

Collaborative Work By Graduate Students: A Comparison Of Modalities

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Abstract

Online learning as a choice in higher education has grown exponentially. Research has indicated the importance for instructors to provide opportunity for student collaboration through use of online tools such as wikis, discussion boards, and group projects. A survey methodology was employed to gather higher education students' opinions on both participation in group projects at the post-secondary level and the efficacy of using wikis versus traditional formats such as face-to-face interaction or discussion boards as collaboration tools. Responses were collected from two groups of students taking a graduate level course called Life Span Development; one traditional face-to-face group and one online web-based group, with a total number of 66 participants. The results of this study support the values of integration of student collaboration in group work on course assignments. Furthermore, this study provided comparison and contrast between the three collaboration modalities of discussion boards, face to face groups, and wikis. This study provides support for further research to analyze benefits and challenges of these modalities and others on multiple types of assignments.

Keywords: Online learning, Student collaboration, Group tasks

Introduction:

Online learning as a choice in higher education has grown exponentially. Keengwe and Schnellert (2012) noted the exponential growth of distance learning courses and the core role of the distance educator to facilitate learning and enable peer interactions to flourish. However, Revere and Kovach (2011) concluded that many online learning experiences are still an attempted replication of traditional classroom instruction that focuses on knowledge acquisition from the authority of the instructor instead

of focusing on student engagement. Lou (2004) suggested that a criticism of online courses was the focus on knowledge acquisition versus problem solving, which is a skill critical to meeting real-world challenges. Harastinski (2006) indicated a lack of opportunity for informal and social communication in online education that is naturally present in traditional campus settings for creation of bonds of community and participation in learning communities.

Literature Review:

Keengwe and Schnellert along with Wong (2007) discussed three key interactions in online learning as interactions of student with content, student with classmates, and student with instructor. Cooperative and collaborative learning have been used in postsecondary education to increase student application of course content through social and academic interaction in a small group format. According to Bliss and Lawrence (2009), Cooperative Learning is a task that is split into subtasks performed independently with later assembly into a conjoined project. Collaborative Learning is mutual and shared concept building through socially mediated processes.

Pedagogy has shifted from the more linear process of learning in online education to network learning. Konyu-Fogel, Dubois, and Wallingford (2013) noted that this type of learning includes the key elements of “knowledge navigation with joint construction by faculty and staff, fusion of learning and work, and achievement-based outcomes.” (p.70). Cooperative or collaborative learning is done through assignment of students to small groups which then conduct assignments that provide opportunity to work on a relevant issue, case or question demonstrating a concept’s usefulness (Michael & Sweet, 2008).

Koh and Hill (2009) further defined online group work as “students working together in a small group through electronic media regardless of geographic location.” (p. 70). Michael and Sweet (2008) indicated that effective group assignments use a common problem for individuals and groups, and require students to use course concepts to resolve the problem. Hamer and O’Keefe (2013) discussed examples of group assignments such as study groups, group research projects, and group presentation of project results. Koh and Hill noted a theme across online courses of participation in discussion boards and common examples of group projects of working together on a course paper or a presentation for the class on a current issue related to course content.

Harastinski (2006) noted that successful learning communities have opportunity for students to exchange information and provide both social support and support for the assigned tasks. Courses that are taught in the traditional modality of a face-to-face meeting of instructor and students

provide opportunity for this through assignment of group work in the class session or with a meeting of group members outside of the scheduled class session. In a study with 28 students, Harastinski found that the opportunity for synchronous collaboration through use of Instant Messaging promoted higher participation in group work than use of asynchronous collaboration alone. Keengwe and Schnellert (2012) shared several suggestions for instructors in development of online group work. As online students generally view interaction as an effective means of learning, they emphasized the importance for instructors to create opportunities for interaction through development of online tools such as wikis to enhance effective online interaction. A review of online courses across multiple universities indicate that discussion boards are a common online course tool to promote student interaction.

Theory

For purposes of this study, the term “Collaborative Learning” will be used to encompass the conceptual constructs of Collaborative Learning, Cooperative Learning, and Team-Based Learning. This pedagogical approach is strongly rooted in developmental theory. Collaborative learning is based in Constructivist learning theory as presented by Vygotsky (Sigelman & Rider, 2014). Vygotsky proposed that learning occurred in a sociocultural context with intelligence held by the group rather than the individual. This theory included several facets that are reflected in collaborative learning. Learning is culturally shaped as knowledgeable guides as instructors, peers, parents, bosses, etc. pass on problem-solving strategies to a person. Another facet of this theory proposed that knowledge is not a fixed state but is within the range of potential for unlimited growth of the mind. Santrock (2014) also noted that Vygotsky’s social constructivist approach emphasized the importance of sociocultural influences on development as integral to contextual factors in learning. Santrock suggested that as a pedagogical framework, social constructivism promotes instruction and learning via collaboration, social interaction, and sociocultural activity. A key difference between this theory and other theories is the notion that students need opportunities to learn with others rather than just support for exploration of their world and discovery of knowledge.

