

# STRATEGIES TO SUPPORT PERSONAL KNOWLEDGE MANAGEMENT USING A WIKI SITE IN ONLINE COURSES

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## ABSTRACT

*This article discusses the strategies to support Personal Knowledge Management (PKM) using a wiki site in online courses and examines student perceptions of the helpfulness of the wiki site and the applied PKM-related strategies. Fifty-seven students in six online class sessions completed a 25-item perception survey. The results showed that students did perceive the helpfulness of using the wiki site and the applied PKM-related strategies to support personal knowledge management in online courses. The applied PKM-related strategies contributed the most to help students convert explicit knowledge to more advanced and complex explicit knowledge (“combination”) in the process of knowledge management. The results also showed that gender and one’s comfort level with using wikis for PKM were possible factors affecting the student perceptions of some applied strategies. Suggestions for improving the applied strategies to support online PKM using a wiki site and recommendations are presented at the end of the article.*

*Keywords: Wiki, Knowledge Management, Personal Knowledge Management, Online Courses*

## INTRODUCTION

The importance of Personal Knowledge Management (PKM) has been addressed by many researchers (as cited in Chatti, 2012, p.2). It helps individuals with knowledge creation, management, and application. Helping students to manage their personal knowledge efficiently is not an easy task, especially in online courses. Without face-to-face interaction, it is especially challenging for instructors to teach students tacit knowledge (Kanfer et al., 2000; Tee & Karney, 2010), such as attitudes, beliefs, content-specific skills, experiences, mental models, perspectives, or values, because this type of knowledge is not written in instructional materials (Nonaka, 1994; Yi, 2006). Thus, it is indispensable for online instructors to look for strategies to support student learning throughout the process of knowledge management (Ou & Davison, 2007). This article

discusses strategies to support PKM using a wiki site in online courses and examines student perceptions of the helpfulness of the wiki site and the applied PKM-related strategies.

## LITERATURE REVIEW

PKM complements organizational knowledge management by focusing on “the individual’s quest to learn, work efficiently or socialise” (Razmerita, Kirchner, & Sudzina, 2009, p. 1021). Personal Knowledge Management was first introduced in Frand and Hixon’s (1999) working paper, and they defined it as a conceptual framework to organize and integrate information that is important to individuals. It also offers a strategy for transforming random information into systematic and expandable personal knowledge (Frand & Hixon, 1999). The concept of PKM has evolved since 1999 and involves individuals’ interactions with others and with ideas (Efimova, 2005). In

order to manage personal knowledge efficiently, individuals need to “find, interpret and connect relevant pieces of information, negotiate meanings, elicit knowledge in conversations with others, create new ideas and use them to come up with a final product” (Efimova, 2005, p. 8).

Knowledge can be perceived in two dimensions: explicit knowledge and tacit knowledge (Nonaka, 1994; Polanyi, 1966). Explicit knowledge is objective and detached from individual and social value systems (Hislop, 2005). It can be obtained by learning from structured instructional materials such as academic articles and instructor’s handouts or textbooks. On the other hand, tacit knowledge is subjective and content-specific and may be perceived differently based on an individual’s value system or personal expertise (Nonaka, 1994). Individuals usually construct their tacit knowledge by observing and imitating others’ behaviors or interacting with others within groups (e.g., experience sharing, peer evaluation, peer review) (Anand & Singh, 2011; Baran & Çağıltay, 2006; Bender & Longmuss, 2003; Yi, 2006). According to the SECI (Socialization, Externalization, Combination, and Internalization) model of knowledge creation proposed by Nonaka and Konno (1998), the process of knowledge management is a “spiral” of dynamic interactions between explicit and tacit knowledge. In the process, students 1) share tacit knowledge through “socialization,” 2) express tacit knowledge in understandable forms through “externalization,” 3) convert explicit knowledge to more advanced and complex explicit knowledge through “combination,” and 4) convert explicit knowledge to tacit knowledge through “internalization.” After “internalization,” the process continues to a new level of knowledge creation and management.

In addition, to help students manage their own knowledge efficiently, seven techniques have been proposed by Dorsey (2000), suggesting students should:

- 1) use library databases or web search engines to retrieve needed information;
- 2) use professional guidelines or criteria to evaluate the retrieved information;
- 3) organize the retrieved information systematically using appropriate tools;
- 4) analyze and stratify the retrieved information;
- 5) present the retrieved information to the target

audience in a clear and meaningful way;

6) secure the confidentiality of the retrieved information; and

7) collaborate with others to share and construct knowledge.

