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Exploring factors influencing minority students' perceived learning in collaborative Wiki-based learning environments

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Abstract

This study examined the factors affecting minority students' learning experience in Wiki-based environments. These factors included perceived collaborative learning, sense of community, Wiki self-efficacy, and perceived learning experience. The relationships of these factors were explored. The participants were 45 African American students enrolled in two undergraduate-level management courses in which Wiki was used to facilitate the process of group work. A mixed methods approach was applied to analyze the collected data. Results indicated that sense of community and collaborative learning significantly contributed to perceived learning in Wiki-based environments. However, Wiki self-efficacy was not a good predictor of perceived learning. Most of the minority students were positive about their group learning experience that involved collaborative processes as well as the development of knowledge and skills. Emotional support and support for cognitive or meta-cognitive processing were identified as factors that had potential influences on Wiki based collaborative group learning.

Introduction

Collaborative learning has been proved to be an effective approach to facilitate the student learning process (Li, 2015). From the perspectives of social constructivists, collaborative learning is believed to not only enhance learners' understanding of a subject and motivation to learn (Erkens & Bodemer, 2019), but also facilitate the development of communication, collaboration, and problem-solving skills (Gasevic et al., 2019; Medero & Albaladejo, 2020). In the digital era, computer-supported collaborative learning (CSCL) has emerged as a way that involves people working together to learn through the use of computers (Stahl et al., 2006). Researchers have been interested in understanding the intertwining of technology and collaborative learning and the challenges associated with it in CSCL (Li, 2015; Medero & Albaladejo, 2020).

Wiki is a type of web 2.0 tool that is widely used in higher education to facilitate student learning in face-to-face or online learning environments (Hsu, 2019; Li et al., 2021). Wiki allows users to co-construct collective knowledge through editing, revising, and sharing content in an online space (Chang et al., 2011; Lin & Reigeluth, 2016). In web 2.0-supported environments, learners develop the desire of information sharing, idea exchange, and collaboration, which in turn contributes to content learning or professional development (Leow & Neo, 2015; Wassell & Crouch, 2008).

With its interactive features, Wiki has the potential to support collaborative learning and the development of learning communities (Arriba, 2017; Medero & Albaladejo, 2020; Wang, 2016; Zheng et al., 2015). The use of Wiki helps transform learning from an instructor-centered approach to a learner-centered one, through which active participation and deeper thinking are initiated (Huang, 2019; Lin & Reigeluth, 2016; Zheng et al., 2015). The interest of using Wiki in the classroom among educators has continued to arise, which leads to several studies on the potentials of Wiki in teaching and issues related to student learning through Wiki (Arriba, 2017). However, limited studies have investigated factors affecting learning processes when using Wiki in the collaborative group work, and less emphasis was placed on how Wiki enhances learners' collaboration and sense of belonging to a learning community in relation to affective learning outcomes in classroom settings (Chang et al., 2011), although learners' perceived collaboration and sense of community have been identified as important indicators of learners' collaborative experience (Chang et al., 2011; Rockinson-Szapkiw et al., 2013; Wang & Wei, 2011). In addition, no prior research has investigated the impact of Wiki on African American students' learning experiences. Minority students appear to have limited opportunities to access trendy technology tools (e.g., web 2.0 tools, social media, etc.), and they usually have better knowledge or skill levels on basic software tools than advanced ones (Anderson, 2015; Kuo, 2018). In our study, the African American students were non-traditional students who dropped out of school at their young age due to financial or health issues, and came back to the school to earn their bachelor's degree by taking evening or online courses. Many of them were low socioeconomic status (SES) students, and had no experiences in using Wiki in their daily life or applying web 2.0 tools (e.g., Wiki) in the learning process. Although using web 2.0 in student learning is beneficial, limited studies have addressed African American students' perceptions of such tools (Kuo et al., 2017), or the learning strategies of using web 2.0 to facilitate learning processes among minority students.

