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Building Up to Collaboration: Evidence on Using Wikis to Scaffold Academic Writing

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Abstract

Use of a wiki tool as a space for collaborative writing may be an effective way to expand the practice of academic writing, where working in groups to produce a collective text is a common occurrence in higher education. Evidence suggests wikis to be flexible tools which may improve collaboration and provide students with new skills. However, some research has shown that collaboration in wikis may be superficial and that their use may lead to increased workload for students and instructors. Because a great deal of academic writing is accomplished in groups, helping students build their collaborative writing skills is an important academic writing endeavor. This article provides evidence revealing both the potential of wikis to foster collaborative writing and important factors to consider before incorporating a wiki into an academic writing course. Scaffolding tasks to build up to cooperative group writing and introducing new ideas regarding text ownership can make wikis an effective space to practice academic writing. Weighing the evidence provided in this article may help instructors determine whether incorporating a wiki in their own context could constitute an additional space for students to develop their academic writing skills.

Introduction

Wikis are one of the many tools under the umbrella of Web 2.0 technologies, which allow users to become creators of content instead of being mainly consumers of information as they were in Web 1.0. At its core, a wiki is a blank user-defined web space that can display a variety of media, such as text, graphics, web links, and links to audio or video. Open-ended and flexible, wikis have been promoted as a way to enhance learning through increased student interaction (Hogg and Lomicky 2012) and as 'the premier tool for collaboration' (Rosen and Nelson 2008: 217). Fostering collaboration is particularly important in the teaching of academic writing, where, as Vie and deWinter (2008) noted, despite a focus on ideas of shared scholarship, individual authorship is more prevalent and 'true collaborative writing remains rare' (109). Using an online wiki tool for collaborative writing can allow each student to become involved in, and contribute ideas and information to, the writing process which may not be possible otherwise given the constraints of class time that limit the number of students who can participate.

Yet a number of challenges and conflicting views arise from research on writing with wikis. An example of conflicting evidence is the fact that the speed of being able to contribute ideas to a wiki, an ostensibly beneficial attribute, also 'increases the possibility of introducing inaccurate or incredible information or quoting unsubstantiated opinions' (Altanopoulou et al. 2015: 512). Additionally, a variety of studies provide evidence of how incorporating wikis worked – or did not – for writing in discrete contexts. Thus, there is a need for a more concentrated resource of the reported advantages and limitations of wiki use to help academic writing teachers make informed decisions regarding potentially including a wiki as a space for their students to practice academic writing. Therefore, the purpose of this article is to synthesize a number of

reported positive and negative findings involving wiki use for collaborative writing and to suggest best practices in using a wiki to help writing instructors evaluate the wiki tool for use in their classes. The article begins by describing reported benefits of wiki use from a number of studies in a variety of higher education contexts where wikis were used to promote writing. The second part of the article synthesizes findings to convey important points to consider before implementing a wiki tool. The third part of the article provides a summary of evidence-based best practices which can lay the foundation for the effective use of a wiki as space to practice academic writing. The article concludes by inviting instructors to weigh the evidence to determine whether writing in a wiki could be added as a learning tool in their teaching context.

Inclusion criteria

A selection of studies that explored the use of wikis as a collaborative tool and writing in academic contexts from 2005 to 2016 were identified from searches performed using Academic Search Premier (EBSCO) and Google Scholar. The key terms used for the search included: wiki, writing, academic writing, collaborative writing, and higher education. The inclusion criteria for the study selection were: 1) studies which included the term 'wiki' in the title, 2) studies which were carried out in a higher education context, and 3) studies which included a focus on writing skills, academic writing, or collaborative writing. References from the selected articles and reviewer suggestions were also evaluated to identify further relevant articles. Studies were excluded if they focused on levels other than higher education, were published in a language other than English, or primarily focused on using wikis for purposes other than writing. In all of the studies, a wiki tool was used as part of the writing process. The studies included come from a variety of international contexts with a variety of participants. The populations targeted were undergraduate or mixed-level graduate-undergraduate courses, and the aims of the studies were roughly equally divided between courses focused exclusively on writing or language and courses focused on content areas, such as geography or physics. The studies included do not constitute an exhaustive review of the literature, but rather provide a synopsis of recent findings about wiki use for writing in higher education contexts which instructors can use to evaluate whether to incorporate wikis in their own courses.