According to Keengwe and Schnellert (2012) there are three theoretical constructs with online learning of interactivity, social context, and technology. The researchers described the successful online learning community to be one in which members connect and engage intellectually, mentally, socioculturally, and interactively to achieve common learning goals through electronic technology. Bliss and Lawrence (2009) suggested

that group activities would increase peer interactions and could lead to development of socially constructed knowledge. Wong (2007) indicated a pedagogical advantage of student interaction in collaborative construction of knowledge as learners benefit from social interactions concerning tasks they cannot do alone but can do in collaboration with more knowledgeable or more experience peers, and knowledge is discovered and constructed through collective sense making

Benefits of Collaborative Learning

Benefits of Collaborative Learning are seen in three areas – academic benefit for students, professional and personal benefit for students, and benefit for the respective institution.

Academic benefits for students. A common benefit among researchers was student development of higher order and critical thinking skills in problem solving. Bliss and Lawrence (2009) remarked that in group work, the problem solving is beyond the scope of any one individual. Michaelsen and Sweet (2008) and Hamer and O’Keefe (2013) posited that students gain increased mastery of course content, better depth of understanding, and stronger professional networking. Van der Putten & Vichit-Vadakan, 2010; Tirrell & Dewey, 2009 indicated that Collaborative Learning seems to better enable at-risk students with course progress as they received peer support. The researchers also noted that this approach with instruction fostered greater partnership between faculty and students as the focus of process was on learning versus teaching.

Professional and personal benefit for students. Van der Putten and Vichit-Vadakan (2010) indicated benefits of the Collaborative Learning approach to be promotion of peer interaction and active learning, increase in student active role in learning process, construction of a bridge between theory and practice, and assistance in application of critical thinking to real world challenges. Hamer and O’Keefe (2013) discussed the importance that employers place on group skills. Lou (2004) examined the relationship of student group work to their future real world professions. Problem-solving skills were learned through engagement in solving a variety of real problems and interacting with colleagues who are solving similar problems as students or professionals became members of a community of practice.

Tirrell and Dewey (2009) discussed skills that students develop through collaborative learning. These skills are “Prioritization and identification of objects, good communication, and ability to assign roles and responsibilities.” (p. 152). Tirrell and Dewey also indicated that collaborative learning teaches students essential facets of team work such as goal setting, responsibility assignment, management of schedules, decision making process, and measurement of progress for task accomplishment.

Keengwe and Schneller (2012) suggested benefits of shared knowledge building as students inspire each other and depend on each other. Wong (2007) described student group work as proactive learning which engaged students to higher levels of thinking than reactive types of learning and also kept students accountable for their participation and for building on each other's ideas to negotiate for meaning and to collaboratively construct knowledge.

Hamer and O'Keefe (2013) further noted that group assignments helped students to develop teamwork. Glazer, Beslin, and Wanstreet (2013) pointed out that group work helped learners to develop shared values and norms which helped group members to more readily contribute self-disclosure and meaningful interaction. Strengths were identified by Koh and Hill (2009) to be flexibility, convenience with contact of other group members anywhere, anytime, and the possibility that student idea sharing would trigger deeper processing of content with greater thoughtful and in-depth comments from classmates than with synchronous context. Konyu-Fogel, DuBois and Wallingford, (2013) concluded that this collaborative instructional approach helped students to generate ideas, improve independent thinking and problem-solving skills, and prepare for work setting use of teams for task accomplishment.

Institutional benefits. Several researchers also suggested institutional benefits from collaborative learning. Glazer, et al.(2013) indicated that a sense of community in the online learning environment supports student retention and success at both the course and program levels. Bliss and Lawrence (2009) noted several desirable components of student participation that were greater in online course small group work than with just whole class work. There was greater quantity of student initiated discussion postings and greater quantity of content-related postings per student. Wong (2007) indicated that interactive learning tasks promoted greater equality of participation, more extensive opinion giving and exchanges, empowerment of shy students to participate, and promotion of more student-centered learning.