More specifically, to manage tacit knowledge, students need to interact with others through social or peer networking to get feedback and share information. To manage explicit knowledge, students need to create, store, transfer and apply explicit knowledge to problem-solving (Lee, 2009). They also need to learn how to transfer tacit knowledge to explicit knowledge and apply their knowledge to real-world situations appropriately (Anand & Singh, 2011).

The authors of this article adopted the SECI model of knowledge creation (Nonaka & Konno, 1998) and integrated relevant PKM ideas from the literature (Anand & Singh, 2011; Baran & Çağıltay, 2006; Bender & Longmuss, 2003; Dorsey, 2000; Efimova, 2005; Frand & Hixon, 1999; Lee, 2009; Ou & Davison, 2007; Polanyi, 1966; Razmerita et al., 2009) to propose a set of strategies to help students manage their personal knowledge in online courses using web tools:

1) socialization [from tacit knowledge to tacit knowledge]:

a) Assign students to small groups for collaboration.

b) Encourage students to use different media to share personal ideas and experiences.

2) externalization [from tacit knowledge to explicit knowledge]:

a) Encourage students to express their own ideas in a meaningful way.

b) Require students to clearly explain and construct their own ideas by providing analogies, examples, scenarios, etc.

3) combination [from explicit knowledge to explicit knowledge]:

a) Teach students to retrieve information efficiently from library databases or by using web search engines.

b) Require students to evaluate the retrieved information based on professional guidelines or criteria.

c) Ask students to analyze information systematically.

d) Require students to organize information in a clear and logical way.

e) Encourage students to connect the retrieved information to their prior knowledge and combine them into new knowledge.

4) internalization [from explicit knowledge to tacit knowledge]:

a) Ask students to prove what they have learned from structured learning materials.

b) Require students to reflect on what they have learned from structured learning materials.

In term of the tools used to support online PKM, Razmerita et al. (2009) suggested that Web 2.0 technology has a positive impact on managing personal knowledge. Through Web 2.0, individuals are not just passive information consumers; instead, they become active knowledge contributors. Web 2.0 helps with the essential parts of the process of knowledge management such as collaboration, knowledge sharing, and networking. There are many different Web 2.0 tools that can be used to facilitate PKM, and wikis are among the best. Wikis have been proposed by many researchers in academic settings (Cooney, 2006; Grace, 2009; King, 2006; Singh, Harun, & Fareed, 2013), and they are well-known for their advanced functionalities of 1) group communication and interaction, 2) sharing, distributing and presenting information, 3) storing and retrieving information, 4) creating information, 5) modifying and editing information, 6) organizing information, and 7) tracking learning history (Grace, 2009). Thus, the authors of this article chose a wiki site, PBworks ([www.pbworks.com](http://www.pbworks.com)), as a Web 2.0 tool to support online PKM.

## STUDY IMPLEMENTATION

### *Context*

The proposed PKM-related strategies were implemented in six fully online, semester-long course sessions in a southern university in the United States to help students manage their personal knowledge. Four course sessions in the Online Teaching Endorsement (OTE) program focused on preparing master-level students to be online instructors and making sure they would learn knowledge and skills needed for online course design, development, and delivery (see Sample Class A below). The other two sessions were the introductory course to instructional design and technology (see Sample Class B below). Students in the Instructional Technology Master's

Degree (ITMED) program were required to take this introduction course. Students enrolled in each session received three credit hours. In these course sessions, students were given similar instructions (e.g., assignment guides, wiki tutorials, and peer evaluation rubrics) by the same instructor to use PBworks as a knowledge management system for 1) sharing their own knowledge with others, 2) presenting their course assignments or projects, 3) organizing the collected learning e-resources, 4) assessing their own knowledge, experiences, and skills, and 5) reflecting on their own learning process and outcomes throughout the course. Students were randomly assigned into small groups for sharing knowledge and providing peer feedback. The instructor also gave students individual feedback to deepen knowledge, correct misconceptions, motivate learning, facilitate group communication, and encourage self-reflection. It is believed feedback from peers and the instructor help reinforce the process of knowledge management (King, 2006).

### *Sample Class A*

Sample Class A was one of the courses in the OTE Program that prepared master-level students to be online instructors. Its goal was to engage students with practical experiences in the selection, implementation, and evaluation of digital resources and strategies for online teaching and learning. Students in this class were randomly assigned into groups of two to three and were asked to use PBworks for assignment completion, group communication, and peer feedback. The major instructional activities on the wiki site included:

1) Scenario Construction: Students had to construct scenarios focusing on areas of online teaching, learning, assessment, and evaluation strategies.

