

Using the Online Learning Environment to Develop Real-Life Collaboration and Knowledge-Sharing Skills: A Theoretical Discussion and Framework for Online Course Design

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Abstract

Previous research has suggested that effective collaboration and knowledge-sharing skills are crucial for successful employment in the modern economy where much professional work is now done in teams. Many of these teams involve participants who are not co-located geographically and who communicate with each other through online media. If current faculty are to prepare students to enter this modern workplace, they must prepare them to succeed at online collaboration and knowledge sharing. This article examines the theoretical basis for using collaborative online learning techniques to teach library and information (LIS) students. It provides examples from a newly-designed three-course online Competitive Intelligence and Knowledge Management (CI/KM) concentration to demonstrate that the online environment is well suited for developing collaboration and knowledge-sharing skills and to illustrate how a number of collaborative techniques can be used in a real online class to develop a sense of community among students. The examples indicate that collaboration and knowledge sharing, while not always easy to achieve, are fostered in the online learning environment and that students become more comfortable with collaborative techniques over time. The article also presents a framework for online course design that maximizes the benefits of collaboration and knowledge sharing.

Keywords: Collaborative learning, knowledge management, group work, learning techniques, library and information science education, course evaluation

Background

Online environments have changed the ways in which Library and Information Science (LIS) faculty prepare their students to enter the working world by allowing them to simulate, in the online classroom, collaboration and knowledge-sharing situations that students will meet when they leave academia. Self-managing teams, communities of practice, and virtual organizations are commonplace among the environments in which students currently enrolled in LIS programs may work when they complete their degrees. This paper examines the theoretical basis for using collaborative online learning techniques to teach students and presents the results of observations of and feedback from LIS master's degree students exposed to these techniques as part of a newly-designed three-course Competitive Intelligence and Knowledge Management (CI/KM) concentration delivered in the online learning environment.

LIS students today are looking increasingly toward online programs as a way in which to obtain critical job skills. According to the American Library Association website, as of July 2009, 46 of the 57 accredited LIS master's programs in the U.S., Canada, and Puerto Rico offer online courses (<http://www.ala.org/Template.cfm?Section=lisdirb&Template=/cfapps/lisdir/index.cfm>). Convenient as

online programs may be in terms of scheduling, many students bemoan the lack of a sense of community with classmates in their online courses. Fostering a collaborative and knowledge-sharing environment is essential when students may live in different geographical areas and meet in virtual classrooms; these skills transfer directly to the workplace where employees may find themselves located half way around the world from others in their organizations. Students in the CI/KM concentration focus on designing knowledge-sharing opportunities within organizations to support strategic decision making. The CI/KM concentration leverages the online learning environment to provide a real-life, problem-based approach to teaching the collaboration skills that students will need to become successful information professionals in the modern economy. This article will show how careful course design based on the principles of learning via collaboration and knowledge sharing can build a sense of community among online learners.

Literature Review: Collaboration and Knowledge Sharing in Online Learning

Two crucial concepts that underlie this analysis are “collaboration” and “knowledge sharing.” While the two concepts are related, they are generally used differently in the research literature.

Both involve the exchange of information among multiple people. In academic settings, “collaboration” is usually connected with student work on assignments, discussions, or other joint learning activities. Ingram and Hathorn (2004) suggested that people often conflate “collaboration” and “cooperation,” yet these are two distinct concepts. They defined “collaboration” as more complex than “cooperation,” in which students simply “split an assignment into roughly equal pieces to be completed by the individuals and then stitched together to finish the assignment” (p. 216). True collaboration, they wrote, involves:

a more complex working together. Students discuss all parts of the assignment, adding and changing things in conjunction with one another as they come to understand more about the topic. At the end, the final product is truly a group product, in which it is difficult or impossible to identify group contributions (Ingram and Hathorn, 2004, p. 216).

The authors went on to specify that true collaboration consists of three critical elements: participation, interaction, and synthesis.