Challenges of Collaborative Learning

As with other approaches to learning, Collaborative Learning also presents instructional challenges. While researchers have noted many benefits in use of cooperative/collaborative learning, challenges have been noted as well. These challenges can be due to factors about the online learning modality or factors about students.

Online learning modality. Traditional expectations of students for online study contributes some challenge to collaborative course work. Glazer, et al. (2013) observed that the natural geographic distance of many

online learners promoted a more central focus on individual needs than a student's need for involvement and interaction with the class. Koehler and Mishra (2005) found that traditional student expectations for online study are to work on their own and that an initial phase of team work may show students feeling frustrated that little is actually getting done due to the focus on collaboratively defining goals, setting priorities, and achievement of a project vision.

Koehler and Mishra (2005) found that groups who related well to each other and enjoyed the assignment accomplished more, learned more, and got more out of the class (p.144). This is consistent with the theories of group dynamics (Jacobs, Masson, Harvill, & Schimmel, 2012). Group dynamics theory indicates that groups go through stages in which a primary task of the beginning stage is exploration and planning. The later phases known as the working phase and ending phase involve task accomplishment and completion.

Student factors. Konyu-Faget, et al. (2013) reported that group work can be hindered through cultural differences of members, technical challenges, or lack of participation by group members. Hamer and O'Keefe (2013) found student dislike for assignment to group projects due to reports of negative interaction between group members' personalities. Konyu-Fogel, et al. (2013) indicated that success of group work is dependent on development of a sense of trust among group members and immediate feedback from peers and the instructor to promote greater retention of academic content.

Koh and Hill (2009) suggested that group work online may lack social interaction that is present in a face to face setting and there may be delay in group development stages. These researchers additionally revealed student report of lack of sense of community, reduced sense of connection, and difficulty with communication among group members. Students expressed concerns with minimized capacity to interact directly, lack of time, and difficulty with communication due to difference in writing styles and perspectives.

Keengwe and Schnellert (2012) identified the biggest challenge of group work to be communication problems among students with much of this due to student schedules that were difficult, different, and busy. Bliss and Lawrence (2009) shared concerns that could arise from non-participating members, contribution that was unrelated to academic content, conflict with busy schedules, and a student desire for a direct path to learning.

Wikis

A wiki is a web page that features open editing, meaning more than one person can contribute to the page. Wikis are becoming a common tool for collaboration in educational settings. In a study of wiki use in online

graduate level courses by Deters, Cuthrell, and Stapleton (2010), results indicated that even though students were hesitant about learning a new technology, they found the wiki to be a great collaboration tool.

Hughes and Narayan found mixed results in their study on the use of wikis in post-secondary courses (2009). One group of students found the wiki to be useful in supporting collaboration and student learning while the other group did not. These researchers suggested that due to the small sample size and mixed results, further research on the use of wikis in instruction is needed. In another study by Elgort, Smith, and Toland (2008), results indicated that wikis may not be enough to overcome negative feelings about group work; however, the wiki was seen as a useful for collecting and managing their work. Eighty-eight percent of the participants in the face-to-face course and 94 percent of online students indicated that the group work was beneficial. 77 percent of students in both groups agreed that using wikis encouraged better individual participation in the group project” (p. 205).

Discussion Boards

Discussion boards are a common student interaction activity across online courses. A discussion board is an online forum in which an instructor provides directions and a prompt for student discussion. Students then share individual responses to the prompt and share replies to classmates on their responses to the prompt. Revere and Kovach (2011) noted that these promote student interaction in two ways. First, students can increase knowledge via student driven content. Second, these provide a means of supportive climate with online students for peer review and exchange. Curry and Cook (2014) indicated that as students actively participated in discussion boards, this helped them to gain further context for their own perspective as well as new information per the growth in context of other classmates. Exposure to this diversity of perspectives helped students to expand their contextual worldview.

Revere and Kovach (2011) identified some challenges with discussion boards. They pointed out that the literature does not strongly support skill building for students in analytical and evaluative skill as students tend to remain at a level of shared knowledge versus recognition, understanding, and analysis. Furthermore, delays in student postings can delay instructor feedback or peer reflection that might enhance mastery of concepts. In addition, there can be students who learn from others without making significant contributions themselves.