2) P-12 Learning Module: Students had to design a unit of instruction for specific P-12 target audiences, including syllabus construction, activities planning, instructional materials and assessments design, and self-reflection on the entire design process.

3) Knowledge Management System (KMS): Students had to build an online portfolio using the wiki site to present their course assignments and organize learning e-resources that are helpful to them such as learning objects, lesson plans, professional literature, and websites.

One of the scenarios was about incorporating learning objects and multimedia into an online lesson each student wanted to create. Students were asked to provide the following information for this scenario assignment, including: 1) a title of the lesson, 2) an introduction to the lesson, 3) essential question(s) related to the lesson, 4) relevant learning objectives, 5) learning object(s) for the lesson, 6) an instruction of how to use the selected learning object(s), 7) a description about how the selected learning object(s) address the “dimensions of flexibility,” and 8) relevant assessment criteria. Students had to revise their work based on the feedback received from their peers and the instructor. They also needed to complete peer- and self- evaluations based on the quality, timeline, and accuracy of the feedback received and given at the end of the course. They were required to maintain and continue developing the built KMS throughout the OTE program.

### *Sample Class B*

Sample Class B was the introductory course in the ITMED program. Its goal was to introduce master-level students to theories of learning and instruction, digital citizenship, and research and practice in the Instructional Design and Technology (IDT) field. Students were randomly assigned into groups of three to five and were asked to use the PBworks wiki for project completion, group communication, and peer feedback. There were three major projects in this class:

1) IDT & Self Project: Students participated in and completed specified individual and group activities designed to develop IDT knowledge and skills related to personal and professional goals.

2) IDT & Community Project: Students participated in and completed specified individual activities designed to develop IDT knowledge and skills related to theories and communities of practice.

3) IDT & Society Project: Students participated in and completed specified individual and group activities designed to develop IDT knowledge and skills related to social issues.

One of the three major projects, the IDT & Self Project, included three activities. First, students had to write a narrative to state their professional background and goals for working and studying in the area of IDT. Second, students had to analyze their own professional goals against

the framework of the Association for Educational Communications and Technology (AECT) five domains (design, development, utilization, management, and evaluation) (Seels & Richey, 2012) and their own skills development within these domains and the students had to address how they would achieve their professional goals. Third, they had to work with their group members to explore the IDT resources available to help them achieve their professional goals. Students were asked to construct most project contents through the wiki site and reflect on their own learning process. They also had to revise their work based on the feedback received from their peers and the instructor and complete peer-evaluation based on the quality, timeline, and accuracy of the feedback received at the end of the course.

### *Instrument*

To understand how students perceived the use of the wiki site and the applied strategies to support online PKM, the 130 master-level students in the six online courses were invited to complete a perception survey at the end of the course sessions. Students in the ITMED program were not required to take the OTE courses but they could take the courses as electives. Students who took both types of courses were instructed that they only had to fill the survey once. The perception survey contained four main sections:

1) Questions 1–3: demographic information (three items related to gender, prior experience using wikis for PKM, and comfort level of using wikis for PKM),

2) Questions 4–12: perceptions of using the wiki site to support PKM in online courses (nine five-point Likert scale items),

3) Questions 13–23: perceptions of using the PKM-related strategies to facilitate the process of knowledge management, including “socialization,” “externalization,” “combination,” and “internalization” (eleven five-point Likert scale items), and

4) Questions 24–25: suggestions for improving the wiki site and the applied PKM-related strategies (two open-ended questions) (see Appendix A).

The reliability of the survey was high, with Cronbach’s alpha at .95 and .89 for Section 2 and Section 3, respectively.

Table 1. Participant Demographics

	Gender		Prior Experience with Wikis for PKM		Comfort with Using Wikis for PKM	
	Male	Female	Yes	No	More	Less
OTE (n=42)	9	33	22	20	36	6
ITMED (n=15)	2	13	4	11	15	0
Total	11	46	26	31	51	6

Table 2. Means and Standard Divisions on Student Perceptions of the Wiki Site and the Applied PKM-Related Strategies to Support Online PKM.