“Knowledge sharing” focuses more heavily on the knowledge exchanged. Hendriks (1999) stressed that “knowledge” resides within human beings:

Knowledge is not like a commodity that can be passed around freely; it is tied to a knowing subject.... It takes knowledge to acquire knowledge and, therefore, to share knowledge. Knowledge sharing presumes a relation between at least two parties, one that possesses knowledge and the other that acquires knowledge (p. 92)

He went on to suggest that knowledge sharing is comprised of two sub-processes. In the first, the knowledge holder makes internally held knowledge externally available:

This externalization can take many forms, including performing actions based on this knowledge, explaining it in a lecture, or codifying it in an intelligent knowledge system.... Knowledge externalization does not have to be a conscious act, nor does it have to be aimed at being shared by others. For instance, we can learn by watching someone perform a task, even if this person is unaware of the specific knowledge needed for the task, or unaware of being watched (p. 92)

In the second sub-process, a new person internalizes the knowledge. For those seeking to gain knowledge, “Internalization, too, may occur in many different forms, including learning by doing, reading books, or trying to understand the codified knowledge in a knowledge base” (p. 92)

Many authors (e.g. Johnson & Johnson, 2007; Parente et al., 2007) have suggested that effective collaboration and knowledge-sharing skills are crucial for successful employment in the modern economy. As Johnson and Johnson wrote:

We live in an historical period in which knowledge is the most critical resource for social and economic development, and people need to be able to participate in a networked, information-based society. Whereas previously people engaged in manufacturing-based work where they generally competed with or worked independently of each other, now people engage in

information- and technological-rich work where they work in teams. (p. 785)

Toward this end, the teaching of collaboration and knowledge-sharing skills is essential. However, some authors claim that there has been a widespread failure of schools at all levels to teach these skills (e.g. Johnson & Johnson, 2007). As Roberts (2004) pointed out, although “collaborative learning itself is hardly a new idea...almost all formal learning today, particularly at university level, still takes place in an environment in which students are expected to learn individually” (p. vi).

Educational Benefits

Why promote collaboration and knowledge sharing in the online classroom? First, when working together students construct new knowledge, often understanding course content better and retaining it longer than via individual learning (Dawley, 2007; Johnson & Johnson, 1990). Ashcraft, Treadwell, and Kumar (2008) explained that: “Collaborative learning...whereby students interact and build on each other’s ideas, is constructivist in nature” (p. 110), provided that meaningful interaction takes place among students throughout the learning process.

In addition to facilitating the acquisition of course content and concepts, collaborative learning also promotes learning how to work in group settings. For example, Kemp (2006) showed that learning in online environments is well-suited to the development of teamwork skills.

A third educational benefit is the development of critical thinking skills. Du, Durrington, and Mathews (2007) surveyed 24 university students to understand students’ perceptions of the purposes and goals of online discussions. Students felt that online discussions led to increased critical thinking skills, and they also found the achievement of stated course goals easier and more efficient when an online discussion component was included as a part of the course. Many researchers have shown a connection between collaboration and increased critical thinking skills as well (e.g. Abrams, 2005; Lock & Redmond, 2006).

Of course, all of these benefits are contingent on effective teaching practices. Instructors cannot simply translate their face-to-face teaching practices into an online setting, but must tailor their teaching to the online environment. Especially important is clear communication with students about the online learning process, including both expectations of student behaviors and explanations of the benefits of online collaboration and knowledge sharing (Lewis & Abdul-Hamid, 2006, p. 89).

Technology, Collaboration, and Knowledge Sharing

These educational benefits are not limited to learners in any one discipline, nor are they limited to online learning. However, online learning environments are particularly well-suited to teaching and learning through collaboration and knowledge sharing due to systems affordances and other aspects of online environments. As online instructors have increasingly come to recognize this, “Online learning has moved from a teacher-directed and static content environment to a constructivist environment that is learner-centered and collaborative” (Lock & Redmond, p. 234).

Palloff and Pratt (2005) identified two waves of online education. In the first wave, which lasted from the 1990s until early in the first decade of 2000, online learning was largely self-directed. Instructors typically posted class notes and other materials online and asked students to post reactions to them, with little interaction among learners. With the advent of the second wave, new online delivery methods began to promote increased student-to-student interaction, and a new focus on constructivist learning emerged. Online instructors now began to emphasize the learners’ search for meaning, tying personal experiences to the learning process, and focusing on learning through collaborative problem solving. This second wave of online education is much more interactive than the first wave, with students collaborating and sharing knowledge via a number of teaching/learning techniques and via a host of new interactive social software applications.

