidance (Table VII).

5.5 Limitation and future research

Finally, we observed participants from only one side of the participation exchange as the research subjects. However, all group members mutually influence one another during collaborative learning. Therefore, we recommend that future studies include the exchange counterparts. As well as, some of the exchange partners are French speakers and the potential back translation problem could foster more misleading and extra anxiety which should be avoided in the future. In addition to using questionnaires to gather and quantify data, interviews should be used to collect qualitative records and understand the exchange counterparts. These actions will enable further exploration of the mutual influence among group members. In addition, we used only Google Wiki to conduct the research. However, numerous Wiki participation platforms exist on the internet. Therefore, we recommend that future studies explore platforms that are highly suitable for transnational collaborative learning to provide learners with a complete exchange environment.

Stage	Task	Description	Notes
Planning	Group members arrangement	Understanding background of participants Trying to arrange familiar faces in the same group Assigning computer experienced students in the group	Reducing SA
	Exchange participations arrangement	Arranging non-native (main communication language) speaker in both sides Avoid age different participants in the same group	
	Tasks arrangement	Providing established tasks and related discussion topics to learners	
Preparation	Task providing	Providing clear personal background to participants in both sides	Reducing SA
	Content thinking	Based on the main tasks to design related activities Allowing learners working ahead to collect necessary elements (picture, video, map, etc.) for posting	
	Language preparing	Providing extra practice in the meeting of language club Providing sharing sessions from the experienced students	Reducing FLA
	Computer skill preparing	Providing Wiki operation workshop Providing opportunity to practice Wiki before the tasks	Reducing CA
Execution	Working with each other with group and partner sides	Pairing group members to help each other Providing extra group active to allow team member to know each other	Reducing SA
	Group discussion	Teachers have to understand the operation model of each group Selecting the "right" group leader Observing the interaction carefully and communicate with the teacher from the partner side	Reducing SA, FLA, and CA

Table VII. The practical model for future internet transnational collaboration learning

References

Aydin, S. (2011), "Internet anxiety among foreign language learners", *TechTrends: Linking Research and Practice to Improve Learning*, Vol. 55 No. 2, pp. 46-54.

Bohemia, E., Harman, K. and Lauche, K. (2009), *The Global Studio: Linking Research, Teaching and Learning*, Delft University Press, Amsterdam.

Corso, G. (2008), "Learning outcomes in college academic service-learning experiences: so much may factor into assessing such experiences", ERIC Document Reproduction Service No. ED501290, National Center for Research on Teacher Learning.

Cowan, B.R. and Jack, M.A. (2011), "Exploring the wiki user experience: the effects of training spaces on novice user usability and anxiety towards wiki editing", *Interacting with Computers*, Vol. 23 No. 2, pp. 117-128.

Cowan, B.R., Vigentini, L. and Jack, M.A. (2009), "Exploring the effects of experience on wiki anxiety and usability- an online study", *Proceedings of the 23rd BCS Conference on Human Computer Interaction the British Computer Society, Edinburgh*, pp. 175-183.

Cunningham, U., Fagersten, K. and Holmsten, E. (2010), "'Can you hear me, Hanoi?' Compensatory mechanisms employed in synchronous net-based English language learning", *International Review of Research in Open and Distance Learning*, Vol. 11 No. 1, pp. 161-177.

Dahlgren, M., Larsson, S. and Walters, S. (2006), "Making the invisible visible. On participation and communication in a global, web-based master's programme", *Higher Education: The International Journal of Higher Education and Educational Planning*, Vol. 52 No. 1, pp. 69-93.

Engberg, M.E. and Fox, K. (2011), "Exploring the relationship between undergraduate service-learning experiences and global perspective-taking", *Journal of Student Affairs Research and Practice*, Vol. 48 No. 1, pp. 85-105.

Erath, S.A., Flanagan, K.S. and Bierman, K.L. (2007), "Social anxiety and peer relations in early adolescence: behavioral and cognitive factors", *Journal of Abnormal Child Psychology*, Vol. 35 No. 3, pp. 405-416.

Ertmer, P.A., Newby, T.J., Liu, W., Tomory, A., Yu, J. and Lee, Y. (2011), "Students' confidence and rerceived value for participating in cross-cultural wiki-based collaborations", *Educational Technology Research and Development*, Vol. 59 No. 2, pp. 213-228.

European Commission (2005), "Annual report 2005 on the European community's development policy and the implementation of external assistance in 2004", available at: http://ec.europa.eu/europeaid/multimedia/publications/publications/annual-reports/2005_en.htm (accessed November 19, 2012).

European Commission (2010), "A digital agenda for Europe", available at: http://ec.europa.eu/information_society/digital-agenda/index_en.htm (accessed November 19, 2012).

Festa, C.C. and Ginsburg, G.S. (2011), "Parental and peer predictors of social anxiety in youth", *Child Psychiatry and Human Development*, Vol. 42 No. 3, pp. 291-306.

Gunter, G. (2001), "Making a difference: using emerging technologies and teaching strategies to restructure an undergraduate technology course for pre-service teachers", *Educational Media International*, Vol. 38 No. 1, pp. 13-20.

Hashim, R., Ahmad, H. and Abdullah, C. (2010), "Antecedents of ICT attitudes of distance education students", *Turkish Online Journal of Educational Technology – TOJET*, Vol. 9 No. 1, pp. 28-36.