Reported Benefits of Wiki Use for Writing

In reality, no method or tool is likely to result in a completely positive or negative learning experience and, as Chao and Lo stated, the use of 'wikis alone cannot make collaborative writing happen' (as cited in Navarrete and Cabrero 2014: 189). Information in this section constitutes a synthesis of findings regarding some advantages of using wikis to develop academic writing skills, predicated on the idea that a wiki is a flexible space where a range of writing tasks can be envisioned and produced. Indeed, 'wikis invite [teachers] to think of new ways to ask students to collaborate' (Vie and deWinter 2008: 116). As explained below, wikis can be a convenient way for learners to work according to their individual schedules and to allow instant access to peers' writing. Also, being able to easily access a common repository of information generated by peers may help improve the quality of writing and can provide teachers with clear evidence of achievement of the learning outcomes. This section concludes with evidence suggesting that more collaboration regarding engagement with the writing and more student-centered learning can occur as a result of using wikis for writing tasks.

Flexibility

Just as writing itself is multi-faceted, so are the ways in which instructors use wikis in the writing process. Indeed, one of the wiki tool's strongest reported benefits lies in its flexibility as an open space which allows instructors to create a wide variety of activities to develop and apply academic writing skills, from traditional writing tasks to newer multimodal writing assignments. Also, although a wiki is generally not an effective tool to use for discussion, it can be a useful tool for less linear interaction and for collaboration. From writing tasks focused on paragraph structure and work on coherence (Kuteeva 2011) to a learner-generated glossary of a course's central concepts (Meishar-Tal and Gorsky 2010, and Zheng,

Niiya, and Warschauer 2015) to extended writing (Kear, Donelan and Williams 2014) and annotated bibliographies (Muñoz 2012), research on wiki use demonstrates that wikis facilitate the creation of a broad range of tasks to practice writing. In an example from a course using wikis to create a lab report for physics, 'students are guided to recall, reflect on the experiment, and they also have an opportunity to negotiate, discuss, and share interpretations during the online writing process [using wikis]' (Lo 2013: 383). In the field of geography, using wikis to scaffold article writing for publication in e-journals provided undergraduate and graduate learners with the opportunity for multiple levels of interaction and skill development (Walkington 2012). Using a wiki, undergraduate writers produced and submitted articles for an e-journal to showcase student writing. The articles were given feedback by graduate students in the role of the editorial advisory board allowing learners of both levels to apply writing skills appropriate to their level. Faculty members in the study, as the supervising editors, were able to oversee and monitor student output at both the undergraduate and graduate levels. The examples mentioned here demonstrate that 'writing instructors have added layers of complexity to [the wiki] definition by utilizing wikis for a great many purposes beyond drafting a document with others' (Sura 2015: 14). In short, there are numerous ways in which a wiki can be used as a space to practice a range of academic writing skills across different levels and contexts.

Common, convenient resource

According to findings reported in several of the studies consulted, wikis can be a convenient tool offering a centralized space to carry out group writing. Kear, Donelan and Williams (2014) and Ma and Yuen (2008) noted that even first-time users reported that wikis were easy-to-use tools. In addition, findings from several studies suggested that learners greatly appreciated the ability to work at their own pace and to contribute to the wiki at any time (Aydin and Yildiz 2014, Boulton and Hramiak 2012, Chao and Lo 2015, Lo 2013, Ma and Yuen 2008, and Walkington 2012) because wikis allow learning time to extend beyond the confines of the classroom (Navarrete and Cabrera 2014, and Vie and deWinter 2008). Learners reported that the self-pacing afforded by wikis meant that 'you can get on the wiki and work when you have the motivation and concentration' (Sura 2015: 18). Even learners who reported a negative overall opinion of wiki use, as explained further in the second section of this article, appreciated the ability to work at their own pace (Allwardt 2011). Additionally, written group work was located in a central space that was easily accessed by other group members and constituted a useful shared resource (Boulton and Hramiak 2012, and Kear, Donelan and Williams 2014), and members of one group could easily see work being done by other groups in their own wiki pages (Allen and Tay 2012, and Ma and Yuen 2008). The capability for easy access to group work in a wiki could constitute an advantage over group work executed in face-to-face contexts where students may have limited access to peers' writing, determined by how frequently the group can meet or by the availability of print copies. Consequently, working in a wiki may potentially increase participation as learners can contribute according to their own schedule outside of class hours and can see the work being done by peers in the same group and in other groups.

