Wikis as individual student learning tools: the limitations of technology

Wikis as Individual Student Learning Tools:
The Limitations of Technology

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ABSTRACT

This paper presents research into the attitudes and behaviours of students using wikis for individual writing tasks. The wiki-based assignment differs from the use of wikis normally researched because it was an individual task, not involving collaborative writing. This activity provides an excellent opportunity to learn more about how wikis are actually used by students in higher education. The research finds there is no compelling evidence that the wiki on its own improves performance over and above the general aptitude of students. It also finds that students generally did not utilise the wikis for high-intensity editing and revision. However, students did report that the wiki was valuable as a way of aiding them to review and develop their ideas. We conclude that using wikis for individual writing tasks can, where appropriate active instructions are given to support development of cognitive abilities, lead to improved outcomes for students.

Keywords: Assessment, Editing Process, Education, E-Learning, Internet, Online Learning, Wikis

INTRODUCTION

Wikis are often promoted as a valuable technology for use in improving university learning, but there remains significant uncertainty as to the benefits they may provide, or the way in which their theoretical benefit can be practically realized. This paper explores two key research questions emerging from current literature on the use of wikis. What are the attitudes and behaviors of students when using a wiki for an individual writing task? Does the particular way in which students use wikis correlate with

improved learning? Through these questions, the paper explores the way that students understand the possibilities that wikis provide for editing and improvement of work before submission for assessment and for collaborative readership while undertaking the writing task. These questions are critical because of the lack of detailed research into the actual practices of individual students when using wikis (Cole, 2009); nor have there been many substantive assessments of the value of wikis in terms of demonstrable improved learning. Since most wiki use involves groups, where the specific relationship of an individual to the wiki is less clear since their engagement is filtered through the group process, conducting

research on individual student tasks provides the opportunity to know better how and why an individual might best integrate the use of a wiki into their learning process. The paper concludes by indicating the way that students must be assisted to learn how to use a wiki in a productive manner.

Background

Wikis have been the subject of extensive commentary and analysis for their potential to support learning for nearly a decade. In 2004, Schwartz et al. informed educators about the value and potential learning advantages of wikis, concluding that the "full potential" of wikis was "yet to be realised" (Augar et al., 2004; Noël & Robert, 2003). In more recent years, however, there have been many articles reporting on the use of wikis. Indeed, along with blogs, wikis have become one of the main ways in which the development of so-called Web 2.0 applications is thought to bring change in higher education by giving students greater control over their studies and improving social learning (Wheeler, 2010). McLoughlin and Lee (2010) have made similar claims, reviewing several examples of various applications, including wikis, to associate technologies of "knowledge networking" (Allen & Long, 2009) with better learning outcomes. Laughton (2011) demonstrated the viability of using wikis in place of learning management systems noting the greater ability of wikis to promote collaborative learning (Duffy & Bruns, 2006; Hemmi et al., 2009).

This collaborative quality of wikis has been a principal source of interest. Bruns and Humphreys (2005, p. 27) argued that wikis are "non-linear, evolving, complex and networked texts with multiple authors [that] can provide a great opportunity for student collaboration, coproduction of texts, argument, and interaction". In almost all cases, wikis are linked with "collaborative learning" involving group work, co-authorship and so on within current university practice (Jones, 2007, p. 463; Elgort et al., 2008; Guo & Stevens, 2011, p. 221; Wheeler, 2009). While wikis, on one level, enable people

to write a single document together, more profoundly "the wiki space is one which is fundamentally unstable and collectively produced, with a tendency to problematize conventional notions of authorship and ownership" (Hemmi et al., 2009)