According to Du et al., (2015), African American students prefer to work in groups or in the environment that involves collaboration or a strong sense of community. Therefore, it is imperative to investigate African American students' use of Wiki in the collaborative group learning. Furthermore, learners' confidence in using the adopted technology tool is critical to their learning experience (Abulibdeh & Hassan, 2011; Wang et al., 2013). Learners with low technology self-efficacy may encounter more difficulties or be more anxious in the learning process, compared to their counterparts. Hence, we assume that African American students' self- efficacy in using Wiki may play an important role in Wiki-based learning environment. In this study, we explored factors including collaborative learning, sense of community, Wiki self-efficacy, and perceived learning, as well as the relationships of these factors in Wiki-based learning settings for minority students.

Literature review

Theoretical framework

Social constructivism and Connectivism form the theoretical framework of this study. Constructivists premise that learning takes place when learners attempt to make sense of their own experiences (Driscoll, 2005). Extended from constructivism, social constructivism was proposed with the belief that knowledge can be collaboratively constructed through social interactions (e.g., communication, conversation, discussion, negotiation of meaning, etc.)

between individuals in various communities (Rondon-Pari, 2011). According to the perspectives of social constructivist, there are three key components that comprise the fundamental processes of learning, including zone of proximal development (ZPD), intersubjectivity, and enculturation (Woo & Reeves, 2007). ZPD refers to the difference between the actual development level (i.e., what a learner can do on his or her own) and the potential development level (i.e., what a learner can achieve with the help or guidance from others; Vygotsky, 1978). Intersubjectivity is a mutual understanding that people can achieve through meaningful sharing, communication, and interaction (Woo & Reeves, 2007). Enculturation is the process by which people learn values and beliefs that are accepted or appropriate in the culture or society where they live or are surrounded (Woo & Reeves, 2007).

Social constructivists emphasize the influence of social contexts, and assert that learning occurs through the interaction between individuals and the society (Vygotsky, 1978; Woo & Reeves, 2007). Individuals learn by their experiences with particular social or cultural contexts (Zhu et al., 2009) and through collaboration with others in a learning community (Papastergiou, 2006). Collaborative learning environments (e.g., group discussions, team projects, or learning communities) enable learners to share ideas, thoughts, and information with peers (Leow & Neo, 2015; Zhu et al., 2009). The collaborative processes that involve reciprocal interaction, joint construction of meaning, and negotiation from multiple perspectives lead to the development of new understanding and the acquisition of knowledge, skills, and dispositions (Cuhadar & Kuzu, 2010; P. L. Smith & Ragan, 2005; Sivan, 1986). The use of technologies (e.g., computers, web 2.0, etc.) in constructivist learning environments not only facilitates the collaboration process among learners, but also has the potential to enhance the development of ZPD through learners' interaction with more knowledgeable peers or experts (Cuhadar & Kuzu, 2010; Papastergiou, 2006).

Connectivism is a newly developed learning theory of the digital age. With its focus on the impact of technology, connectivism emphasizes how technologies (e.g., Web browsers, web 2.0, search engines, databases, and other digital tools.) provide people with opportunities to learn through information sharing across the World Wide Web and among themselves (Downes, 2010; Siemens, 2005). According to connectivism, learning does not happen merely through an internal construction of knowledge within an individual, but it also takes place through the process of connecting specialized nodes, information sets or sources (Barnett et al., 2013; Siemens, 2005). It is believed that knowledge is distributed across a network of connections arising from actions and experience within a community (Downes, 2007). Collaboration that involves members of a group helping each other for a specific objective is key to connectivist learning (Kizito, 2016). Through collaboration, a network of connections is established when individuals share their interests, opinions, perspectives, or knowledge (Kropf, 2013). As connectivism assumes that knowledge and expertise reside in the connections or networks, collaboration facilitates the process of learning and makes such a learning process efficient (Kizito, 2016). In connectivism, it is important for people to develop the ability to identify connections or relationships between ideas, thoughts, and concepts (Siemens, 2005). The use of collaborative technologies allows members of a group to carry out major tasks of knowledge building through a set of connections (Barnett et al., 2013).