Added visible evidence

From the instructor's perspective, access to visible evidence of individual student input in group writing and the potential to facilitate achievement of the learning outcomes were described as two strengths of using wikis to scaffold academic writing. Firstly, tutors reported that one benefit of using wikis for writing was the ability to directly monitor which students had contributed which pieces of information to the collaborative text (Kear, Donelan and Williams 2014). Specifically, the capability of wikis to record a history of each version created, and to indicate individual student contributions, was cited as a useful feature for instructors (Boulton and Hramiak 2012, Kuteeva 2011, Lo 2013, and Zheng, Niiya, and Warschauer 2015). Additionally, Alshumeimari (2011) and Muñoz (2012) reported that using a wiki resulted in better quality writing over writing produced on paper following a more traditional process. For example, when a wiki was used to create an annotated bibliography as a common class resource in the Muñoz study, the resulting individually written research papers cited an average of 16 sources each, a much higher figure than the average number of sources cited in papers where no common annotated bibliography had been created. The author noted that the improvement may have been the result of students having 'more quality references at

their disposal' (Muñoz 2012: 124). Similarly, findings in another study concluded that achievement of the learning outcomes also appeared to be enhanced as a result of writing produced in wikis, especially for learners performing poorly at the beginning of the term, because all the learners were able to easily see their peers' writing (Altanopoulou *et al.* 2015). In Lo's (2013) study, participants estimated that the lab reports they produced using wikis were superior in quality to the reports they had produced prior to using wikis. Lastly, Wichadee (2010) and Nami and Marandi (2014) noted that because students were aware that others would read and review their work, they showed increased focus on improving the initial presentation of information, which implies greater reflection on the students' part, potentially leading to deeper and longer-lasting learning.

Collaboration

The collaborative production of a piece of writing is often the first activity which springs to mind when considering using a wiki for writing, and the collaborative possibilities afforded by the wiki tool are a frequently reported benefit. Accordingly, the literature showed that designing a writing activity where group members come together to produce a common text may improve writing on several levels. First of all, Kuteeva (2011) reported that using a wiki created a space which not only fostered 'learner interdependence' (46) but also heightened the awareness of academic paragraph structure and of the use of language within paragraphs. Moreover, several studies reported improved collaboration where students editing peers' contributions made both form-related and meaning-related changes in wiki activities aimed at collaborative writing (Alharbi 2015, Aydin and Yildiz 2014, Kessler 2009, Kuteeva 2011, and Muñoz 2012). Form-related changes refer to those which focus on use of language, word form, and spelling, whereas focus-related changes refer to changes to the meaning, for example, a change providing clarification to or elaboration of existing text (Aydin and Yildiz 2014). In Kessler's (2009) study specifically, more changes overall were related to meaning than to language and grammar when the language errors did not impede understanding (84), demonstrating that learners made both lower-order and higher-order changes when working together to produce a common text. Additionally, how much collaboration occurs among learners might also be enhanced through wiki use. For instance, findings from groups using a wiki to create a collaborative literature review reported overall equal contributions from group members, whereas groups meeting face to face to produce the collaborative review reported that some members contributed much more than others (Allwardt 2011: 602). In creating a glossary for a graduate course, Meishar-Tal and Gorsky (2010) calculated that a total of 750 edits were made by 60 students over one term to produce definitions for 142 different entries, with each student performing approximately 17 edits on average (30). Findings from these studies highlight that wikis can be used to improve both the quality and quantity of collaboration in academic writing.