There are, however, some problems with the way the use of wikis in education has so far been conceived. Too much is made of the "natural" capacity of wikis to promote collaboration (Su & Beaumont, 2010, p. 417), implying that the technology itself can lead to students working together. Parker and Chao (2007, p. 57) believed that wikis are useful educational technologies because the technology is relatively simple to use but fail to appreciate that ease of use can lead to unreflective adoption by students. A further issue is insufficient discrimination between wikis and other applications which, technologically and more importantly socially, are quite different in their affordances and cultures of use (e.g., Gray et al., 2010). More generally 'Web 2.0' is often assumed to carry with it the force necessary to change teacher behaviour towards different pedagogical models and be aligned with the natural disposition of students towards such technologies, based on their use of social media outside of university (Lee & McLoughlin, 2007; see critique in Karasavvidis, 2010). Further, the concentration on the collaborative possibilities of wikis has limited exploration of alternative uses and focused researchers' attention on the way groups, rather than individuals, work with wikis (Cole, 2009). In many cases, wiki use outside of education, such as at *Wikipedia*, is only consequentially collaborative. On the whole, individuals create and manage content with little explicit commitment to group processes except as defined by the technical architecture of wikis (Niederer & van Dijck, 2010).

Jones (2007, p. 460) has argued that technologies should be used in education only "on the basis of an assessment of the degree to which their inclusion will contribute to the creation of a meaningful learning experience and, in particular, assist students in meeting identified learning objectives". With this caveat,

wikis have been proven to be an important part of offering excellent educational opportunities for students. But, as Ramanau and Geng (2009) identified, more empirical studies of wikis are needed to provide a more nuanced understanding of the precise way in which alignment of outcomes and techniques can be achieved. Furthermore, while there are many articles reporting students' attitudes towards wikis, there has been little research into the specific ways that wikis are used. Such studies, of which this article is one, will help to establish whether in fact the benefit of wikis for students is "self evident" (Choy & Ng, 2007, p. 209) and in what precise ways teachers can set tasks for students that require wiki use to achieve what kinds of learning outcomes.

The Study

This research was conducted as part of teaching the unit Internet Commerce and Consumers at Curtin University, Perth Australia in 2009 and 2010. The unit was primarily organised around a single large team-work assignment and aided by online collaborative software. Two other assignments supported this assessment task. The final assignment, an individual essay, ensured greater validity of grading of each student alone. The first assignment was a short report. All assessments were carefully integrated with the content and structure of the unit (Tay & Allen, 2011).

The first assignment is the focus of this research. The report was to be created as a single page in a wiki set up by the teacher to which all students had access. Students could see all other students' work, but could not edit other pages. There was no requirement for formal online discussion or commentary upon these pages. Students were given specific instructions about the format and content of the report but no direct instructions about using the wiki. The exercise was designed to familiarise students with wikis as a form of online publishing and also to show them the possibilities for collaborating, in their teamwork assignment, via a wiki. Further, the reports' availability to other

students helped students imagine an audience for their work. We wanted them to think about writing for others, as well as teachers, so as to assist in motivating them to create good content, think about presentation and communication and to prepare them for the main assessment that would be published, fully available online to anyone who wished to read it.

This assignment has proven an ideal vehicle for research into wiki-based education. The assignment was a similar task for each learner, making the experiences of all students comparable. The focus on individual writing of a single wiki page within a relatively short period of time, allows much more detailed investigation of specific practices of content creation and revision, practices normally obscured behind the dynamics of collaboration. Finally, wiki use in this assignment was not a replacement for, or part of, more general e-learning techniques but simply one specific task. Thus the research can concentrate exclusively on the specifics of wiki use uninfluenced by student views that, while appearing to be about wikis, may simply reflect more general effects of substituting a wiki-based environment for more traditional online or on-campus learning spaces.

Methodology

Three methods were used to investigate students' attitudes towards and behaviours towards wiki use: a survey of students; a broad review of the summary data of revisions; and a detailed version by version comparison for a sample of students. These methods promoted an understanding of the key attitudes that students have towards the use of wikis (the survey), and also cross-checked their perceptions of what they are doing with the actual behaviour in the wiki (as measured from reviews of the revision data automatically generated by the wiki system). By both reviewing the broad data and then sampling specific examples, a much richer picture of the ways in which wikis are used (as compared with more superficial accounts) was uncovered.