Collaborative learning

Collaborative learning is an instructional method in which learners at various performance levels work together in small groups towards a common goal and experience different perspectives of other learners (Gokhale, 1995; B. L. Smith & MacGregor, 1992). The shared learning experiences provide learners with opportunities to engage in discussion, converse with other learners, and present or defend ideas, which enhances not only interaction among learners, but also critical thinking and problem- solving skills (Armstrong & Hyslop-Margison, 2006; Kuo et al., 2013; Medero & Albaladejo, 2020). Collaborative learning facilitates learner-centered learning by shifting the emphasis from individual efforts to group work. It involves the joint efforts by learners, or learners and instructors together, and various forms of communication in face-to-face or computer-supported settings (Laal & Laal, 2011).

The use of Wiki supports collaborative learning by enhancing learning experiences in idea exchange, knowledge sharing, and knowledge production (Arriba, 2017; Campbell & Ellingson, 2010; Chang et al., 2011; Huang, 2019; Li et al., 2021). For example, Chang et al. (2011) investigated students' perceptions of utilizing Wiki as a platform for content review, data collection, and idea sharing in collaborative learning activities. Students indicated Wiki as a useful tool that provides the opportunities for conflict resolving and communicating with their classmates. They also stated that Wiki enlarged the resources of learning support. Similarly, Campbell and Ellingson (2010) examined the influence of integrating group work and Wiki tools on student learning in an online class. Wiki was found to be a medium that enhances asynchronous peer-to-peer interaction, critical thinking, and communication skills in collaborative activities. In addition, Wiki is useful for large groups and can help create collaborative learning environments in large classes (Arriba, 2017). Arriba (2017) investigated the use of Wiki among 110 students and found that Wiki can enable effective collaborative learning through students' active participation and the monitoring and assessment of individual work. Huang (2019) utilized Wiki to develop scaffolded wiki learning activities to promote students' collaboration and interaction in online learning settings.

Sense of community

Sense of community is a valued concept in technology-enhanced learning. It pre- supposes bonding relationships of the individuals in a group who share feelings of belonging, acceptance, respect, and connectedness (Peacock & Cowan, 2019; Rovai, 2002). McMillan and Chavis (1986) define sense of community as "a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together" (p. 9). Membership, influence, shared emotional connection, and reinforcement of need are four factors that contribute to the development of an individual's sense of community (McMillan & Chavis, 1986). Sense of community is associated with many positive outcomes (Cho et al., 2010; Sanchez et al., 2005; Top, 2012), and it is an important factor for students' successful learning experience (Halic et al., 2010; Sadera et al., 2009). Higher levels of sense of community are linked to improved student attainment, increased learner satisfaction, and reduced attrition rates (Kocdar et al., 2018; Peacock & Cowan, 2019; Rovai, 2002).

Wiki has been identified as a useful medium that facilitates learners' sense of community by increasing their participation, engagement, and interaction in classroom or online learning (Campbell & Ellingson, 2010; Huang, 2019; Rockinson-Szapkiw et al., 2013). Appropriate use of Wiki with instructional strategies that align with course content helps develop the awareness of a learning community (Huang, 2019). Discussions and team or group work through the use of Wiki facilitate interaction among learners. Students were found to have a higher level of sense of community and perceived learning in collaborative Wiki-supported environments than those in traditional classroom instruction (Rockinson-Szapkiw et al., 2013). Wang and Wei (2011) verified the importance of Wiki in building the feeling of a community among learners through an empirical study in which the use of Wiki was found to facilitate interaction, participation, relationship building, and knowledge accumulation and sharing. Huang (2019) utilized Wiki as a pedagogical tool in a graduate online class to promote students' cognitive and social presences in the community of inquiry.