Group Tasks

Group tasks are assignments given to a group of students to encourage learning through student interaction with peers. These can be

accomplished through online technologies or through small group meetings within a face to face class. Revere and Kovach (2011) indicated that effectively designed student groups encouraged relationship building as well as the opportunity to explore and expand their current knowledge about course content. The added benefit for online students is a bridge between their natural physical separations. Revere and Kovach emphasized the need for instructors to assist groups in working well together and in maintaining equitable workload distribution among group members.

Method

Research indicated that students garner the benefits of deeper understanding of content as well as professional networking skills through collaborative group work (Michaelsen & Sweet, 2008; Hamer & O’Keefe, 2013). Accordingly, this study examined the propensity of group work to facilitate learning in higher education courses through a comparison of student experiences using traditional face-to-face, discussion board, and wiki modalities.

Description of the Research Design

A survey methodology was employed to gather higher education students’ opinions on both participation in group projects at the post-secondary level and the efficacy of using wikis versus traditional formats such as face-to-face interaction or discussion boards as collaboration tools. Responses were collected from two groups of students taking a graduate level course called Life Span Development; one traditional face-to-face group and one online web-based group. Statistical analysis using Statistical Package for the Social Sciences (SPSS ®) software included calculation of item response percentages, independent t-tests between online and face-to-face students’ responses, and independent t-tests on survey items based on gender.

Participants

The sample consisted of higher education students enrolled in a graduate level Life Span Development course taught either face-to-face (N= 31) or online (N= 35). Of the total 66 participants, 52 were female and 14 were male. Ages of participants ranged from 22 to 50 years old. To prevent technology proficiency from skewing study results, participants were asked to self-report their level of computer skill. Sixty-eight percent of the participants described their computer skills as “good” with no participants indicating “poor” computer skills. Students enrolled in these courses on a first-come first-served basis with no influence of enrollment by the researcher.

Instrumentation

After a review of the literature (Elgort, et. al., 2008, Chang, Morales-Arroyo, Than, Tun, & Wang, 2010, & Witney & Smallbone, 2011), a survey instrument was developed by the researchers to gather data on higher education students' opinions on group work in graduate level courses in general as well as wikis, discussion boards, and face-to-face interaction formats as tools for collaborative group work. The instrument contained 38 total Likert-type items divided into five areas; four items gathered demographic information, 13 items addressed group work in general, while seven items focused on wiki usage, seven items focused on discussion boards, and seven items focused on face-to-face group work. The Likert-type scale used to measure student opinions ranged from strongly agree (1) to strongly disagree (4).

Procedures

Participants were graduate students in two online sections and one campus section of Life Span Development. In each of these sections, students were randomly divided into work groups of five students in each group for the duration of the course. Each section had two study guide assignments; one to be completed by collaborating in a traditional type format either face-to-face for campus students or discussion board for online students, and one to be completed using wiki technology as the format for collaboration.

The first study guide was on Theories of Life Span Development. The two online sections completed this in a discussion board set up for each work group specifically for that assignment. The campus section completed collaboration on this assignment through face to face collaboration time during each class session until the due date for the assignment. In the online sections, students were informed that the group discussion board should be used by group members to collaborate on development of their Study Guide on Theories. With the campus sections, each week, the class had time for group members to collaborate on development of their Study Guide on Theories. Students were free to share information and ask questions of each other. Students were to each submit their own study guide into the appropriate link in the Blackboard course link to be graded. The participation portion of the assignment grade was based totally on the interaction in the discussion board for the online students. With the campus class, the participation grade was based on the interaction observed by the instructor in group work each class session.

The second study guide covered eight life span stages studied in the course. Both the two online sections and the campus section were required to work together through a wiki to develop this study guide. The campus

section was not given class group work time with which to work on this assignment. Instructions were given to all three sections to use the Wiki to collaborate on development of their Study Guide on Life-Span stages. As with the first group assignment, students were free to share information and ask questions of each other in the Wiki. Students also submitted this assignment into the appropriate link in Blackboard. This participation was also worth 30 points of the total grade for the assignment and the participation grade was based totally on the interaction and information in the Wiki.

Results

Graduate level students, both online and face-to-face students (N=66) were asked to respond to items eliciting opinions about group work (see Table One) and percentages were calculated using SPSS®. Sixty-three percent of the students surveyed denoted that meeting face-to-face for group work was an unrealistic expectation for graduate level students. Additionally, 78.8 percent of respondents indicated that virtual meetings were better for collaboration on group projects. Although 57.6 percent agreed that they preferred to work alone, 93.9 percent indicated that group projects build collaboration skills with 89.4 percent indicating that the group projects in the Life Span Development course were valuable learning experiences. Seventy-nine percent expressed that they could not have done better on the project working alone. The majority of respondents denoted that both online students (60.0 percent) and face-to-face students (86.2 percent) should have to participate in group work and that technology can be used to facilitate group work in both face-to-face (92.3 percent) and the online (89.1 percent) courses.