The survey (n=39; >55% of total population) was run in 2010, exploring the hypotheses

Table 1. Survey results of student attitudes towards wiki use

Item	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion	Total
Using the wiki was relatively straightforward in technical terms	8	19	12	0	0	39
	21%	**49%**	**31%**	**0%**	**0%**	**100%**
I found it helpful being able to see what other students were writing on the wiki	2	27	4	0	6	39
	5%	**69%**	**10%**	**0%**	**15%**	**100%**
It was helpful being able to edit and revise my assignment before completion using the wiki	6	30	1	0	2	39
	15%	**77%**	**3%**	**0%**	**5%**	**100%**

formed from our initial experiences with the unit in 2009. Students were asked whether they found wiki technology easy to use relative to other applications; whether they appreciated the value of being able to observe other students working on the same task; and whether they found it useful to be able to edit their work because it was done in the form of a wiki page. This survey was made available online with a call for participation distributed to all students electronically. Given the nature of the research and the convenience sample obtained, data are only used to produce descriptive statistics.

The high level of support for the utility of the wiki for editing reported in the survey prompted a review of the version logs for all wiki pages (including work from 2009 to increase the depth of the dataset, which totalled 93 pages). This research involved collating, for each student, the number of saved revisions made to pages, the span of days over which wiki editing occurred, the main day on which editing took place (defined as the day on which the most revisions were saved) and the marks awarded for the assignment and other assignments. Data were sourced from the public summary page history display within the wiki software.

The third step was formulated upon reviewing this data. It became clear that not all revisions saved to the wiki were equivalent and that it was difficult to ascribe meaning to the timing of wiki use judged solely in terms of days. A deeper analysis of 18 selected wiki pages (20% of total) was conducted to assess

the exact character and timing of each revision made. Selection was random, sampling a range of grade results and intensity of revision practices.

FINDINGS

Survey Findings

39 students responded to the survey, slightly more than 55% of all potential respondents. 70% were female (females accounted for 56% of the total population); 82% described their Internet abilities as above average or expert; and 75% agreed that they had quickly understood the requirements of the unit at the start of studying it. In other words, there were no significant problems of a technical or other nature which might negatively influence the use of the wiki for this task in the majority of cases. The responses to the three questions relevant to this research are presented in Table 1.

The survey shows that the wiki was mostly seen as easy to use (70%) and that the vast majority of students found it helpful being able to see what others were doing (74%) and to be able to edit and revise their assignment in the wiki before completion and submission (92%). However, while students might have perceived their use of the wiki in this way, what evidence might there be from the actual behaviors they exhibited and which are recorded in the version logs for each wiki page they created?

Table 2. Revision behavior by students, by intensity groups

	Mean Total revisions	Mean, primary day	Proportion on primary day	Mean days on task
Low intensity of use	4.9	3.9	85%	5.0
Medium intensity of use	9.4	6.1	55%	9.5
High intensity of use	42.0	18.8	46%	10.2

Review of Version Logs

Data were available to the researchers on 93 individual student pages. Students completed 1308 revisions of their wiki pages with an average of 14.01 revisions per student (not including the 93 original 'version zero' page creations). Activity was spread over an average of 8 days, ranging from 1 day (16 students) to 20 days (1 student). Since the first day includes creation of version zero, this spread of days does not necessarily mean that active *revision* was taking place over those days, since some students created their page but did not work on it until later. Based on close analysis of a sample of cases (25%), on average, students were actively creating or editing on 4 out of 8 days. For all 93 students, there was an identifiable primary activity day, on which the largest number of edits per student occurred. Counting all student edits on their various primary activity days, 720 edits (55%) occurred on that day, with a mean per student of 7.74 edits on that day. Relative to the total revisions by each individual student, a mean of 64% of all edits occurred on that primary day. More than 30% of students did 80% or more of their work on that single day. Furthermore, for 67% of students, this primary day was the *last* day on which they changed their wiki page in any way. On average, students commenced their wiki page 6.3 days before their primary day, and completed it 1.3 days later.