Section No.	Section Name	PKM Process	Questions	M	SD
2	Wiki		Q 4-Q 12	4.44	.61
3	PKM-Related Strategies		Q 13-Q 23	4.39	.48
		"socialization"	Q 13-Q 14	4.19	.66
		"externalization"	Q 15-Q 16	4.43	.51
		"combination"	Q 17-Q 21	4.54	.43
		"internalization"	Q 22-Q 23	4.36	.62

## RESULTS AND DISCUSSIONS

In total, 57 students (including 11 males and 46 females) completed the survey to share their thoughts on the use of the wiki site and the applied strategies to support online PKM. Forty-two students were in the OTE program and 15 of them were in the ITMED program. The survey response rate was 43.85%. Twenty-six students (45.6%) reported they had used wikis for PKM prior to the current course they were taking, but the rest of them (31 students, 54.4%) did not have any prior experience using wikis for PKM. In addition, 51 students (89.5%) reported they felt comfortable using wikis for PKM. Table 1 is a summary of the participant demographics.

Descriptive data are provided in Table 2 to show the means and standard deviations for questions in Sections 2 and 3. The means for all sections were above 4, which indicated students strongly agreed that using both the wiki site and the applied PKM-related strategies did help support and facilitate their personal knowledge management in online courses. The lowest rating was found on the perceived helpfulness of the applied strategies to facilitate "socialization" ( $M = 4.19$ ;  $SD = .66$ ) and the highest rating was found on the perceived helpfulness of the applied strategies to facilitate "combination" ( $M = 4.54$ ;  $SD = .43$ ) in the process of knowledge management.

### *The Use of the Wiki Site to Support Online PKM*

There were nine five-point Likert scale items in Section 2 of the survey about using the wiki site for group communication (Question 4), sharing knowledge (Question 5), presenting knowledge (Question 6), storing knowledge (Question 7), retrieving knowledge (Question 8), organizing knowledge (Question 9), refining knowledge (Question 10), monitoring knowledge (Question 11), and securing knowledge (Question 12). In Table 3, the means for questions in Section 2 were all above 4, which indicated that students strongly agreed with the helpfulness of the wiki site to support PKM in online courses. This result was consistent with the suggestion for using wikis to support PKM made by Razmerita et al. (2009).

Out of the nine questions, Q4–Q12, the lowest rating was found on Question 4, which concerns using the wiki site to support group communication during the online PKM process ( $M = 4.12$ ;  $SD = .83$ ). The reason for this relatively lower rating was probably that the amount of peer feedback received in different groups varied greatly. Some groups worked closely together via the wiki site, but other groups might need intervention from the instructor to use different communication strategies for better group interaction. The comments made by students to the last two open-ended questions could be used

Table 3. Means and Standard Deviations for Questions in Section 2

No.	Question	M	SD
4	The wiki site made it easy to communicate effectively within a group.	4.12	.83
5	The wiki site made it easy to share my knowledge with others.	4.44	.68
6	The wiki site made it easy to present my knowledge.	4.53	.66
7	The wiki site made it easy to store my knowledge.	4.54	.76
8	The wiki site made it easy to retrieve my knowledge.	4.51	.66
9	The wiki site made it easy to organize my knowledge effectively.	4.53	.71
10	The wiki site made it easy to refine my knowledge.	4.28	.82
11	The wiki site made it easy to monitor the development of my knowledge.	4.23	.85
12	The wiki site made it easy to secure my knowledge.	4.21	.94

to explain this result. For example, Student 38 (OTE) mentioned she did not receive much review and feedback from her group members and noted, “I received instructor’s feedback on all wiki assignments and activities but did not receive much peer review and feedback. It is difficult to make revisions based on peer review when you don’t receive much of it.” Setting up a checkpoint during the online PKM process may help ensure all students have similar group work experiences. In addition, students do not typically engage in activities that require peer feedback when interacting with one another in online courses. Thus, to facilitate the group communication in the online PKM process, giving students an in-class training including guidelines, instructional handouts, lectures, or worked examples on how to provide peer feedback before asking them to use wikis for online PKM would probably help resolve this problem (Brammer & Rees, 2007; Hsiao, 2017; Hsiao, Huang, & Moore, 2014, 2016; Sluijsmans, Dochy, & Moerkerke, 1998). By giving students an in-class training, they would know how to effectively share their own knowledge or experience within a group in online courses, which triggers the exchange of tacit knowledge (Yi, 2006).