New skills

A final benefit reported by both instructors and learners was the acquisition of new skills and the blurring of roles that working in a wiki engendered. Findings described how collaborative writing in a wiki seemed to heighten learners' awareness of the target reader (Kuteeva 2011) and improve learners' digital literacy skills (Muñoz 2015, and Sura 2015). Writing articles for an e-journal in a wiki provided the opportunity for students to become published, peer-reviewed authors as undergraduates, promoting a sense of personal and professional accomplishment. This use of a wiki for writing permitted graduate students to apply and improve their skills as reviewers and simultaneously benefit from seeing other reviewers' feedback. Also, as a result of the wiki journal article writing experience, undergraduate student-authors were subsequently motivated to submit more articles for publication, reinforcing more long-term writing skills (Walkington 2012: 553-555). Regarding peer learning and the development of editing skills, students in Sura's (2015) study appreciated the use of a wiki because the activity was an opportunity to evaluate peers' writing and to gain a different perspective on the writing process by allowing students to become evaluators instead of always being the ones evaluated. More specifically, a participant in the study noted in a reflection on using wikis that reviewing and editing in the wiki 'gave me the chance to be the teacher, instead of always being on the receiving end' (21). These examples demonstrate that wikis are 'well suited to creating multi-vocal texts' (Vie and deWinter 2008:110), may allow

learners of varying levels to build and refine new skills, and provide them with the opportunity to gain a different perspective on the writing process.

Overall, this section provided evidence pointing to potential benefits of wiki use for writing to broaden access to and participation in the writing process for both students and instructors. Indeed, the collaborative facility of wikis to synthesize the input and ideas of multiple authors across multiple levels challenges a belief that ideas are the intellectual property of one individual author (Nelson 2008, and Vie and deWinter 2008: 110). This challenge in turn is a double-edged sword as some students' perceptions of text ownership and authorship preclude them from taking full advantage of collaborative wiki writing, which is among the factors to consider before using a wiki, as explained in the following section of this article.

Considerations of Wiki Use for Collaborative Writing

In addition to the potential advantages of wiki use stated above, several important points to consider arise from research on use of the wiki tool for writing. As elaborated in this section, using wikis may increase the workload of both students and instructors alike. Moreover, individual habits and preference, perceptions of agency, or frustration with the limitations of the tool may cause learners to avoid writing in the wiki or to have a negative view of both the wiki tool and the writing activity. What is more, findings reported below suggest that not all types of writing can be effectively facilitated by wiki use, and negative reactions may result when instructions for an activity are unclear or when the parameters of an activity appear incongruent with the learners' perceived needs. Lastly, the types of collaboration often targeted by instructors, namely soliciting contributions from all group or class members and a focus on higher order over lower order changes, might not materialize from the collaborative writing activity in the wiki. Each of these issues is elaborated further in this section and needs to be taken into careful consideration before deciding whether to adopt a wiki tool in an academic writing course.

Increased workload

When first using wikis as part of a course, both instructors and learners may find that they spend more time than they would have spent on more traditional, paper-based writing activities. Firstly, increased workload was reported for instructors (Sura 2015) in part because they were required to log into the learning management system (LMS) or into the standalone wiki application to monitor individual or group progress, whereas progress from traditional group work activities taking place outside a class was not directly monitored by the instructor. Kear, Donelan and Williams (2014), who praised the wiki feature that gives instructors the ability to see each student's contribution, likewise stated that it took more time on the instructor's part to go in and monitor student activity in the wiki, which constituted a disadvantage of its use. The authors suggested that in more traditional activities, group work may have been carried out during regular class time or where groups regularly submitted milestones to document progress, which may not have added to the instructor's existing workload in the same way that monitoring work in a wiki might. Similarly, evidence from the student perspective suggested that more time was needed to become accustomed to writing and collaborating in a wiki (Ma and Yuen 2008). For instance, Taiwanese students in Lo's (2013) study found their first experience with collaborative writing in wikis overwhelming, although the author noted that working with wikis became easier following more practice on successive writing tasks (387). In sum, the additional time needed to monitor student progress on the part of instructors or to become familiar with the wiki tool on the part of students may affect both student and instructor perceptions of writing in a wiki and needs to be taken into account.