The population of students was subdivided into three groups, representing intensity of wiki use. 'Low intensity' categorized students whose total revisions was 14 or below (less than the average number of revisions) *and* whose activity on the primary day was 65% or more of their total revisions (greater than the average primary-day

activity). 'Medium intensity' use categorized students whose total revisions was 14 or below *but* whose activity on the primary day was less than 65% of their total revisions *or* the inverse (more than average edits with greater than average primary-day activity). 'High intensity' categorized students whose total revisions was more than 14 *and* whose activity on the primary day was less than 65% of their total revisions. There were 34 low-intensity students (37%); 41 medium-intensity students (44%) and 18 high-intensity students (19%). Data for these following groups is shown in Table 2.

These data show clearly that students have very different ways of using a wiki reflecting the distribution of edits across time *and* the total number of edits.

Given students' belief that editing via the wiki was helpful (Table 1), we investigated if there was any correlation between this editing behavior and the quality of students as measured in the grades received for assignments. These comparisons are shown in Tables 3 and 4.

As shown in Tables 3 and 4, there is a small correlation between the students who achieved better grades in the unit's assessments and the students who used the wiki more intensively. However there is little evidence of a substantial difference due to the wiki itself. Broadly speaking, students who, based on the final, traditional essay assignment, were weaker students were also the ones who were more likely to low-intensity users.

Investigation of Individual Pages

Eighteen students' pages were reviewed in depth to reveal more details of wiki-use behaviour. A summary of the qualitative findings is reported

Table 3. Comparison of intensity groups by marks awarded

	Average grade for wiki task	Average grade for final essay	Average grade overall
Low intensity of use	68.0%	65.0%	70.5%
Mmedium intensity of use	70.0%	69.0%	71.2%
Hhigh intensity of use	70.0%	70.0%	73.3%
All students	**69.0%**	**68.0%**	**71.4%**

first (and more information is available from the authors not presented here for reasons of space).

Low-intensity students often had prepared their assignments in another form and simply cut and paste it into the wiki with almost no revisions; others appear to have written the assignment in a single, short sitting and then have saved it without major revision. Low intensity use often involved creating a page early in the assignment cycle and then returning to it only once, on the day before the assignment was due. The qualitative data demonstrate that low-intensity behaviour usually involved almost no effective engagement with the technology at all, simply seeing it as another version of a word-processor or similar existing tool. However, the same sort of behaviour could generate results for that task ranging from a bare pass (55%) to excellent work scoring above 80%.

Mid-intensity usage similarly involved an array of results, from a variety of practices, sometimes spread consistently over several days, sometimes done in many revisions on a single day. In most cases, mid-intensity students created more versions of their page because they were more attentive to formatting, typographical correction and other minor changes than low-intensity students. Notably, however, higher achieving students tended to have more distributed edits, over time, and to conduct more substantive editing of content.

High-intensity users demonstrated that some students spent a lot of time making changes but without materially improving the quality of their work; others however found effective ways to use the wiki as a 'thinking space' to organise their work before making substantial revisions for final submission. High-intensity users often tended to conduct an internal dialogue, writing notes and instructions into the wiki for themselves and them removing them as they completed the work. The most successful students, both achieving 90% for the assignment, did many revisions, but in an orderly manner, such as leaving all formatting changes until the end, and in working consistently over several days building their assignment in sections and reviewing each section in turn. Notably, less than

Table 4. Comparison of grade groups in final assignment and intensity of wiki use

	Low	Medium	High
	34%	**48%**	**19%**
Last assignment Grade			
80 or more	7%	53%	13%
70-79	36%	39%	25%
60-69	33%	48%	19%
50-59	33%	53%	13%
less than 50	80%	20%	0%

25% of all edits made substantially changed or created content and 50% were purely concerned with formatting.