#### *The Use of the PKM-related Strategies to Support Online PKM*

There were 11 five-point Likert scale items in Section 3 about the use of the PKM-related strategies to support the process of knowledge management, including “socialization,” “externalization,” “combination,” and “internalization.” Out of the 11 questions, Q13–Q23, the means for questions in Section 3 were all above 4 except for Question 13

( $M = 3.81$ ;  $SD = .92$ ) (see Table 4). According to the data shown on Table 2, the applied PKM-related strategies contributed the least to help student share tacit knowledge through “socialization” in the PKM process. There were two applied strategies to help with facilitating “socialization” in the process of knowledge management. One was to have students work in small groups for knowledge management (Question 13) and the other was to ask students to use different media to share their knowledge (Question 14). Students less agreed with the helpfulness of using group method ( $M = 3.81$ ;  $SD = .92$ ) as compared to using different media ( $M = 4.58$ ;  $SD = .63$ ) to support “socialization” in the online PKM process. The result was consistent with students’ responses to Question 4 related to group communication. Again, setting up a checkpoint during the online PKM process may help ensure that all students have similar group work experiences and maximize the helpfulness of the group method to “socialization.” Giving students an in-class training on how to provide peer feedback may also help facilitate group communication and share tacit knowledge in the online PKM process (Brammer & Rees, 2007; Hsiao, 2017; Hsiao et al., 2014, 2016; Sluijsmans et al., 1998).

Based on the data shown on Table 2, the applied PKM-related strategies contributed the most to help student convert explicit knowledge to more advanced and complex explicit knowledge (“combination”) in the PKM process. There are five strategies to help with facilitating “combination,” including: 1) searching information via library databases or web search engines to expand knowledge, 2) evaluating information based

Table 4. Means and Standard Deviations for Questions in Section 3

PKM Process	No.	Question	M	SD
"socialization" [from tacit to tacit]	13	Working in a group helped me to manage my knowledge.	3.81	.92
	14	Using different media helped me to share my knowledge with others (e.g., email, comments).	4.58	.63
"externalization" [from tacit to explicit]	15	Completing course projects/modules helped me to present my knowledge in a meaningful way.	4.56	.54
	16	Constructing scenarios helped me to demonstrate my knowledge.	4.30	.73
"combination" [from explicit to explicit]	17	Searching information via library databases or search engines helped me to expand my knowledge.	4.53	.57
	18	Evaluating information based on professional guidelines or criteria helped me to define knowledge.	4.53	.54
	19	Analyzing resources, skills, practices, and career goals helped me to refine knowledge.	4.53	.50
	20	Building my own knowledge management system helped me to organize knowledge logically.	4.61	.56
	21	Building my own knowledge management system helped me to combine new knowledge and prior knowledge.	4.53	.54
"internalization" [from explicit to tacit]	22	Constructing projects/modules helped me to internalize my knowledge learned from the class.	4.53	.57
	23	Writing a reflection paper/caption helped me to reflect on the development of my knowledge.	4.19	.85

Table 5. Results of t-tests Comparing Male and Female Students on Their Responses to Q16 and Q23

	Group						Mean Difference	t	df	P	Cohen's d
	Male			Female							
	M	SD	n	M	SD	n					
Q16	4.73	.47	11	4.20	.75	46	-.53	-2.24*	55	.029	0.85
Q23	4.73	.47	11	4.07	.88	46	-.66	-2.41*	55	.020	0.94

\*  $p < .05$

on professional guidelines or criteria to define knowledge, 3) analyzing resources, skills, practices, and career goals to refine knowledge, 4) building a knowledge management system to organize knowledge logically, and 5) building a knowledge management system to combine new knowledge and prior knowledge. Among those strategies, students more agreed with the helpfulness of building their own KMS on knowledge organization ( $M = 4.61$ ;  $SD = .56$ ). It was also the highest rating found in Section 3 (see Table 4).

#### Factors Affecting Student Perceptions

In addition to the descriptive data provided, independent *t*-tests were used to see if certain factors were significantly influencing student perceptions of the wiki site and the applied strategies to support PKM in online courses. The results showed that gender and student comfort level with wikis for PKM influence student perceptions of some applied strategies (see Table 5). Significant

differences were found between male and female students' responses to Question 16 and Question 23. Question 16 related to the perceived helpfulness of constructing scenarios to demonstrate knowledge. Male students rated higher ( $M = 4.73$ ,  $SD = .47$ ) than female students ( $M = 4.20$ ,  $SD = .75$ ) on this question,  $t(55) = -2.24$ ,  $p = .029$ . Question 23 related to the perceived helpfulness of writing a reflection paper/caption to reflect on knowledge development. Again, male students ( $M = 4.73$ ,  $SD = .47$ ) rated higher than female students ( $M = 4.07$ ,  $SD = .88$ ) on this question,  $t(55) = -2.41$ ,  $p = .020$ . These results showed that male and female students perceived differently on the helpfulness of some applied strategies to support online PKM.

