



## The effectiveness of wikis for project-based learning in different disciplines in higher education



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### ABSTRACT

Concerning the effectiveness of using wikis for project-based learning in higher education, this study compared the perceptions and actions among students in three undergraduate courses of different disciplines, English Language Studies, Information Management, and Mechanical Engineering, who used wikis in their course assignments. Using a triangulation methodology, the study shows that students mostly hold positive attitudes towards the use of wikis for project-based learning. However, significant differences exist in 5 aspects, such as “Motivation” and “Knowledge Management”, in the questionnaire among all participants. Additionally, the level of participation and core actions on the wikis vary among students of the three disciplines. These findings can be explained by the variations in participants’ previous learning experiences, their technical backgrounds and the relationship between learning goals and collaborative learning. A series of insights are offered in the context of the use of wikis in project-based learning in higher education.

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### 1. Introduction

The popularity of social media in the past few decades has motivated many researchers to utilize social media tools, services and applications for educational activities in higher education (Gikas & Grant, 2013; Moran, Seaman, & Tinti-Kane, 2011; Tess, 2013). Compared with traditional media, which emphasize a uni-directional knowledge transmission and acquisition, social media focus more on active participation, collaboration, and knowledge sharing among users (Mao, 2014). As such, some researchers believed that substantial changes in educational approaches will take place with the adoption of social media in higher education (Anderson, 2008; Tess, 2013; Vartiainen, Liljeström, & Enkenberg, 2012). Hung and Yuen (2010) urged that technology integration courses be redesigned to leverage social media. Although it seems that advances in technology have demanded changes in

educational approaches, the primary impetus behind the changes still lies in the increasing need to develop students’ key competency for teamwork and collaboration during their course of study (Pellegrino & Hilton, 2013). Professionals today have to cope with increasingly sophisticated problems and to complete tasks that require expertise from different disciplines. In many cases, success depends largely upon teamwork (Dettmer, Knackendoffel, & Thurston, 2012). Students today need to be equipped with collaboration capabilities when they graduate from universities (Khine & Saleh, 2010; Slater & Ravid, 2010). Until now, even though many scholars have been involved in research on the effects and limitations of social media with respect to education, most studies have mainly focused on the effects of the technical aspects of social media on learning; for example, the comparison of the technological affordances of different types of social media tools for collaborative learning (Hmelo-Silver, Chernobilsky, & Nagarajan, 2009; Ioannou, Brown, & Artino, 2015; Suthers, Vatrappu, Medina, Joseph, & Dwyer, 2008), and neglected reflective analysis on the instructional approaches for learning with the use of social media.

Project-based learning as an instructional method has been introduced into social media environment with the aim of facilitating collaboration in higher education (Biasutti & EL-Deghaidy, 2015; Hamid & Mansor, 2012; Popescu, 2014). However, little is known about how

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students in different disciplinary courses perceive the affordances of social media for collaborative project-based learning. Since students are the direct beneficiaries of the intervention, it is logical for us to explore their point of views. To fill this research gap, the authors conducted an empirical study to explore whether the effects of social media tools (in particular, wikis) on project-based learning vary in different disciplines from the perceptions of students.

## 2. Literature review

In this literature review, an overview of research on wikis, project-based learning, and using wikis in project-based learning is provided. Besides, the theoretical foundations of using wikis in project-based learning on which we based the study are described.

### 2.1. Wikis for higher education

With the trend of bringing social media into classrooms, accompanied with the ongoing demand for students to develop teamwork and collaboration skills, social software, such as wikis, which support collaborative learning, have attracted considerable attention in higher education in recent years (Ertmer et al., 2011; Judd, Kennedy, & Cropper, 2010; Malinen, 2015). According to Leuf and Cunningham (2001), a wiki is a hypertext system that allows users to record and change their posts; a wiki is also a database within which users can create and edit their own webpages. Put simply, a wiki is a web-based tool for individuals to build up hypertexts incrementally and collaboratively (Cole, 2009; Shih, Tseng, & Yang, 2008). In light of three key features of wikis – open editing, a revision tracking mechanism, and a discussion feature – the potential of wikis to promote effective learning is gaining increasing interest among educators (Roussinos & Jimoyiannis, 2013; Zheng, Niiya, & Warschauer, 2015). With open editing, students can create their wiki pages simply by adding hypertexts and can also incorporate multimedia to develop their wikis for knowledge building. Additionally, the track changes feature of wikis can promote collaboration and support students' higher order thinking skills through revisions of shared documents with peers (Sanden & Darragh, 2011). As for the wiki's discussion features, they provide opportunities for students to detect problems, settle controversies, and reach agreements to revise the shared pages (Liou & Lee, 2011; Matthew & Callaway, 2008; Nami & Marandi, 2014). With these features, wikis have been mostly used as tools to facilitate group projects (Abdekhodae, Kourosh, Modarres, Chase, & Ross, 2015).