DISCUSSION

Research reveals a most interesting picture of the variation between how students perceive their use of wikis and their behaviors in using the wiki which, on the whole, suggest a much more limited engagement with the possibilities of the wiki for editing and revision. Students reported that creating their assignments using the wiki was easy and helpful to achieving the goals of the assessment task, not only because they could revise and edit but also because they could see examples of other students' work (both complete and in progress). However, the editing behavior of students throws some doubt on the general applicability of these claims. Many students not only completed the assignment in a very short period of time, often by cutting and pasting the primary content of their work into the wiki from other applications, but also did not use the editing feature to improve the underlying quality of their work focusing instead on minor revisions to make their assignment presentable within the terms set down for the task. A deeper investigation of the way that students edit shows that even students who made extensive use of the editing features did not necessarily do so in a manner conducive to improved learning outcomes.

Students tended to work mainly in a very concentrated manner, completing all or most of the assignment in 1 day. Students did not, in most cases, revise their work much or at all after completing the assignment. They tended to commence the task with a very limited first step, wait for around a week, and then complete it close to the final due date. In other words, only a few students were able to use the wiki to distribute their work across several days, working between different aspects of the process of thinking, researching, writing and so on. Furthermore, most students (81%) were either low- or medium-intensity users. And,

when we consider the kinds of edits made, the majority of revisions even by high-intensity users were presentation edits. Notably too, a significant minority – perhaps as high as 20% of students – appeared to have completed the entire assignment or the vast majority of it in another application before simply copying it into the wiki page.

There was no significant correlation between intensity of wiki use and the results achieved for the assignment. While low-intensity use tended to lead to slightly lower results, the more likely correlation is that weaker students were disproportionately likely to use the wiki less. Indeed, low intensity use resulted in somewhat better grades than would have been expected for such students, whereas more able students did not achieve any significant advantage through use of the wiki. The high-intensity use students were, in some cases, quite poor achievers whose significant editing and revision behavior in fact reflected an inability to complete the task well. In other words, the underlying ability of students is still the most important determinant of how well a wiki-based task is done.

That said, the detailed patterns which our in-depth research revealed some students engaged in, suggest a way forward. For example, one student used wiki in the manner most approximating its perceived ideal use: created content initially, revised it thoroughly, before return to add more content, followed by revisions and further significant amendment (three cycles of composition, review and improvement, structured around disaggregating the report into components to be done in turn), with presentation and proofing left until a single 'pre-publication' period at the end. Note that all kinds of revisions were made along the way, though the majority in each period reflected its primary purpose. Other students, also successful in their uses, had different approaches such as using the wiki for note-taking and 'research', and then slowly developing a formal finished assignment from that material; or indeed to combine one application for drafting with heavy use of the wiki for editing.

Students would, therefore, appear to need more advice about how to link the create / review / revise cycle to component of the overall task, each to be done as a distinct sub-task but which remain related to the overall work by their presence within the same wiki. The malleable nature of the wiki space (which can be used for notes to self, process-oriented dialogue, and so on) may need more explanation, perhaps making clear that what is *taken out* or changed is as important as what remains in the final assignment. At the same time, one of the benefits of wikis is that all kinds of edits might be achieved at the same time. Some learners will be better suited to multiple approximations from version 0 to the final revision but, nevertheless, emphasize periods of activity. Wikis may be best used with a very structured workflow which functionally divides the task and ensures attention in each period of use is focused mostly on one function. In this case, not all writing tasks suit wikis. Nor should we assume that wikis are all about cognitive improvement. One student appeared to use the wiki to help manage time – part-completing the assignment when he could, rather than working on it consistently. Another's suggests that his earlier efforts were about learning how to do the task, followed by doing it, and then a final 'tweak' by adding an image.