In addition, in the responses to Question 16, Question 20, and Question 22, significant differences were found on the perceived helpfulness of the applied strategies to support online PKM between students who felt more comfortable and

Table 6. Results of t-tests Comparing Students Who Felt More and Less Comfortable Using Wikis for PKM on Their Responses to Q16, Q20, and Q22.

	Group						Mean Difference	t	df	p	Cohen's d
	More			Less							
	M	SD	n	M	SD	n					
Q.16	4.37	.66	51	3.67	1.03	6	-.71	-2.32*	55	.024	0.81
Q.20	4.67	.52	51	4.17	.75	6	-.50	-2.14*	55	.037	0.77
Q.22	4.61	.49	51	3.83	.75	6	-.78	-3.44*	55	.001	1.23

\* $p < .05$

students who felt less comfortable using wikis for PKM. First, Question 16 related to the use of scenarios to help with knowledge demonstration. Students who felt more comfortable using wikis for PKM rated higher on the question ( $M = 4.37$ ,  $SD = .66$ ) than students who felt less comfortable ( $M = 3.67$ ,  $SD = 1.03$ ),  $t(55) = -2.32$ ,  $p = .024$ . Second, Question 20 was about building a KMS to help with knowledge organization. Again, students who felt more comfortable using wikis for PKM rated higher ( $M = 4.67$ ,  $SD = .52$ ) than students who felt less comfortable on the question ( $M = 4.17$ ,  $SD = .75$ ),  $t(55) = -2.14$ ,  $p = .037$ . Third, Question 22 was about using projects/modules to help with internalizing knowledge learned from the class. Students who felt more comfortable using wikis for PKM rated higher on the question ( $M = 4.61$ ,  $SD = .49$ ) than students who felt less comfortable ( $M = 3.83$ ,  $SD = .75$ ),  $t(55) = -3.44$ ,  $p = .001$ . These results revealed that comfort level with using wikis for PKM was another factor affecting how students perceived some applied strategies.

#### Suggestions for Improvement

Question 24 and Question 25 were open-ended questions allowing students to share their thoughts with more detail and provide suggestions for improving the use of the wiki site and the applied strategies to support online PKM. Twenty-two students responded to these two open-ended questions. Content analysis was used to analyze the responses to these open-ended questions to identify patterns in the responses. According to the responses, overall students were satisfied with the use of the wiki site to support online PKM. This result was consistent with the above-mentioned results. Six students expressed positive thoughts

on the wiki usage. For example, Student 52 (OTE) said, "Using wikis is a great way to present your PKM. [I] enjoyed creating every page. Wish I was [not] working full-time so I could spend more on the wikis." Student 4 (ITMED) also expressed her satisfaction with the wiki site. She said, "I am satisfied with the way it [wiki] works and would like to use this tool again in future IT classes."

Besides the wiki usage, students also valued the applied strategies to support online PKM. Five students expressed the same idea about their perceptions of the applied strategies. For example, Student 4 (ITMED) stated:

*The PKM activities were challenging and it allowed me to think critically about my progress and analyze the information I was learning. Not only were the activities good, but they raised the standard of my writing skills in a direction that is more formal and professional.*

Student 38 (OTE) also liked the PKM-related activities. She expressed:

*I enjoyed completing the PKM-related activities and felt they continued to build upon each other to demonstrate my knowledge of course content and ability to apply it to real-world situations. I also enjoyed being able to combine prior knowledge with new knowledge learned in the course.*

To improve the use of the wiki site and the applied strategies to support online PKM, four students suggested adding examples of the wiki products [knowledge management system]. For example, Student 16 (OTE) suggested offering "a



couple of exemplar wikis that students can view would be helpful.” Student 18 (OTE), Student 22 (OTE), and Student 3 (OTE) made a similar suggestion. In addition, Student 38 (OTE) proposed having a better peer reviewing system in future courses. She said, “I believe a better peer review system would enhance the content and format of the PKM-related activities and wiki assignments.” Student 9 (ITMED) advocated for more freedom on wiki organization. She mentioned:

*Although the mandated structure of the wiki site was helpful, I would suggest organization be left to each student. Everyone organizes their thinking and notes differently. A suggestion could be made that the major wiki sections need to correlate to the major sections of the course, [and] then students could build out from there. When you're forced to use someone else's organizational structure, the work doesn't "feel" like it's yours.*

These suggestions should be considered when revising the PKM-related strategies and activities for future courses.