Wiki self-efficacy

Wiki self-efficacy refers to individuals' confidence in performing tasks using Wiki, including content editing, revising, and sharing, as well as multimedia processing in Wiki. Based on previous studies, learners' computer knowledge level or confidence in using digital technologies was suggested to be influential on their perceptions of learning (Kuo et al., 2017; Yang, 2009). Karasavvidis (2010) explored barriers of implementing Wiki among undergraduate students, and found that students struggled with the Wiki task because they did not possess the adequate knowledge, attitude, skills, or strategies when using Wiki in the class. Similarly, according to the study of Sharp and Whaley (2018) about adult students' learning experience with Wiki, the technical aspect of Wiki was found to be one of the major challenges that had a negative influence on students' learning experience in wiki-based collaborative environments. These challenges included actions performed to use Wiki to add photos, edit posts, or position content on the wiki page (Sharp & Whaley, 2018).

Research questions

1. What are students' perceived collaborative learning, sense of community, Wiki self-efficacy, and perceived learning?
2. What are the relationships between students' perceived collaborative learn- ing, sense of community, Wiki self-efficacy, and perceived learning?
3. Do students' perceived collaborative learning, sense of community, Wiki self- efficacy predict perceived learning?
4. Do students with prior experience in Wiki show better wiki self-efficacy and perceived learning than those without prior experience in Wiki?
5. What are students' perceptions of group learning experiences through the use of Wiki?

Methods

Sample

The participants were the undergraduate students from the program of Interdisciplinary Studies who were enrolled in two management courses at a

southern university in the United States. One course had 31 respondents and the other 15. Of 46 students, 45 responded to the survey. Among them, 13 (28.9%) were male and 32 (71.1%) female. Most of the students were single (Married: 37.8%; Single: 62.2%). Most of the participants were in these age ranges: 46–55 (35.5%), 26–35 (20%), and 36–45 (20%). All of the students were African Americans (see, Table 1). The majority of the students (89%) did not use Wiki until they attended the class with the requirement of using Wiki from the instructor.

Procedure

The group project was a four-week activity that required students to use Wiki in the collaborative learning process. A Wiki tool was introduced to students with a brief overview of Wiki features. Prior to the start of the group project, the instructor explained the process of the group project and relevant tasks involved in the collaborative process. Students in each group were expected to work collaboratively on several tasks through discussion. These tasks included choosing a topic, searching for cases and resources, and posting information relevant to the selected topic on Wiki pages. During the last week of group work, students were asked to reflect on their own project and provide feedback or comments to peer groups' Wiki pages. Throughout the whole collaborative process, the instructor served as a facilitator to provide guidance and directions to groups encountering problems.

Instruments

The survey included five major sections: learner background information and four scales that measure learners' Wiki self-efficacy, sense of community, per- ception of collaborative learning, and learners' perceived learning. These four scales were reported with good reliability, except for Wiki self-efficacy whose original reliability was not reported by the developers (see, Table 2). An open- ended question was included in the survey to ask students about their learning experiences of the group work through Wiki.

Table 1. Background Information of Minority Students.

	N	Percentage
Gender		
Male	13	28.9%
Female	32	71.1%
Marital Status		
Married	17	37.8%
Single	28	62.2%
Age		
18–25	7	15.6%
26–35	9	20%
36–45	9	20%
46–55	16	35.5%
Above 56	4	8.9%
Ethnicity		
African-American	45	100%
Use Wiki before taking the course		
Yes	5	11%
No	40	89%

Table 2. Instruments.

Scales	Scale type	Number of items	Original reliability	Reliability in this study
Wiki self-efficacy	5-point Likert scale	13	NA	0.91
Sense of community	5-point Likert scale	6	0.87	0.92
Perceived collaborative learning	5-point Likert scale	8	0.72	0.84
Perceived learning	5-point Likert scale	7	0.87	0.94

Note. NA refers to "not available" as the reliability information of Wiki self-efficacy was not reported in the original study.