Limited editing features

A second point to consider before incorporating a wiki as a writing space is the fact that students may be accustomed to a particular set of features from their experience with word processing software, which may impact on how they react to the wiki. In other words, students who are used to the multitude of editing features available in most commercial word processing applications may find that the editing features of the wiki tool are more limited and

take more time to learn to navigate. Conflicting student perceptions of the wiki tool in Ma and Yuen's (2008) study demonstrated that whereas a number of first-time wiki users reported the tool as easy to use, a sizeable portion of the participants (15.9%) found the opposite to be true due to the limited wiki features for writing (303-304). Findings from other studies suggested that unfamiliarity and frustration with the wiki tool led groups to collaborate by meeting face to face instead of online and to simply paste their resulting writing into the wiki (Allwardt 2011, and Walkington 2012). Similarly, participants in Dishaw *et al.*'s (2011) study opted to complete their collaborative work by writing exclusively in word processing documents and using email to share versions with the group, thereby circumventing any collaboration in the wiki. Generally, familiarity with the editing features available in many word processing applications seemed to underscore the lack of an equivalent set of features available in the wiki tool, which led to perceptions that the wiki tool was not useful for writing (Kear, Donelan and Williams 2014, and Dishaw *et al.* 2011) or that use of a wiki actually impeded learning (Sura 2015). In a strong cautionary statement on wiki use, Allwardt (2011) concluded that 'the technology [of the wiki] seemed to overshadow student learning' (602). Consequently, wiki tool limitations coupled with the general preferences of learners and groups may lead learners to choose alternative ways to complete the given writing task, and this may undermine the purpose of or negatively impact the writing activity.

Type of Collaboration

An additional factor to consider with using wikis relates to the quality and quantity of collaboration envisioned by the instructor. Although both are among the wiki tool's productive features previously mentioned, several drawbacks to the quality and quantity of collaboration are also raised and should be taken into account when considering wikis as a space for collaborative writing. One reported issue related to the tendency of learners to wait until just before the assignment was due to begin posting work in the wiki, which greatly reduced the time available for meaningful interaction to contribute to, and reflect on, the writing process (Allen and Tay 2015, and Allwardt 2011). In the Meishar-Tal and Gorsky study (2010), a single student accounted for over 50% of the total editing actions in the wiki, indicating that the number of total changes to a group wiki does not necessarily reflect equal participation among individual members. Moreover, the higher-level negotiation of meaning hoped for by instructors often failed to materialize in writing in the wiki space. For instance, Muñoz (2012) observed an overwhelming learner preference for complimentary rather than constructive feedback because students 'did not feel it was their place to criticize another student' (25); likewise, learners in the Meishar-Tal and Gorsky (2010) study preferred to add more ideas to the writing rather than edit or delete peers' ideas and contributions from the wiki. When students were invited to edit articles written by students from a previous semester, they seemed to 'exercise their agency not in terms of revising and building the way [the instructor] had hoped, but in avoiding and diverting from it' (Sura 2015: 22). These issues may have been related to perceptions of ownership or to a lack of expertise regarding the ability to critique peer writing. Consequently, students writing in wikis 'must accept that the wiki document or entry does not belong to them individually, which in many ways goes against how students are trained via tests, grades, and papers to view their work' (Vie and deWinter 2008: 114). This may result in information being added to the wiki without learners engaging with the existing text in a meaningful way. In sum, writing instructors may want to consider that even though the purpose of an activity focuses on peer review and negotiated meaning, collaboration may occur on a more superficial level.

Assignment parameters

A final area to consider concerns the aim of the writing assignment itself. It may be that an assignment is not well suited to completion in a wiki or that a wiki writing activity, if not effectively designed to include the technological implications of the tool, may lead to negative views of both the wiki tool and of the writing activity. Participants in Dishaw *et al.*'s (2011) study perceived that the use of word processing software was better suited to the task of collaboratively writing a research paper and that the wiki tool was a poor fit for the activity. In the Sura (2015) study, the length of the wiki writing project was the main issue leading to learner dissatisfaction. Students in the study had one dedicated class period each week to work in the wikis, and the project extended over an entire semester. However, the required activities and interactions were accomplished well before the end of the term, leading