In this newer model of online education, the instructor is more a learning facilitator than a deliverer of information, as is standard in constructivist educational models (Young, Shaw, Cantrell, & Thompson, 2001). As Li & Akins (2005) explained:

The shift toward a constructivist philosophy in the last two decades [of education in general] calls for a shift of focus to students, and this shift is especially important for online education.... Students and instructors actively search for new information, learn from each other, and

advance knowledge. (p. 58)

In addition to promoting increased learner interaction, technology can help to reduce some of the common barriers to effective knowledge sharing, such as distance barriers and time constraints between participants (Hendricks, 1999; Ruggles, 1997). System affordances that facilitate collaboration can lead to increased student interaction, even beyond that which typically occurs in a physical classroom setting (Chou & Chen, 2008).

However, for learners accustomed to learning in face-to-face environments, and for those more familiar with individual teaching/learning techniques, the switch to learning in this new, interactive and collaborative online educational format can be difficult. As Conrad and Donaldson (2004) explained:

Interaction and collaboration [are] not intuitive to many adult learners who have been educated in a predominately lecture-based environment. Initially, a learner may be more comfortable in a passive student role and will need guidance and the opportunity to become more involved in an online learning environment. (p. 9)

Learner satisfaction and engagement are increased when students make social connections with other students (Anderson & Simpson, 2004). As a result, a crucial factor in facilitating collaboration and knowledge sharing among students is building a sense of community among course participants (Lewis & Abdul-Hamid, 2006; Hanna et al., 2000; McElrath & McDowell, 2008). As a case in point, Northrup (2002) administered the Online Learning Interaction Inventory to 52 students in an online master's program. The majority of the respondents felt building a sense of community was critical to success in online learning.

Developing Collaboration and Knowledge Sharing Skills in the Online Learning Environment

The following section describes the development and implementation of a new three-course concentration in Competitive Intelligence and Knowledge Management (CI/KM). The CI/KM concentration is an optional course of study within the master's degree (MS) of library and information science. Students pursuing the MS can choose to complete the entire degree online or on campus, or they can take a mixture of online and face-to-face courses. However, the required three-course sequence for the CI/KM concentration is only offered online.

Developing the students' collaboration and knowledge-sharing skills was an implicit objective in the design of each of the three courses in the concentration, as was fostering a sense of community among the students. The three-course concentration sequence was launched in September 2008; all courses were taught by the same instructor. A total of 38 students took at least one course in the concentration during academic year 2008/2009; four students took two of the courses, and three students completed the three-course sequence. Student performance related to collaboration and knowledge sharing was observed in each of the courses, and student feedback on what techniques had and had not worked was collected at the end of each course in optional surveys. While the number of students completing the full three-course sequence during the first year is small, observations drawn from those students provide valuable input for the course design and evaluation process. As has been noted by Yin (1994), "Even a single-case can often be used to pursue an explanatory, and not merely exploratory, purpose." (p. 46)

Course Design

The basic online course design used BlackBoard as its course management tool. Since the first course in the concentration is an advanced-level master's course, most students who entered the concentration were already familiar with the BlackBoard online environment. Each course in the sequence included a welcome message from the instructor detailing expectations regarding collaboration and knowledge sharing:

I believe that teaching and learning are symbiotic experiences in which both the students and the instructor must participate actively to achieve understanding of the subject matter. Each person will bring a different set of experiences to the class that will benefit others, and active participation in all class discussions is expected. Interaction with your colleagues is important to your learning experience and will be weighed heavily in your final grade.

During the first week of each course, students were required to introduce themselves online and share,

in addition to some basic information about their background, an interesting fact about themselves that could provide a basis for establishing an online relationship. During the introduction phase of the first course, students volunteered information such as where they lived (all across the United States and, in one case, in Germany), their marital status and the number of children and pets they had, and their interests in various hobbies ranging from horseback riding to playing ice hockey. The online discussion, which averaged four postings per student, also included a lively exchange on the pros and cons of online courses, in which students commented on the trade-offs between the convenience of the online environment with the appeal of face-to-face interactions. One student wrote, "While online classes are very convenient and allow the students to learn a great deal, those 5 to 10 minutes of chatting with classmates before class is also very valuable." With this common perception on the part of students in mind, one goal of the course design was to build a sense of community within the class that would create an environment in which collaboration and knowledge sharing could occur.