The Wiki self-efficacy scale was adapted from the multimedia self-efficacy scale developed by Papastergiou et al. (2011). It included 13 items to measure students' ability to perform tasks relevant to the use of Wiki, including content editing and multimedia processing through Wiki. The tool name in the original scale was changed to Wiki for all items in the Wiki self-efficacy scale. The collaborative learning scale, developed by So and Brush (2008), included 8 items to measure learners' perspectives on preferences for group versus individual work, preferences to online versus face-to-face interaction, amounts of collaboration, and overall satisfaction with collaborative learning. Sense of community and perceived learning scales were developed by Halic et al. (2010) each of which included 6 and 7 items, respectively. Both scales were based on a study involving undergraduates using a web 2.0 tool in a large lecture class.

Data collection & analysis

Data were collected by distributing the printed survey to students at the end of the course. The study was approved by the university's Institutional Review Board, and informed consent forms were obtained from the students who participated in the survey. To increase the response rate, students who volunteered to fill out the survey were awarded extra points. The collected data were analyzed using quantitative and qualitative methods. Quantitative approaches included descriptive analysis, correlation, regression analyses, and T-tests. Qualitative approach was applied to analyze students' responses to the open question about their collaborative experiences with the use of Wiki.

Results

Descriptive information

Table 3 shows the average scores of the respondents for four instruments. Overall, students seem to possess a medium-level of Wiki self-efficacy ($M = 4.03$, $SD = 0.73$). The average score for sense of community was 4.00, higher than the midpoint score of 3. Students perceived moderately high levels of perceived collaborative learning with an average score of 4.06. Similarly, students appeared to agree that the use of Wiki helped them to learn in the

course, with a slightly high average score in perceived learning ($M = 4.18$, $SD = 0.61$).

Correlation and regression analyses

Table 4 indicates the correlation among four selected variables. Sense of com- munity ($r = .788, p < .01$) and perceived collaborative learning ($r = .721, p < .01$) are found to be positively correlated with learners' perceived learning at a significant level. Wiki self-efficacy was not significantly correlated with sense of community ($r = .164, p > .05$), perceived collaborative learning ($r = .162, p > .05$) and perceived learning ($r = .108, p > .05$). Sense of community shows a significant correlation with perceived collaborative learning ($r = .768, p < .01$). The multiple regression model (see, Table 5) was significant, $F(3, 41) = 27.83$, $p < .001$. Further examination of the results revealed that 67.1% of the variance in perceived learning was explained by three predictors. Wiki self-efficacy did not significantly contribute to perceived learning, $t(41) = -.374, p > .05$. Sense of community ($t(41) = 4.017, p < .001$) and perceived collaborative learning ($t(41) = 2.189, p < .05$) were significant predictors of perceived learning. Among two significant predictors, sense of community was the strongest predictor of perceived learning.

T-test analysis

Students who reported using Wiki before attending the class appeared to have higher Wiki self-efficacy than those reporting not using Wiki; however, the difference was not significant, $t(43) = .177, p > .05, d = .11$. Similarly, there were no significant differences in the scores of perceived learning between the students who had used Wiki versus those who had not, $t(43) = .882, p > .05, d = .30$ (see, Table 6).

Table 3. Descriptive Information for Each Scale.

Scales	Range	Midpoint	M	SD
Wiki self-efficacy	1–5	3	4.03	0.73
Sense of community	1–5	3	4.00	0.77
Perceived collaborative learning	1–5	3	4.06	0.52
Perceived learning	1–5	3	4.18	0.61

Table 4. Correlations among Variables.

	Wiki self-efficacy	Sense of community	Perceived collaborative learning	Perceived learning
Wiki self-efficacy	-	.164	.162	.108
Sense of community		-	.768**	.788**
Perceived collaborative learning Perceived learning			-	.721**
				-

Note. **$p < .01$.

Table 5. Multiple Regression Model: Perceived Learning Explained by Three Predictor Variables.

Variables	B	$SE\ B$	β	t	p
Wiki self-efficacy	−.029	.077	−.034	−.374	.710
Sense of community	.447	.111	.564	4.017	.000***
Perceived collaborative learning	.358	.164	.307	2.189	.034*

Note. *$p < .05$, ***$p < .001$.