Table 1 Total Responses (%) to Technology and Group Work
(N =66)

Item Content	Percent Strongly Agree	Percent Agree	Percent Disagree	Percent Strongly Disagree
Online students should not have to participate in group projects	12.3	27.7	50.8	9.2
Technology can facilitate group projects online	18.8	70.3	9.4	1.6
Campus students should not have to participate in group projects	4.6	9.2	67.7	18.5

Technology can facilitate group projects in campus class	10.8	81.5	7.7	0.0
F2F not realistic for graduate students	16.9	46.2	32.3	4.6
Virtual meetings are better for project collaboration	19.7	59.1	19.7	1.5

Wiki Collaboration

All participants (N= 66), were required to complete a group project using a wiki format. Subsequently, percentages of participant ratings were calculated. Eighty- nine percent of respondents indicated that they were comfortable contributing to the group project through the wiki format and 81.6 percent found it an easy mode of communication. A breakdown of the percentages by online (N= 35) and on campus (N=31) students showed that 97.2 percent of the online students found the wiki to be an easy mode of communication compared to only 87.1 percent of on campus students. Additionally, online and on campus students were similarly comfortable contributing to the wiki for the group project (97.2 percent online and 93.5 percent on campus). Results also showed that 82.9 percent of the online students (N = 35) identified the wiki as a good format for presenting the group project. Only 34.3 percent indicated the project would have been better working through the discussion board and furthermore, a small percent, 17.2 percent specified face-to-face as being a better method. On campus students (N =31) also agreed (87.1 percent) that the wiki was a good format for presenting the group project; however, a higher percentage indicated that the project would have been better working through the discussion board (45.1 percent) and meeting face-to-face (58.1 percent) compared to online students

Discussion Board Collaboration

Although both online and on campus students were required to complete one group project using the wiki format, a second group project was assigned using a more traditional platform. Online students were required to complete a second group project via the discussion board while on campus students were required to complete the project face-to-face. Online study participants were also asked to respond to a set of questions related to using the discussion board for group project collaboration. 91.2 percent considered the discussion board an effective collaboration tool. In comparison, an examination of the responses of the online graduate students

regarding the wiki suggested that only 76.4 percent found the wiki to be a good tool for collaboration. Responses also revealed that 97.2 percent identified both the discussion board and the wikis as good tools for communication. A slightly lower percentage (82.9 percent) suggested the discussion board was a good method for presenting the project, but 97.2 percent were comfortable using the discussion board for the group project. Overall, 90.2 percent of the online graduate students indicated the discussion board was a great method for collaboration on the group project. Only 34.3 percent reported that the wiki would have been a better format and even less (17.2 percent) indicated that face-to-face would have been a better alternative.

Face-to-Face Collaboration

The on campus students were also required to complete a second group project in class using face-to-face collaboration. Responses to working on the group project face-to-face were favorable; however, not as favorable as the responses to completing the project using the wiki. For example, 74.2 percent of the students considered face-to-face communication easy compared to 87.1 percent of the on campus students who indicated that the wiki was an easy mode of communication. Additionally, 71 percent indicated that face-to-face was a good mode for presenting the group project while 87.1 percent suggested the wiki was a good method of presenting the group project. Overall, 80.6 percent of the campus students supported working face-to-face as a good method for collaboration, yet at least 61.3 percent revealed that using the wiki for group work would have been better and 46.7 percent supported the discussion board as a better method. This suggested that campus students favored use of technology for group work.

SPSS® was used to compare the mean responses of online and on campus (face-to-face) student responses on group work at the graduate level. An independent t-test was conducted and a statistical difference was found between online and on campus students on two items: “Face-to-face meeting for group work is not a realistic expectation for graduate students”

($t_{(59)} -2.117, p = .038$) and “Online students should not have to participate in group projects”

($t_{(63)} 4.270, p = .000$). Examination of the mean response to the item “Face-to-face meeting for group work is not a realistic expectation for graduate students” revealed a higher mean response for on campus (face-to-face) students ($M= 2.4677, SD = .82$) compared to the online students ($M= 2.0571, SD = .73$). Responses were coded as Strongly Agree =1, Agree = 2, Disagree = 3, and Strongly Disagree =4, thus online students were in stronger agreement that meeting face-to-face is not a realistic expectation for graduate students. Additionally, a review of the mean response for the

second item, “Online students should not have to participate in group projects”, showed on campus students were in stronger agreement ($M=2.1613$, $SD= .82$) than online students ($M = 2.9412$, $SD .65$). More on campus students considered group work not conducive to the online environment.