students to lose interest in the project overall. In another study, students completing a collaborative literature review using a wiki noted that the scope of the project was too large and that dividing the project into more manageable steps or stages would have been beneficial (Allwardt 2011). Hence, allotting too much time – or too little – can impact writing performance in the wiki space. A lack of specificity in what learners are required to do in the wiki can also impact participation and the resulting quality of writing produced. In one study, learners who were required to read news articles written by peers and to produce their own articles reported that the assignment instructions were not detailed enough and that there was not enough time to both read peers' articles and to produce their own. As a result, the assignment did not foster a sense of peer learning since over three-quarters of participants seldom or never reviewed or engaged with peer writing before adding their own articles (Ma and Yuen 2008: 304). Evidence here suggests that it is important to reflect on the writing activity design and sequence and on the creation of explicit guidelines for the writing activity when considering using a wiki as a collaborative writing space.

Suggested Ways to Use Wikis to Support Academic Writing

Evidence from studies reported above demonstrates that, as in many types of activities, there are both potential benefits and potential drawbacks to using a wiki as a space for academic writing. The purpose of this synopsis of research is not only to show some reported benefits and drawbacks of writing in wikis, but also to compile the lessons learned from the research into a list of best practices which instructors who are considering using a wiki may want to incorporate. As Stoddart, Chan, and Liu (2016) stated, 'There is no magic formula that will make a wiki collaborative project successful' (147). There are, however, evidence-based approaches and tangible strategies described in the following section which can provide a foundation for productive activities using wikis.

Preparation and support

Adequate preparation and support are important factors to consider which can contribute to a potentially effective learning experience when writing in wikis. As described here, researchers of the studies reviewed above underscored the need to provide both students and instructors with information about how wikis work, to allow for practice opportunities, and to provide technical support. Firstly, even though the idea of a wiki may be broadly familiar to students from the online encyclopedia *Wikipedia*, fewer students may actually know what a wiki is or how one works. Rather than assume that students were familiar with wikis, Muñoz (2012) first had participants complete a 20-minute tutorial with a video and a handout about wikis and how they work. Sura (2015) also recommended beginning with a brief video, such as the video introduction created by Common Craft describing wikis and how they function as a collaborative open space. Moreover, allowing students to practice with the functionality of the tool by adding, editing, and commenting on text was also reported as an effective step in supporting subsequent wiki writing activities (Allwardt 2011, Altanopoulou *et al.* 2015, Chao and Lo 2011, Kessler 2009, Stoddart, Chan, and Liu 2016, and Zheng, Niiya, and Warschauer 2015). Similarly, Ma and Yuen (2008) prefaced the writing project with 'two sessions of basic hands-on experience using wikis [which] solved most of the technical problems' (301). Dishaw *et al.* (2011) recommended beginning with three to four preparatory assignments where students can build familiarity and confidence with using the wiki tool as well. Instructors also may be unfamiliar with the affordances of wikis as a teaching and learning tool and, like learners, need support for possible technical issues. At the instructor level, the absence of support with regard to technical issues may change the perspective of an otherwise creative instructor into a negative attitude of 'I tried that once. It didn't work' (Sura 2015: 19). Therefore, ample practice with the tool and adequate technical support for both students and teachers are effective practices to facilitate writing skill development using a wiki.

Building up to collaboration

Gradually building up to more cognitively demanding exchanges to negotiate meaning and produce a common text using a wiki may lead to improved outcomes. The research suggests that beginning with 'additive' uses of the wiki tool can allow learners to focus their own