We note in particular that some students did very well in the assignment with almost no use of the wiki at all, suggesting that excellent students stuck with well-established assignment techniques, writing their work in a word processer as they might for most other essays, and then simply copying it into the wiki. This strategic learning approach, in which a set task is re-interpreted and adapted by students to rely on their known strengths for achieving good results (Cassidy & Eachus, 2000), again suggests that wikis do not determine how, or how well, students will learn while using them. The most likely cause of good results is not the wiki per se, however used, but the quality of the student (which is an amalgamation of many diverse traits including scholarly aptitude, motivation to achieve good results, commitment to learning, and capacity to devote time to study).

In this respect, we conclude that wikis may be valuable only if their novelty, or particular fluidity of form, motivates students to work more assiduously. And, in this respect, it is not the wiki itself but the *public* nature of the work (even if only for other students to see) which will motivate greater engagement (see Allen, 2010, for evidence on public knowledge work and students' improved motivation).

We would argue that the "parallel play" opportunities are at least as important as the editing capabilities of wikis, Students, completing their assignments while being able to see the work of others (or perhaps for early contributors anticipating others seeing *their* work) played an important role in making this use of wikis valuable. The availability of students' work for each to see helps students to understand what is required of them by checking their understanding of a task again that of others. Students do not need to fear revealing their lack of understanding in explicit questions but can subtly check to calibrate their approach with the general consensus approach. It has been shown that students benefit from seeing model answers (Rust, 2002) as part of the scaffolding process by which a teacher provides students with the tools by which to understand how, specifically, a generally framed problem is to be completed. 'Parallel play' writing serves the same purpose, but in a more cogent form because students are comparing themselves with each other rather than to a teacher-selected example. We also believe that this approach builds a greater sense of collaborative sensibility, that all students see themselves as part of a collective experience. Given the central role of teamwork in the unit, this sensibility was vital, but is applicable in many other courses.

The social process of wiki-page writing was intimately linked to visibility: students' revisions focused heavily on presentation suggesting that the 'audience' for their work did play an important part. Notably, most students commenced their task by personalizing the page (via title, putting in their name and so on): this suggests that wikis encourage students to see and *enact* the relationship between their view

of a subject and that of the cohort of students as a whole. Perhaps, in this way, we see that students compared themselves less to individual students and more to the entirety of all students with whom they were studying. While wikis are not the only technology by which this can be achieved, it does seem likely that the cultural dynamics of wikis, where writing is presumed to be contingent and subject to later editing make them suitable because students are less inhibited about sharing work that is still 'in process'. However, just as instructions about how best to use wikis for revisions are needed, it is likely that more success can be achieved by providing a more explicit and coherent context of 'shared, but individual' work so as to increase students' sense of the realistic value of sharing and reviewing others' work.

CONCLUSION

The cognitive work of many university assignments is a process of: planning, reading, researching, thinking, developing ideas, writing, reviewing, revising, editing and finalizing. When wikis are used for these kinds of tasks by an individual, rather than a group, they enable this work to be distributed differently in *time*, allowing for a greater interaction between each individual sub-component. Furthermore, where wikis are public, accessible to all other students, the wiki environment creates a much stronger sense of audience: students can see their work at a distance and better appreciate the revisions needed to improve their assignments. These two advantages are clear in the work of the students assessed during our research.

However, wikis do not inherently lead students to work in different ways. The potential advantages for cognitive engagement that wikis offer must be *realized* by students in two ways. First, they must realize what wikis can do by coming to understand what is possible and how best to use their time on task. Second, they must realize in the sense of actually doing it, of exploring and learning through the use of the wiki application to integrate their

conceptualization of effective work with its actual practice. Only a very small proportion of students, perhaps as few as 25%, appear to have achieved both realizations. Moreover, these realizations are more likely founded in the students' general scholarly aptitude and not specifically because of the wiki. The technology's ease of use did not impede students, but clearly in some cases misled them as to what was the most effective use. In other words, wikis afford an array of possible styles of work, each apparently equivalent and appropriate but which in fact are *not* equivalent in their capacity to promote effective learning. As a result, students may overestimate the degree to which they are exploiting the advantages that wikis offer.