Conclusion:

Previous research had indicated the importance for instructors to provide opportunity for student collaboration through use on online tools such as wikis, discussion boards, and group projects. In this study, these tools were utilized in a graduate course on Lifespan Development and Learning with two online sections and one campus section. Students in all three sections completed two group projects for course assignments. In each section, students were randomly assigned to groups and the same group completed both assignments. The two online sections completed the first assignment in a discussion board format and the campus section completed this in a face to face format. All three sections completed the second assignment through creation of a wiki.

Students interacted with content through work on a graded course assignment. Students interacted with classmates as they collaborated together to complete the assignment. Students interacted with the instructor through email communication for guidance and clarification on the assignments and through instructor feedback per grading.

This study confirmed both benefits and limitations of collaboration modalities for student group work such as wikis, discussion boards, and group tasks. Benefits were indicated for students as well as institutions and instructors. This study indicated some additional considerations for educators as they integrate student collaborative work into courses. Information on these benefits and limitations were obtained through student completion of the survey and through student feedback on University end of course evaluations.

This study examined overall receptiveness of students to collaborative work on assignments. The majority of study participants indicated that collaborative group work was a valuable learning experience (89.4 percent), that group work was beneficial for both online and campus students (86.2 percent campus students and 60 percent online students). Additionally, 93.9 percent of participants indicated that group projects do build collaboration skills. Even with noting the benefits of collaborative work on assignments, 57.6 percent of the participants indicated that they would rather work alone than in a group. So, even though the participants recognized the value of collaborative learning, working alone was more appealing. Additional research is needed to investigate this dichotomy.

Both online students and campus students affirmed the benefit of technology use to facilitate group project work (89.1 percent for online groups and 92.3 percent for campus groups). This supports supplemental use of technology tools such as discussion boards and wikis with campus classes along with face to face group work. Technologies can expedite group work by providing a virtual platform for collaboration reducing the time and effort needed for meeting face-to-face in the same location. Other emerging technology platforms should be investigated for their efficacy in facilitating online group work. As online education continues to flourish, technologies with the capacity to build collaborative learning environments will become increasingly important.

Survey questions assessed student comfort with discussion boards, wikis, and face-to-face groups. Comfort was greatest with the discussion board at 97.2 percent compared to comfort with the wiki and face to face - the wiki was 89.3 percent and face to face 87.1 percent. This might be explained to some degree by the greater familiarity that students already had with the common usage of discussion boards in both online courses and as a supplement to campus courses – such as with occasions when class sessions might be cancelled due to weather emergencies or attendance of an instructor at a professional conference. The wiki, although becoming a more commonly used technology tool, was a new tool for most students in this study.

Student responses supported ease of communication for all three modalities. The discussion board was perceived to have the greatest ease of communication with 97.2 percent response, the wiki was next with 81.6 percent, and face to face communication was 74.2 percent. This could be explained through student factors such as cultural differences of members or lack of participation by group members (Kony-Foget, et al. (2013). Participation is more readily visible in view of discussion boards as contributor names are listed and one must click on the name of the contribution in order to view it. Wikis have content contributions in a chronological order as entered. An instructor or other person has to scroll through the wiki content to note who has participated. Face to face communication can be influenced by natural conversational dominance and reticence of group members.

All three modalities were perceived to have efficacy in collaboration and as a way to present completion of an assignment. The wiki was rated as the best way to present information with 86.2 percent, followed by 82.9 percent for the discussion board, and 71 percent for face to face presentation. The discussion board was perceived to offer the best method for collaboration with 91.2 percent, followed by 86.3 percent with the wiki, and 80.9 percent with face to face. In both areas, ratings could be influenced by the structure of the modalities as well as student factors.

The results of this study support both benefits and challenges noted in previous literature on integration of student collaboration in group work on course assignments. Both online and face-to-face students valued the collaborative group project. Technology provides online students equal opportunity for social interaction and enhanced learning experiences that otherwise might elude them. This study further provided comparison and contrast between the three collaboration modalities of discussion boards, face to face groups, and wikis. Additional research is indicated to analyze benefits and challenges of these modalities and others on multiple types of assignments.

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