Content analysis

Student responses about their group learning experiences were visualized by using the word cloud application (see, Figure 1). The descriptors that were mentioned more frequently were shown in a larger font size and brighter color. Through the coding process, three themes were generated including individual feelings toward group work, learning process, and collaboration process. The theme of individual feelings toward group work refers to participants' positive or negative feelings when working in the group project. The theme of learning process focuses on how participants learned knowledge or skills through groupwork. The theme of collaboration process addresses the actions that participants took to facilitate group collaboration as well as participants' disposition toward team members.

Most students described their positive feelings toward group projects. They felt their wiki-based groupwork experience was educational, effective, interesting, or informative. There were only a few students who were confused or lost in the group learning approach, which led to some degrees of the negative feelings of participants. In terms of the learning process that involved the development of knowledge and skills, it seems that through the group work, students acquired more skills than the content knowledge. Many students indicated that their organization, collaboration, and computer skills were gradually enhanced through the group project. In addition to the learned skills, students also indicated they gained a better understanding of the content knowledge through the wiki group project.

Actions related to collaboration processes were most often identified by students, especially when referring to group-oriented behaviors that included interaction, information sharing, and idea negotiation to achieve a consensus among group members. Individual disposition toward team members was another factor emphasized in the collaboration process. Some participants indicated the importance of receiving emotional supports from team members. These supports can be encouraging words, praise for team members' opinions, or showing respect to each other.

Table 6. T-test Analysis for Wiki Self-efficacy and Perceived Learning.

	Used Wiki		Had not used Wiki				Cohen's
	M	SD	M	SD	$t(43)$	p	d
Wiki self-efficacy	4.10	0.84	4.01	0.78	.177	.939	0.11
Perceived learning	4.29	0.49	4.12	0.64	.431	.882	0.30

Figure 1. Descriptions of students' perceptions of group learning experiences.

Discussion

Wiki self-efficacy is not a significant predictor of perceived learning

Although Wiki self-efficacy was found to have a positive relationship with sense of community, collaborative learning, and perceived learning experience among minority students, these correlations were not significant. Wiki self- efficacy did not significantly predict perceived learning. This result indicates that minority students' confidence level in using Wiki was not a critical factor for their feelings of belonging to a learning community, nor their perceived collaboration and learning experience. This may be because that a short training on Wiki was provided to all students prior to the implementation of the group work, which led to the small variation of scores on Wiki self-efficacy. Therefore, the influence of Wiki self-efficacy on perceived learning was not identified at a significant level.

Although technology expertise or confidence has been claimed to be critical to student learning, the findings of empirical studies about the influence of one's self-efficacy about web 2.0 tools on their learning experience appear to be inconclusive (Kuo et al., 2017; Karasavvidis, 2010; Sharp & Whaley, 2018). The studies of Karasavvidis (2010) and Sharp and Whaley (2018) indicated the lack of appropriate confidence or skills in using Wiki as an important factor that is linked to students' negative learning experience in Wiki-based settings. The finding of our study is aligned with Top (2012) study on undergraduate students' learning experiences with the use of blogs. The level of computer knowledge was found to have a positive relationship with sense of community, collaborative learning, and perceived learning at a non-significant level.

Sense of community and collaborative learning are key factors for perceived learning experience

Sense of community and collaborative learning were found to significantly predict minority students' perceived learning experience, which infers that African American students who had a stronger feeling of belonging to a learning

community or perceived more of the collaborative learning experience were more likely to have a positive learning experience in the Wiki-based environment. This finding is consistent with the results of previous studies where sense of community and collaborative learning experience were found to have a positive impact on learning experience through the use of web 2.0 tools (Kuo et al., 2017; Campbell & Ellingson, 2010; Halic et al., 2010; Top, 2012). For examples, the studies of Halic et al. (2010) and Top (2012) found sense of community to be a significant predictor of students' perceived learning with the use of web 2.0. Kuo et al., (2017) and Top (2012) found that students' perceived collaborative learning significantly predicted students' perceived learning.