Although many students reported they liked the use of the wiki site and the applied strategies to support online PKM, some did point out the problem with formatting on the wiki site. Three students mentioned the same problem with the wiki site used. Student 6 (ITMED) said, “My only issue with the wiki [site] was formatting problems with items that were copied and pasted into the wiki [site]. For example, the font size and style would not change to the choices that I picked in the wiki [site].” Student 24 (OTE) also mentioned:

*My biggest struggle in the wiki [site] was the formatting issues. I would click on one line and it would say “Verdana 14 point” and click on another line next to it, and it would also say “Verdana 14 point” yet the lines appeared very different. I consistently pulled my material from Microsoft Word and would put it into my wiki, and that information was also the same font as well.*

Formatting guidelines or tutorials may need to be provided to avoid this type of problem for future courses.

## CONCLUSIONS AND RECOMMENDATIONS

The authors of this article discussed the strategies to support PKM in online courses using a wiki site and examined student perceptions of the use of the wiki site and the applied PKM-related strategies. The results showed that students perceived the helpfulness of using the wiki site to support PKM in online courses. Although students reported they liked the use of the wiki site for online PKM, some did point out the problem with formatting on the wiki site. Thus, formatting guidelines or tutorials may need to be provided to avoid this type of problem for future courses.

In addition, the results showed that students also valued the applied strategies to support online PKM, although they less agreed with the helpfulness of using the group method to share tacit knowledge (“socialization”). The applied PKM-related strategies contributed the most to help students convert explicit knowledge to more advanced and complex explicit knowledge (“combination”) in the process of knowledge management. Among those strategies to support “combination,” students gave the highest rating to the helpfulness of building a KMS to knowledge organization.

Although this was a small-scale study, the authors did find that gender and the comfort level with using wikis for PKM affected student perceptions of some applied strategies. When developing strategies to support online PKM using a wiki, these factors need to be considered in order to meet the needs of diverse students. Future research may continue to investigate the role of gender and student comfort-level with PKM tools in the process of building an effective PKM.

Based on the results, the authors proposed the following methods to help improve the applied strategies in this study:

- 1) setting up a checkpoint during the online PKM process to ensure that all students have similar group work experiences and maximize the helpfulness of the group method to “socialization”;
- 2) giving students an in-class training, including guidelines, instructional handouts, lectures, or worked examples on how to provide peer feedback to facilitate group communication and exchange of tacit knowledge in the online PKM process;
- 3) establishing a better peer review system to help enhance online PKM-related activities;
- 4) adding examples of KMS to help students

understand how to better manage their personal knowledge with a wiki; and

5) giving students more freedom on the structure of the knowledge management system to increase their feelings of ownership towards their own work.

This study was a small-scale study that only included 57 participants and was implemented in specific online contexts with wiki assignments, which makes it difficult to generalize the results to a large population. However, the study did provide an insight into how a wiki site and PKM-related strategies could be used to support online PKM, which was the missing piece in the literature. Directions for future research would be

1) use qualitative research methods such as participant interviews or online observations to explore the actual process of online PKM;

2) include a larger sample size or include different types of online courses to help generalize and transfer the results to other contexts; and

3) further investigate how gender or student comfort level with using wikis for PKM influences the process of PKM building.