Opportunities for Collaboration and Knowledge Sharing

Each course used a combination of small group and full class discussions and assignments. The first course in the sequence introduced the use of a Reading Blog in addition to regular online discussions to encourage students to share relevant material with one other. The second course in the sequence introduced the use of a class wiki to encourage collaboration. The students were also encouraged to experiment with Jing, a program that adds media richness to presentations by allowing students to record audio segments while capturing screen activities, such as PowerPoint slides. Based on student feedback on the first two courses, the final course in the sequence used both the blog tool and Jing. At the end of each course, students were asked to evaluate their own participation in the course and to comment on their reactions to the various opportunities they had had for developing collaboration and knowledge-sharing skills.

Analysis of Student Course Feedback

Written comments on student course evaluations from the three courses were aggregated, and the resulting body of data was analyzed for recurring themes relating to students' learning experiences. These themes were then organized into the three broader categories: 1) keys to success in online teaching via increased collaboration and knowledge sharing, 2) educational benefits of online teaching via increased collaboration and knowledge sharing, and 3) drawbacks to teaching via online increased collaboration and knowledge sharing. Each of these broader categories and the sub-themes that fall under them are explained below. Data excerpts are included to clarify each theme and to serve as proof of their existence within the data, employing a discursive strategy in reporting the analysis of qualitative data (Lindloff, 1995, p, 234). The full list of broad categories and sub-themes appears in Table 1.

Table 1. An Online Course Design Framework for Maximizing Student Collaboration and Knowledge Sharing

Keys to Success	Educational Benefits	Drawbacks
Instructor behaviors:	Connection to practice	Technology overload
1. Participation/engagement	Peer-to-peer learning	Technological learning curve
2. Personalization	Student control	Technological incompatibility
3. Facilitation of learning	Teamwork skills	Student resistance
Student behaviors:	Critical thinking skills	
1. Peer interaction		
2. Equal participation		

The students from all three courses listed a number of keys to successful teaching/learning via collaboration and knowledge sharing. These key factors fell into two sub-categories: 1) instructor behaviors, and 2) student behaviors.

The most commonly mentioned key instructor behavior was participation/engagement. Students agreed that the more active the instructor was during the course and the more interested she appeared to be in both the topics of study and in student learning, the more they learned. As one student wrote: “[I learned the most when] the instructor engaged with both the individual and groups.” Another wrote that “[The instructor’s] level of engagement in the discussions, including in the small group forum, was invaluable. This is not something every professor attempts, and in my opinion, those classes really suffer.” Students stressed not just the amount of instructor participation in the course but also the quality of instructor interaction with students as key to increasing their learning: “[The instructor’s] attention to interacting with the class on the discussion board [was] outstanding and really [did] make a difference.”

Next, students tied the instructor’s personalization of the course to increasing their own engagement. Personalization methods included the student introduction forum at the beginning of each course, as well as other techniques designed to help students think of their peers and the instructor as real people, despite never meeting them in person. Personalization methods also help to develop a sense of community in which the students feel comfortable sharing. “The feedback from [the instructor] was very helpful and I appreciate the immediate response and reminders she gave throughout the course. This was a wonderful learning experience and I plan on applying much of what I have learned in my job setting. Sorry we didn’t discuss cats! :) I have two new kittens and would have loved to share that! “

Keys to Success in Online Teaching via Increased Collaboration and Knowledge Sharing

The course introduction technique proved to be especially popular with students: “I do think an introduction (just like what you already have included) with some pictures and Jing might increase the personalization of the course and give you even greater accessibility.” Another student said that “It was also interesting to hear the voices of some of my classmates via our [online] conference calls, which made the experience unique.” Still, students would have liked even more personalization built into the courses: “At times, I felt very disassociated from the rest of the class and thus indifferent to various course topics I had less experience with.... It would [have been] nice to ... put a voice to what is a virtual person in a virtual world.”