Ultimately, our research shows that the introduction or continued use of a particular technology within higher education is just one part of the complex process by which student learning can be encouraged. It is important, of course, to align technology uses with the learning outcomes as Jones (2007) has argued. But it is also vital that teachers act as intermediaries between students and the technologies, providing advice about exactly how and what is to be done with them. The power and sophistication of digital network applications comes from flexibility and fluidity, as demonstrated by the fact wikis can be used many different ways. However the technologies themselves do not reveal clearly to students what *best* use is to be made of them. Thus, in the future, we will be providing students with specific instructions about how to use the wiki to distribute their work temporally, and to understand the way wikis enable more rapid and fluid movement between the different cognitive components of the overall task.

In this manner, we do not merely 'adopt' a technology such as wikis from outside of education into the learning process but can adapt it to meet the specific requirements of education, of which the most important when using innovative technologies is getting students to learn *how* to learn. Using wikis for individual, as opposed to group, writing and presentation tasks will, therefore, enable each student to

reflect on and develop their cognitive abilities, with the wiki becoming the vehicle to achieve this reflexivity. While we based our research on the revision tracking capabilities of wikis, the real lesson may be that students themselves should research the way in which they create versions, and in doing so bring actively to mind the work habits which wikis afford, but which are not always realized.

REFERENCES

Allen, M. (2010). *Going public with learning: Online education and the real world*. Paper presented at the Conference Diegetic Life Forms II: Creative Arts Practice and New Media Scholarship, Perth, Australia.

Allen, M., & Long, J. (2009). Learning as knowledge networking: Conceptual foundations for revised uses of the Internet in higher education. In *Proceedings of the World Congress on Engineering and Computer Science* (pp. 652-657). Hong Kong: Newswood.

Augar, N., Raitman, R., & Zhou, W. (2004). Teaching and learning online with wikis. In *Proceedings of the 21st ASCILITE Conference Beyond the Comfort Zone* (pp. 95-104). Perth, Australia: ASCILITE.

Bruns, A., & Humphreys, S. (2005). Wikis in teaching and assessment: The M/Cyclopedia project. In *Proceedings of the International Symposium on Wikis* (pp. 25-32). New York, NY: ACM.

Cassidy, S., & Eachus, P. (2000). Learning style, academic belief systems, self-report student proficiency and academic achievement in higher education. *Educational Psychology: An International Journal of Experimental Educational Psychology*, *20*(3), 307–322.

Choy, S. O., & Ng, K. C. (2007). Implementing wiki software for supplementing online learning. *Australasian Journal of Educational Technology*, *23*(2), 209–226.

Cole, M. (2009). Using Wiki technology to support student engagement: Lessons from the trenches. *Computers & Education*, *52*(1), 141–146. doi:10.1016/j.compedu.2008.07.003

Duffy, P., & Bruns, A. (2006). The use of blogs, wikis and RSS in education: A conversation of possibilities. In *Proceedings of the Online Learning and Teaching Conference* (pp. 31-38). Brisbane, Australia: QUT.

Elgort, I., Smith, A., & Toland, J. (2010). Is wiki an effective platform for group course work? *Australasian Journal of Educational Technology*, *24*(2), 195–210.

Forte, A., & Bruckman, A. (2006). From Wikipedia to the classroom: Exploring online publication and learning. In *Proceedings of the 7th International Conference on Learning Sciences* (pp.182-188). Mahwah, NJ: Lawrence Erlbaum.