Apart from supporting students' learning, wikis also have the potential to help teachers make appropriate judgments and decisions in teaching and assessment. A common problem in group learning is that teachers find it difficult to distinguish contributions among group members, which may cause discontent or complaints from students who think that their contribution and efforts were “stolen by” the free-riders. Such lack of transparency also makes it challenging for teachers to provide timely support and guidance to individual students. With the revision history function of wikis, students' collaborative process has become transparent to teachers, so teachers can supervise the learning process, provide effective feedback, and make pedagogical decisions more easily (Lai & Ng, 2011).

Much theoretical and empirical research has shown that wikis can enhance students' collaborative learning in higher education contexts. For instance, Salaber (2014) focused on students' learning outcomes in a postgraduate course using a wiki and discovered that the implementation of wiki activities resulted in enhanced collaborative learning, improvement of learning outcome, and facilitation of students' development of high-level thinking skills. Roussinos and Jimoyiannis's (2013) investigation into students' beliefs and perceptions of a wiki-based collaborative learning activity also showed that wikis were effective in enhancing students' group assignments and collaborative learning. Moreover, in De Wever et al.'s (2015) study, surveys, log-file analyses,

group product scores and pre- and post-test scores were integrated to investigate learning experiences, learning behavior, the content knowledge and the quality of wiki tasks, which provided researchers and educators a comprehensive understanding of the effects of using wikis for student learning. In sum, in the past decade, many empirical studies have showed that wikis have been effectively used to enhance students' collaborative work (e.g., Judd, Kennedy, & Cropper, 2010; Malinen, 2015).

However, some studies have revealed that using wikis for projects does not necessarily ensure effective collaboration among group members (Choy & Ng, 2007). For example, students are often reluctant to amend others' work (Blau & Caspi, 2009); they tend to focus only on information they contributed (Wheeler, Yeomans, & Wheeler, 2008). Some possible reasons for this may relate to students' perceptions of amending others' work. For instance, students often feel that editing others' work is inappropriate (Coyle Jr., 2007), and they do not wish to interfere with “somebody else's material” (Konja & Ben-Zvi, 2008). In addition, students may not take advantage of the wiki collaborative features as they may prefer to work in isolation, resulting in very limited support from group members (Boling, Hough, Krinsky, Saleem, & Stevens, 2012). Therefore, a wiki per se cannot guarantee effective collaboration among learners, and instructional support is critically needed in order to generate high-level collaborative activities and help students develop collaborative skills (Cole, 2009; De Wever et al., 2015; Wichmann & Rummel, 2013). As a useful instructional strategy, project-based learning has been introduced by many researchers to bring about productive group work, in which projects are pertinent to learners' real worlds and require students' active engagement in the process of collecting resources, communicating ideas, and evaluating concrete products (Boss & Krauss, 2014; Howard, 2002; Koh, Herring, & Hew, 2010).

### 2.2. Project-based learning in higher education

Project-based learning refers to engaging students in accomplishing a project in real-world context, through which students move towards developing knowledge and skills related to the project (Cavanaugh, 2004). According to Lipson et al.'s (2007) research, there are three characteristics that an ideal project-based learning should exhibit: process-oriented, context-related and student-centered. As a process-oriented endeavor, project-based learning serves to drive learning activities that culminate in a final product (Bell, 2010; Land & Zembal-Saul, 2003), and students' learning of knowledge, skills and dispositions are embedded in the process of project development (Cavanaugh, 2004). In project-based learning, students are provided with context-related projects in which students' learning experiences reflect real-world collaborative problem-solving practices (Olesen & Jensen, 1999; Thomas, 2000). Students' are required to participate actively in project-based learning and take the initiative to explore ways to complete a task. By contrast, teachers act as facilitators in creating the conditions necessary for students to work with each other (Pascarella, Terenzini, & Feldman, 2005; Smith, Sheppard, Johnson, & Johnson, 2005).

In the early 1900s, Kilpatrick (1918) introduced project-based learning as an instructional approach in K-12 education. With its successes in schools, and project-based learning gradually spread to professional education and higher education (Cavanaugh, 2004; Koh et al., 2010; Von Kotze & Cooper, 2000). Project-based learning has advantages over traditional didactic instruction in promoting students' professional development in several aspects. First, the primary learning goal of project-based learning is the cultivation of life skills (e.g. teamwork, communication), whereas the learning goal of traditional instruction is the acquisition of knowledge (Lipson et al., 2007). Second, the learning materials of project-based learning are developed by students during their discovery process, whereas the learning materials of traditional instruction are textbooks or assigned reading resources. Last but not least, project-based learning requires students to approach projects in an

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