The final key instructor technique involved the instructor’s role in facilitation of learning, as described in the literature review. For example, one student commented that “The moderator role [the instructor] played really helped me learn and appropriately reinforced or improved my understanding of the material.” Another explained that:

Some of the best learning opportunities arose from [the instructor’s] very insightful comments in the weekly postings and blogs. It prompted us to think beyond our initial remarks and to try to focus on CI concerns. Do not stop doing that! These very personal and specific comments made us all realize there were other steps that still needed to be taken -- that what we had created was still a work in process, not a completed project.

Students also identified two key student behaviors tied to their successful learning via online collaboration and knowledge sharing. Many students commented that student interaction added to their own learning. A few students expressed preferences for real-time communication technologies, such as conference calls and chat utilities, explaining that slower communication platforms, such as wikis and discussion boards, reduced student interaction and consequently their own engagement:

In a separate course I took part in the online chat tool that is part of BlackBoard. Although I was skeptical at first, within a very short period of time I found it invaluable. The group projects would benefit greatly if the students were encouraged to similarly chat - certainly as part of brainstorming the initial topics. The Discussion Board is a bit too asynchronous to encourage immediate engagement.

In general, students enjoyed the increased opportunities to communicate directly with other students, instead of limiting their contact to communicating with the instructor. As one student wrote about the course blog and wiki pages, “I liked the opportunity to leave comments for fellow students.”

Students also stressed that equal participation in small-group work and other collaborative settings was vital to creating a successful learning community. As one student wrote:

Of all the group projects that I have done over my college career, this was one of the best groups I have ever worked with. Everyone showed up to our phone conferences on time and with their assignments done. There was no snarkiness in our group. Everyone was mature enough to take constructive criticism and have some of their work trimmed. Really - this was an amazing group.

Other students found their groups to be less effective due to unequal student participation: "This was my third group project [in the program] and I pray that it was my last group project. The experience was irritating and frustrating because the [interpersonal] issues caused distractions, but in the end [the other students in the group] and I overcame the distractions and worked well together."

Educational Benefits of Online Teaching via Increased Collaboration and Knowledge Sharing

These key instructor and student behaviors led to a number of educational benefits from learning via online collaboration and knowledge sharing. The most frequently mentioned benefit was the connection to practice. Students wrote that they expected their professional lives to include a great deal of collaborative online work, and that they found the chance to practice this type of work highly valuable, both in learning to use new social software utilities and in learning how best to work online with their peers. Comments included:

- "I enjoyed the opportunity to use the reading blog, as I utilize a blog and wiki in my work setting."
- "The group discussions forced me in a good way to participate and interact with my classmates in a manner that I have to interact with a variety of personalities and colleagues in the real world environment today."
- "The required group work has been invaluable to my own professional development."
- "Working with others helped me realize that CI work needs human sounding boards to come up with a better CI product. Group 1 actually used many tools that companies utilize in decision making (Jing, teleconferences, file shares)."

Another frequently mentioned educational benefit was peer-to-peer learning. Not only did students mention having learned from the instructor and from course materials such as assignments and required readings, but students also frequently wrote that they had learned valuable information and gained insights from their fellow students. One student wrote that "The group work has helped me to understand people's different point of views better." Another added that s/he "found the discussions to be the most engaging part of this class." Yet another student liked the blog assignment the best because it enabled her to learn from her classmates, which was "truly a wonderful learning experience."

Students frequently identified the blog as an ideal platform for learning from their peers. For example, students wrote that "I truly enjoyed reading my classmates' postings and their news blogs. It was interesting to see what other students found.... I know I definitely expanded my universe in this course," and that "I really liked the blog assignment. I not only learned from my classmates [about] where they found articles [but also about the] topics they selected."

In some cases, students who lacked significant work experience were able to learn from those with longer work histories. As two students explained, "The work experiences of classmates...was the most useful aspect of the course for my own professional development," and "[The best part of the course was] the insights generated from others with differing professional backgrounds via the discussion board."

Student control was the next sub-theme to emerge from the data. Because of the many collaborative and knowledge-sharing teaching/learning techniques built into the courses, students felt that they had greater control over course content and over the design of assignments: "I really enjoyed the Reading Blog It is a valuable learning tool and allows students the opportunity to learn and have a feeling of control over which articles are selected, instead of just having to read assigned articles and lectures." One student wrote that when working with her small group, she learned that "it is ok to speak up when I do not think we are on task." Another explained that "You feel responsible in a small group, as opposed to a larger group, to participate throughout the week."