Gray, K., Chang, S., & Kennedy, G. (2010). Use of social web technologies by international and domestic undergraduate students: implications for internationalising learning and teaching in Australian universities. *Technology, Pedagogy and Education*, *19*(1), 31–46. doi:10.1080/14759390903579208

Guo, Z., & Stevens, K. (2011). Factors influencing perceived usefulness of wikis for group collaborative learning by first year students. *Australasian Journal of Educational Technology*, *27*(2), 221–242.

Hemmi, A., Bayne, S., & Land, R. (2009). The Appropriation and repurposing of social technologies in higher education. *Journal of Computer Assisted Learning*, *25*(1), 19–30. doi:10.1111/j.1365-2729.2008.00306.x

Jones, P. (2007). When a wiki is the way: Exploring the use of a wiki in a constructively aligned learning design. In *Proceedings of the ASCILITE Conference on Providing Choices for Learners and Learning* (pp. 460-467). Singapore: Nanyang Technological University.

Karasavvidis, I. (2010). Wiki uses in higher education: exploring barriers to successful implementation. *Interactive Learning Environments*, *18*(3), 219–231. doi:10.1080/10494820.2010.500514

Laughton, P. (2011). The use of wikis as alternatives to learning content management systems. *The Electronic Library*, *29*(2), 225–235. doi:10.1108/02640471111125186

Lee, M., & McLoughlin, C. (2007). Teaching and learning in the Web 2.0 era: empowering students through learner-generated content. *International Journal of Instructional Technology and Distance Learning*, *4*(10), 21–34.

McLoughlin, C., & Lee, M. (2010). Personalised and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology*, *26*(1), 28–43.

Neiderer, S., & Van Dijck, J. (2010). Wisdom of the crowd or technicity of content? Wikipedia as a sociotechnical system. *New Media & Society*, *12*(8), 1368–1387. doi:10.1177/1461444810365297

Noël, S., & Robert, J.-M. (2003). How the Web is used to support collaborative writing. *Behaviour & Information Technology*, *22*(4), 245–262. doi:10.1080/0144929031000120860

Parker, K. R., & Chao, J. T. (2007). Wiki as a teaching tool. *Interdisciplinary Journal of Knowledge and Learning Objects*, *3*, 57–72.

Ramanau, R., & Geng, F. (2009). Researching the use of Wikis to facilitate group work. *Procedia: Social and Behavioral Science*, *1*(1), 2620–2626. doi:10.1016/j.sbspro.2009.01.463

Rust, C. (2002). The impact of assessment on student learning. *Active Learning in Higher Education*, *3*(2), 145–158. doi:10.1177/1469787402003002004

Schwartz, L., Clark, S., Cossarin, M., & Rudolph, J. (2004). Educational wikis: Features and selection criteria. *International Review of Research in Open and Distance Learning*, *5*(1).

Su, F., & Beaumont, C. (2010). Evaluating the use of a wiki for collaborative learning. *Innovations in Education and Teaching International*, *47*(4), 417–431. doi:10.1080/14703297.2010.518428

Tay, E., & Allen, M. (2011). Designing social media into university learning: technology of collaboration or collaboration for technology? *Educational Media International*, *48*(3). doi:10.1080/09523987.2011.607319

Wheeler, S. (2009). Destructive creativity on the social web: Learning through wikis in higher education. In Hatzipanagos, S., & Warburton, S. (Eds.), *Handbook of research on social software and developing community ontologies* (pp. 479–492). Hershey, PA: IGI Global. doi:10.4018/978-1-60566-208-4.ch031

Wheeler, S. (2010). Open Content, Open Learning 2.0: Using wikis and blogs in higher education. *Changing Cultures in Higher Education*, *1*, 103–114. doi:10.1007/978-3-642-03582-1_9

Wheeler, S., & Wheeler, D. (2009). Using wikis to promote quality learning in teacher training. *Learning, Media and Technology*, *34*(1), 1–10. doi:10.1080/17439880902759851

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