

EVALUATING THE IMPACT OF WIKIS ON STUDENT LEARNING OUTCOMES: AN INTEGRATIVE REVIEW

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Although wikis appear to have been reported as effective tools for educators, uncertainty exists as to their effectiveness in achieving student learning outcomes. The aim of this integrative review was to examine the current evidence on the impact of wikis on student learning in courses requiring collaborative or co-developed assignments or activities. The authors searched several electronic databases for relevant articles and used R. Whitemore and K. Knaf's (2005) integrative review method to analyze and synthesize the evidence. Twenty-five articles met the selection criteria for this review, and four major themes for wiki use were identified: (a) writing skills, (b) collaboration, (c) knowledge acquisition, and (d) centralized repository. Although wikis have been found useful in improving student learning outcomes and hold great potential as an instructional strategy to aid students in learning various skills and gaining new knowledge, more research is needed on their effectiveness, especially in the area of nursing education. (Index words: Constructivism; Internet-based learning; On-line learning; Social media; Wiki) J Prof Nurs 0:1–13, 2016. © 2016 Elsevier Inc. All rights reserved.

WIKIS ARE GROWING in popularity in nursing education as a means to support active learning and authentic collaboration among students. As a Web 2.0 technology, wikis allow learners to interact with each other within a virtual learning environment, rather than passively listening to an instructor. A wiki is a Web page accessed via the Internet, offering a space for users to add text, pictures, files, and links to other Web pages (Robertson, 2008; Stephens, Robinson, & McGrath, 2013; Zhao, Kallander, Johnson, & Wu, 2013). Contributions to a wiki may range from minimal (changes in spelling, grammar, or punctuation) to substitutive (content including analysis or synthesis; Alshumaimeri, 2011; Wichmann & Rummel, 2013). This virtual learning environment creates a social space where students can appreciate divergent views and demonstrate

team-based skills (Kump, Moskaliuk, Dennerlein, & Ley, 2013; Stephens et al., 2013; Wheeler & Wheeler, 2009). Wikis also provide an archive of interaction, similar to an audit trail, documenting the evolution of co-constructed documents (Ioannou, Brown, & Artino, 2015). Wikis offer potential application in nursing education by allowing communities of users to share like interests and learn through the support of technology.

The influence of wikis on student learning can be viewed from the learning theory of constructivism (Alshumaimeri, 2011; Biasutti & EL-Deghaidy, 2012; Cole, 2009; Karasavvidis, 2010). Constructivism clarifies how students learn, inquire, and reflect upon past experiences to build, refine, and develop new knowledge. The process is active, dynamic, and student driven, and may occur within a social environment or community facilitated by wiki technology (Alshumaimeri, 2011). Wikis help to construct knowledge by linking and connecting individuals within a learning environment. In academic settings, students have the opportunity for open discussion and an exchange of ideas and opinions for the construction of knowledge rather than solitary mastery of content (Adelman & Nogueras, 2013; Page & Reynolds, 2015; Salajan & Mount, 2012). Wikis facilitate learning among all users by offering a platform or connection for students to share their perceptions while learning about the perceptions and thoughts of others.

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Although wikis were found to be useful tools for some nurse educators, uncertainty exists as to their effectiveness in achieving student learning outcomes. This integrative review was designed to examine the current evidence relative to the impact of wikis on student learning outcomes in courses requiring collaborative or co-developed assignments or activities. Nurse educators seek data to drive pedagogical decisions based on the best available evidence. Conducting an integrative review offers educators a means to research the current thinking on a topic of interest and propose new insights based on a critical analysis of study results (Torraco, 2005). More importantly, published reviews disseminate new knowledge, allowing nurse educators to become enlightened. Together, both activities build the scientific basis for making informed decisions in higher education.