He, W. (2011), "Using wikis to enhance website peer evaluation in an online website development course: an exploratory study", *Journal of Information Technology Education*, Vol. 10, pp. IIP236-IIP247, available at: https://scholar.google.com.tw/scholar?q=Using+wikis+to+enhance+website+peer+evaluation+in+an+online+website+development+course:+an+exploratory+study&hl=zh-TW&as_sdt=0&as_vis=1&oi=scholart&sa=X&ved=0CBkQgQMwAGoVChMI_J2Zn57cxwIVhI6UCh3regKL.

Hurd, S. and Xiao, J. (2010), "Anxiety and affective control among distance language learners in China and the UK", *RELC Journal: A Journal of Language Teaching and Research*, Vol. 41 No. 2, pp. 183-200.

Jain, P. and Krieger, J.L. (2011), "Moving beyond the language barrier: the communication strategies used by international medical graduates in intercultural medical encounters", *Patient Education & Counseling*, Vol. 84 No. 1, pp. 98-104.

Kerr, J. (2009), "Surfing together: a preliminary inquiry into the effects of internet use on social capital in American communities", paper presented at the Annual Meeting of the Midwest Political Science Association 67th Annual National Conference, The Palmer House Hilton, Chicago, IL, April 2-5.

Kessler, G. (2010), "When they talk about CALL: discourse in a required CALL class", *Calico Journal*, Vol. 27 No. 2, pp. 376-392.

Lee, L. (2009), "Promoting intercultural exchanges with blogs and podcasting: a study of Spanish–American telecollaboration", *Computer Assisted Language Learning*, Vol. 22 No. 5, pp. 425-443.

Li, X., Chu, S.K. and Ki, W.W. (2014), "The effects of a wiki-based collaborative process writing pedagogy on writing ability and attitudes among upper primary school students in Mainland China", *Computers & Education*, Vol. 77, pp. 151-169, available at: www.sciencedirect.com/science/article/pii/S0360131514001043

Lin, H. and Kelsey, K. (2009), "Building a networked environment in wikis: the evolving phases of collaborative learning in a wikibook project", *Journal of Educational Computing Research*, Vol. 40 No. 2, pp. 145-169.

Lykourentzou, I., Dagka, F., Papadaki, K., Lepouras, G. and Vassilakis, C. (2012), "Wikis in enterprise settings: a survey", *Enterprise Information Systems*, Vol. 6 No. 1, pp. 1-53.

Macaro, E. (2010), *Continuum Companion to Second Language Acquisition*, Continuum International Publishing, London.

Mohd. Zin, Z. and Rafik-Galea, S. (2010), "Anxiety and academic reading performance among malay ESL Learners", *Journal of Pan-Pacific Association of Applied Linguistics*, Vol. 14 No. 2, pp. 41-58.

Moore, T.D. and Serva, M.A. (2007), "Understanding member motivation for contributing to different types of virtual communities: a proposed framework", *Proceedings of the 2007 ACM SIGMIS CPR Conference on Computer Personnel Research: The Global Information Technology Workforce (SIGMIS CPR '07) ACM Press, New York, NY*, pp. 153-158.

Namwar, Y. and Rastgoo, A. (2008), "Weblog as a learning tool in higher education", *Turkish Online Journal of Distance Education*, Vol. 9 No. 3, pp. 176-185.

Office of Educational Technology, US Department of Education (2010), "Transforming american education: learning powered by technology", available at: www.scribd.com/doc/54489789/ (accessed February 19, 2011).

Pae, J.K. (2007), "Wiki-based english writing: its effect on english writing proficiency and anxiety and Korean learners' perceptions", *Multimedia-Assisted Language Learning*, Vol. 10 No. 1, pp. 81-105.

Shiota, K. (2008), "Using craigslist to reduce learners' anxiety in language and culture learning", available at: http://php.csumb.edu/wlc/ojs/index.php/ds/article/viewPDFInterstitial/37/32 (accessed Octorber 10, 2011).

Sizoo, S., Serrie, H. and Shapero, M. (2007), "Revisiting a theory-supported approach to teaching cross-cultural management skills", *Journal of Teaching in International Business*, Vol. 18 Nos 2/3, pp. 83-99.

Taiwan Ministry of Education (2008), "The Whitepaper for information technology in K-12 education 2008-2011", available at: www.edu.tw/files/site_content/B0010/97-100year.pdf (accessed Octorber 9, 2012).

Varma, S. (2010), "Prior computer experience and technology acceptance", unpublished doctoral dissertation, University at Albany, State University of New York, NY.

Wang, Y.C. (2014), "Promoting collaborative writing through wikis: a new approach for advancing innovative and active learning in an ESP context", *Computer Assisted Language Learning*, in press. doi: 10.1080/09588221.2014.881386..

Further reading

Official Journal of the European Union (2010), "2010 joint progress report of the council and the commission on the implementation of the 'Education and Training 2010 work programme", *Official Journal of the European Union*, available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52010XG0506(01) (accessed September 30, 2011).

Appendix

Table AI.
Google Wiki participation process checklists

Domain	Items
Technological capability	☐ Embedding images
	☐ Embedding sounds
	☐ Embedding videos
	☐ Embedding web links
Collaborative capability	☐ Responses to external content
	☐ Editing personal content
	☐ Editing the content of others
Editing capability	☐ Updating layouts
	☐ Using headings to classify content
	☐ Using tables
	☐ Underlining/font/color
	☐ Linking external web pages
Posted content	☐ Number of times a document is edited
	☐ Spelling errors
	☐ Grammatical errors
	☐ Incorrect word selections
	☐ Punctuation errors
	☐ Receiving responses from others
Editing volume	☐ Number of edits
	☐ Number of words edited

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