## REFERENCES

- Anand, A., & Singh, M. D. (2011). Understanding knowledge management: A literature review. *International Journal of Engineering Science and Technology (IJEST)*, 3(2), 926–939.
- Baran, B., & Çağiltay, K. (2006). Knowledge management and online communities of practice in teacher education. *The Turkish Online Journal of Educational Technology—TOJET*, 5(3), 12–19.
- Bender, B., & Longmuss, J. (2003). Knowledge management in problem-based educational engineering design projects. *International Journal of Engineering Education*, 19(5), 706–711.
- Brammer, V., & Rees, M. (2007). Peer review from the students' perspective: Invaluable or invalid? *Composition Studies*, 35(2), 71–85.
- Chatti, M. A. (2012). Knowledge management: A personal knowledge network perspective. *Journal of Knowledge Management*, 16(5), 829–844. doi:10.1108/13673271211262835
- Cooney, L. (2006). Wiki as a knowledge management tool. (Master thesis, SKEMA Business School). Retrieved from <http://cooney.wdfiles.com/local—files/thesis1/lauras%20thesis.pdf>
- Dorsey, P. A. (2000). Personal knowledge management: Education framework for global business. Retrieved from [https://web.archive.org/web/20090523110010/http://www.millikin.edu/pkm/pkm\\_istanbul.html](https://web.archive.org/web/20090523110010/http://www.millikin.edu/pkm/pkm_istanbul.html)
- Efimova, L. (2005). Understanding personal knowledge management: A weblog case. Enschede, Netherlands: Telematica Instituut. Retrieved from <http://www.dl.edi-info.ir/Understanding%20personal%20knowledge%20management%20A%20weblog%20case.pdf>
- Frand, J., & Hixon, C. (1999). *Personal knowledge management: Who, what, why, when, where, how?* Orlando, FL: Educom 98.
- Grace, T. P. L. (2009). Wikis as a knowledge management tool. *Journal of Knowledge Management*, 13(4), 64–74. doi:10.1108/13673270910971833
- Hislop, D. (2005). *Knowledge management in organizations: A critical introduction*. New York, NY: Oxford University Press.
- Hsiao, E. (2017, October). Incorporating worked examples to facilitate peer review in online courses. Oral presentation at 2017 Annual Georgia Association of Teacher Educators (GATE) conference: Preparing Educators for a World beyond Imagination, Cordele, Georgia.
- Hsiao, E., Huang, X., & Moore, D. R. (2014, November). The impact of a training module on promoting peer feedback in online discussions: A student perspective. Paper presented at 2014 AECT International Convention—Learning, Design, and Technology, Jacksonville, Florida.
- Hsiao, E., Huang, X., & Moore, D. R. (2016, October). Students' perceived effects of worked examples on facilitating online peer review process. Roundtable presentation at 2016 AECT International Convention—Learning from Las Vegas. . . , Las Vegas, Nevada.
- Kanfer, A. G., Bruce, B. C., Haythornthwaite, C., Burbules, N., Wade, J., Bowker, G. C., & Porac, J. (2000). Modeling distributed knowledge processes in next generation multidisciplinary alliances. *Information Systems Frontiers*, 2(3/4), 317–331. doi:10.1023/A:1026520728644
- King, W. R. (2006). IT strategy and innovation: Recent innovations in knowledge management. *Information Systems Management*, 24(1), 91–93. doi:10.1080/10580530601082004
- Lee, C. (2009). The impact of knowledge management practices in improving student learning outcomes. (Doctoral dissertation, Durham University). Retrieved from <http://etheses.dur.ac.uk/242/>
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), 14–37.
- Nonaka, I., & Konno, N. (1998). The concept of “ba”: Building a foundation for knowledge creation. *California Management Review*, 40(3), 40–54. doi:10.2307/41165942
- Ou, C. X. J., & Davison, R. M. (2007, July). Knowledge management problems, causes and solutions: Junior knowledge workers' perspectives. Paper presented at 11th Pacific Asia Conference on Information Systems, Auckland, New Zealand. Retrieved from <http://www.pacis-net.org/file/2007/1231.pdf>
- Polanyi, M. (1966). *The tacit dimension*. New York, NY: Doubleday.
- Razmerita, L., Kirchner, K., & Sudzina, F. (2009). Personal knowledge management: The role of Web 2.0 tools for managing knowledge at individual and organizational levels. *Online Information Review*, 33(6), 1021–1039. doi:10.1108/14684520911010981
- Seels, B. B., & Richey, R. C. (2012). *Instructional technology: The definition and domains of the field*. Charlotte, NC: Information Age Publishing.
- Singh, A. K. J., Harun, R. N. S. R., & Fareed, W. (2013). Affordances of wikispaces for collaborative learning and knowledge management. *GEMA Online Journal of Language Studies*, 13(3), 79–97.
- Sluijsmans, D., Dochy, F., & Moerkerke, G. (1998). The use of self-, peer- and co-assessment in higher education: A review of literature (Otec Report 9u8/R04). Heerlen, The Netherlands: Educational Technology Expertise Centre (Otec), Open University of the Netherlands. Retrieved from <https://moodle.>

org/pluginfile.php/193/mod\_forum/attachment/60038/  
rapport9804.pdf

Tee, M. Y., & Karney, D. (2010). Sharing and cultivating tacit knowledge in an online learning environment. *Computer-Supported Collaborative Learning*, 5(4), 385–413. doi:10.1007/s11412-010-9095-3

Yi, J. (2006). Externalization of tacit knowledge in online environments. *International Journal on Elearning*, 5(4), 663–674.