Methods

Studies were located using the following databases: MEDLINE, Cumulative Index for Nursing and Allied Health Literature, and Educational Resources Information Center. The key search terms used were *wikis*, *collaborative learning*, and *student learning outcomes*. Articles had to be peer reviewed, and only those studies that met the following criteria were included: (a) the study had to include an analysis of data on student learning outcomes associated with the use of wikis, (b) the articles had to be published in English between 2009 and 2015, and (c) the sample had to include students in higher education. The retrieved citations were excluded if they were review articles, proceedings, and dissertations, or if they focused on evaluations of wikis in combination with other Web 2.0 educational technologies (e.g., blogs, on-line journaling; see Figure 1).

Titles and abstracts in the retrieved articles were then reviewed for possible inclusion. After reviewing the full text of the selected citations, 27 were retrieved that met all of the inclusion criteria. The articles were appraised independently by the two co-authors, who used a constant comparison method to identify patterns, themes, or relationships (Torraco, 2005; Whittemore & Knafl, 2005). Similar variables were grouped together to discern common and unusual patterns. A concept matrix categorically displayed the extracted data from each article for iterative comparison. The studies were summarized in a table comparing each study's characteristics and findings (see Table 1).

Findings

The studies included in this integrative review included students from North America, Europe, Africa, and Asia who were enrolled within schools of higher education. A variety of academic disciplines were examined including nursing, pharmacy, medicine, radiography, psychology, English and foreign language studies, and education. Four predominant themes emerged in the review reflecting the influence of wikis on student learning: (a) writing skills, (b) collaboration, (c) knowledge acquisition, and (d) access to and storage of information

as a centralized repository. Wikis were found to be a forum frequently used for improving students' writing skills and for creating the opportunity for collaborative learning. Wikis were also used to promote knowledge acquisition by facilitating discourse, communication, and group activities associated with active learning and student engagement. The access to knowledge for some courses was provided through a wiki as a centralized repository of information.

Writing Skills

Academic writing can be challenging for some students in that it requires not only a mastery of vocabulary and grammatical structure but also the ability to research and reference a topic, organize thoughts, and present them with clarity. Several investigators have evaluated the use of wikis to improve students' writing skills. The studies have taken place in a variety of courses, including English as a foreign language (Alshumaimeri, 2011; Elola & Oskoz, 2010; Kessler, 2009; Montero-Fleta & Perez-Sabater, 2011; Wang, 2014; Wichmann & Rummel, 2013), and education (Wheeler & Wheeler, 2009).

Students who used wikis for writing assignments, as compared with a control group without access to wikis, did significantly better on writing performance than their comparison group (Alshumaimeri, 2011; Elola & Oskoz, 2010; Wichmann & Rummel, 2013). For example, Alshumaimeri evaluated writing performance among two groups of male students ($n = 42$) studying English in Saudi Arabia in terms of accuracy (spelling, word choice, and punctuation) and quality (organization, elaboration, coverage, clarity, links, and intended message). The students were divided into an experimental group, who were to complete the assignment via a wiki, and a control group, who completed the assignment off-line. To ensure equal proficiency between the groups at the start of the study, students completed a pretest, and no significant differences were found between the groups. Although both groups improved significantly in writing performance from the pretest to the posttest, the improvements in the experimental group were significantly greater as compared with those of the control group for accuracy ($F = 49.0$, $P = .000$), quality ($F = 66.7$, $P = .003$), and total score ($F = 122.7$, $P = .000$). The investigators reported that the wiki encouraged the student to focus more on grammar and structural coherence.

A similar finding of improved writing performance with the use of wikis was reported by Wichmann and Rummel (2013), who also evaluated the use of a wiki in an English as a foreign language writing course ($n = 65$). An additional intervention in this study was the use of collaborative scripts (a list of tasks to consider while formulating, drafting, and editing the assignment), which was developed by the instructor and embedded within the wiki pages. The students who were exposed to the wikis wrote more text ($F = 4.61$, $P = .036$) and made more text revisions ($F = 4.60$, $P = .036$), although the revisions in most cases were focused on insignificant edits and

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