Furthermore, the results of this study support the important role of applying collaborative learning strategies in enhancing students' learning experience, which are aligned with the concepts social constructivism and connectivism where collaboration is essential and different levels of sense of community are inherent in collaborative, technology-enhanced environments (Downes, 2010; Kizito, 2016; Papastergiou, 2006). However, the majority of these studies did not include minority students. In the studies of learning with web 2.0, there is limited research on Wiki-based collaborative learning, especially in the investigation of relationships of variables including collaborative learning, sense of community, and perceived learning experience. Only one study investigated these variables for minority students in blog-enhanced environments (Kuo et al., 2017).

Minority students' perceptions of group collaborative learning and potential factors contributing to perceived learning

In our study, the majority of African American students had a positive perception of their collaborative learning experience through the use of Wiki. Collaborative learning in groupwork contributed to the development of knowledge (i.e., content in management) and skills (i.e., management, organization, computer, collaboration, communication skills) among African American students. It appears that through groupwork and the use of Wiki, these students gained more skills in managing collaborative processes through communicating and interacting with other group members. This finding confirmed the viewpoint from Du et al. (2015) that African American students are high context learners with a preference for groupwork or collaborative learning, and that the use of Wiki supports knowledge acquisition and skill development in collaborative learning settings (Campbell & Ellingson, 2010; Chang et al., 2011; Huang, 2019; Li et al., 2021). Aligned with the concepts of social constructivism and connectivism, students in the groupwork acquired knowledge and skills through the process of interaction with others (i.e., social constructivism) and a network of connections of information and sources (i.e., connectivism; Huang, 2019; Rondon-Pari, 2011; Siemens, 2005).

Emotional support and support for cognitive or meta-cognitive processing were potential factors that contributed to the collaborative group work among African American students. Individuals' positive dispositions (i.e., respect, encouraging, supportive, value, etc.) toward team members appeared to be important in the collaborative process, which conforms to the development of sense of community where membership, influence, emotional connection, and relationship building are essential elements (McMillan & Chavis, 1986; Peacock & Cowan, 2019; Wang & Wei, 2011). The use of Wiki helped to shape group-oriented behaviors that involved cognitive (e.g., expounding on ideas, providing feedback) or meta-

cognitive processing of minority students (e.g., valuing others' opinions).

Conclusion and implications

We found that perceived collaborative learning and sense of community significantly predicted perceived learning in Wiki-based learning environments. Sense of community was the strongest predictor of perceived learning. This result confirms the potential of applying Wiki in facilitating minority students' collaborative learning experience in groupwork. Wiki self-efficacy, a predictor suggested to include by previous researchers, was not found to be influential to perceived learning in this study. Content analysis showed that an overall positive attitude of minority students toward the group work through which knowledge and skills were developed. Emotional bonds and support for cognitive and meta-cognitive processing from peers were particularly important during the collaboration process.

   This study not only confirms the importance of collaborative learning and sense of community on perceived learning through conceptual explanations and mixed methods analysis, but also adds to the limited understanding of the impact of Wiki self-efficacy on perceived learning, as well as the effectiveness of using web 2.0 tools in enhancing collaboration and learning outcomes in the classroom setting for minority populations. Beyond adding to the scholarly literature, the implications of practical significance suggest that course instructors should consider (a) using Wiki to facilitate the development of knowledge and skills in collaborative settings; (b) designing pre-group activities (e.g., icebreaker activities to get to know each other, etc.) to enhance the development of sense of belonging among students in the same group; and (c) applying appropriate collaborative activities (e.g., the one proposed in this study, etc.) or strategies (e.g., project-based learning, problem- based learning, scaffolding, etc.) to enhance the level of collaboration and sense of community among minority students, as simply assigning group work does not guarantee that students would work collaboratively in an efficient way. Inclusion of hands-on activities in the group work could help facilitate the collaborative process.

Disclosure statement

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to the privacy policy.

Ethics approval

The study was approved by the university's Institutional Review Board, and informed consent forms were obtained from the students who participated in the survey.

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