contribution using the basic functions of the tool without immediately being tasked with simultaneously evaluating or editing peers' writing. In the Meishar-Tal and Gorsky (2010) study, 83% of the total actions in the wiki were additions with 90% of the participants adding new information; in contrast, deletions amounted to only 15% of the total actions and were carried out by only two students out of sixty (30-31). In my own practice in pre-sessional English for Academic Purposes courses, additive wiki activities are used to introduce learners to academic concepts through student-generated individual wiki pages to define and differentiate popular sources from scholarly sources. Wikis are also used as a repository for group work, where each member can add information or resources to the collective project. When each student adds to an individual wiki page as an initial activity, ideas concerning text ownership and engaging with the writing of others can be progressively confronted as familiarity with the wiki tool grows. Correspondingly, Nelson (2008) encouraged the practice of writing in wikis as 'a means for revealing to the individual student the constructed nature of knowledge' (194), and Vie and deWinter (2008) stated that 'wikis bolster the view that no individual can "own" ideas' (117). Ma and Yuen (2008) also proposed gradually increasing the cognitive demands of writing in wikis to address perceptions of ownership. The authors suggested three stages of activities: 'individual authorship', wherein individuals author and sign their own piece of writing, 'group authorship', wherein small groups work together to produce a common piece of writing, engendering collaboration and expanding ideas of text ownership, and 'large scale collaboration', where the focus of the activity is on the topic and text produced by the whole cohort rather than on who contributed which ideas (307). Thus, building up to collaboration is suggested as a way to lay the foundation for more productive subsequent collaborative writing experiences.

Clear guidelines and expectations

Other important steps leading to more productive collaboration in the wiki space, as suggested by the research reviewed above, are thoughtful consideration of the design of the activity, clearly conveyed instructions, and an explicit statement of expectations for participation. Firstly, when structuring a student writing project using a wiki, consider creating intermediate deadlines to break up a longer project into more manageable pieces and potentially shorten the overall timeline to increase engagement (Allen and Tay 2015, Allwardt 2011, Chao and Lo 2011, Stoddart, Chan, and Liu 2016, and Zheng, Niiya, and Warschauer 2015). Allwardt (2011) also suggested considering a grading scheme based on the number of individual contributions to the wiki. Additionally Nelson (2008) recommended developing a new way to grade student participation 'for this nontraditional model of writing' (200). Furthermore, providing students with clear, well thought out instructions is recommended as a best practice for wiki writing activities (Altanopoulou *et al.* 2015, Meishar-Tal and Gorsky 2010, and Zheng, Niiya, and Warschauer 2015). For example, Kessler (2009) noted that the target of the activity regarding use of language (e.g. conciseness, academic style, and accurate content) should be explicitly stated at the outset. Other research suggested that instructions could specify details regarding the type of peer feedback desired (Muñoz 2012, and Stoddart, Chan, and Liu 2016), for example, by directing learners to make constructive rather than complimentary comments about peers' writing. Finally, providing details about how and how often students should participate was proposed as a way to improve participation and collaboration in the wiki. Specifically, Meishar-Tal and Gorsky (2010) suggested improving collaboration by requiring students to both add information *and* to edit existing text; Kessler (2009) required students to participate in the wiki at least four times. Muñoz (2012), in turn, required each student to contribute two sources to the annotated bibliography wiki without duplicating any sources already listed and provided students with a rubric indicating how participation would be evaluated. In short, incorporating some of these best practices into the wiki activity may help students feel more confident about what is expected of them and lead to the wiki constituting an effective additional space for students to practice academic writing.

Conclusion

In conclusion, the aim of this article was to provide information from research using wikis to develop writing in higher education contexts in order to help instructors decide whether to adopt wikis in their courses and to provide those who already use this tool with

recommendations for best practice. Several benefits of using wikis as a writing space, including flexibility, skill building, and increased collaboration, were described. Points to consider before choosing to use a wiki, such as increased workload and assignment parameters, were explained. Lastly, a synthesis of research-based suggestions for best practices for wiki use, namely the need for clearly-designed activities with explicit instructions coupled with graduated practice using the tool, was provided. The evidence suggests that as learners become more comfortable writing in wikis, more challenging and cognitively demanding objectives of peer editing and synthesis may be easier to achieve. It is worth noting that a significant amount of writing in academia is conducted by groups of researchers, and building students' collaborative writing skills could also benefit them in their future professional work (Wang 2014). Wikis can be a potentially powerful tool for expression, cooperation, and collaboration and can 'successfully mediate learners' revision behavior, and finally, writing performance' (Ma and Yuen 2008, 308). The wiki tool also presents new challenges for writing which 'ask us to rethink our relationships with collaboration, intellectual property, and the myth of the 'author"' (Vie and deWinter 2008: 121). Overall, instructors should carefully consider evidence from research related to writing in wikis before including a wiki as a new space for students to practice academic writing.

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