Students also cited improvement in teamwork skills resulting from the course design, which included student group work lasting over multiple weeks of the course: "The continuous group work [over the term] made it easier to develop and understand the dynamic of the team." Again the connection to practice arose, as students recognized the likelihood that their professional lives will include collaborative work: "I learned that our group operated very much like a learning organization--we did not have all the answers or concepts available to us to solve problems--building up to gain knowledge on a particular topic." Another student learned that "we all do not see things or interpret things in the same manner" and the importance of recognizing differences of opinion and perspective when working with a group.

The final educational benefit was increased critical thinking skills. For instance, one student described the deeper level of thinking prompted by peer contributions to the course blog: "I found the reading blog useful because it helped me to really think about the readings and how I could apply what I learned to my own career." Another student suggested that different technologies promote different kinds of thinking skills, and that "the blog seemed like a place for reflection, while the wiki was for sharing info."

Drawbacks to Teaching via Online Increased Collaboration and Knowledge Sharing

Although the majority of the student feedback relating to learning via collaboration and knowledge sharing was positive, a number of negative themes recurred throughout the data. First, some students complained that due to the use of many different learning technologies, they suffered from technology overload. Examples of related comments include: "I found the blog frustrating because it always needed tending," and "I initially did not like the blog because it was hard to keep [up] with the discussion board and the blog... The assignment tried to do too much at once and folks got bogged down." A few other students complained that the use of multiple learning technologies led to duplication of effort and content: "I think that relying solely on the blog for both discussions as well as reading analysis would be more productive than having the redundancy of two discussion boards and a blog."

Similarly, some of the students complained that the new technologies created a technological learning curve that took time away from learning about discipline-specific course content. As their familiarity with the new technologies increased, however, the students typically overcame this barrier. As one student explained, with a previously unfamiliar technology "it may take a little bit to get going, but in the end we turn in a good product that address[es] the assignment or task that was presented to us in a timely, well-organized manner." Another student wrote simply, "I liked the wiki once I figured out how to use it."

Technological incompatibility was a related problem. With students in different geographic locations, and each with slightly different technological hardware and infrastructure, it is not surprising that some students had access and compatibility problems. As one student wrote: "Sometimes the use of technology can be a barrier to knowledge sharing since different software requires different hardware, and it doesn't always work real [sic] well for everyone."

In other cases, personal issues caused scheduling incompatibilities: "Initially I struggled to get involved in the group discussion because the group decided to use a different method for discussion [synchronous online chat rather than asynchronous postings], and in at least one instance I totally missed the boat because of life circumstances and situations."

Student resistance to new technologies and to new teaching/learning techniques also proved to be a barrier to learning. For example, one student acknowledged student resistance, but suggested that the learning benefits outweighed the resistance: "It is good for CI students to be on the edge of technology (even kicking and screaming)." In other cases, students who resisted full participation in the group learning activities proved to be a hindrance to group members: "I don't know if it was just my Small Discussion Group, but I felt I got nothing out of the few weeks we used those groups. The other students in my group posted very late in the week, which didn't allow for much discussion." This shows the importance not just of equal participation among group members, but of prompt participation as well.

Discussion

Observations of student performance and feedback from the students completing at least one of the three courses showed that collaboration and knowledge sharing did not necessarily come naturally. However, the experiences of the seven students who completed at least two of the courses in the CI/KM sequence suggested that students become more comfortable with collaborative online learning techniques over time. Postings on the Introductions forum for the second and third courses in the CI/KM

sequence included a number of personal exchanges between students who had been in previous courses in which the students caught up on family or professional news and wished each other good luck with their upcoming job searches. These postings demonstrated that a sense of community had developed among the students over time. This sense of community based on shared experience both with each other and with the instructor helped to foster a more open knowledge sharing environment. Observations of student behavior and comments from the students themselves indicate that the greater the opportunity for collaboration and knowledge sharing, the more likely the students are to interact with each other. Students reported positive reactions of varying degrees to all three collaborative tools (blog, wiki, and Jing); some barriers to the use of these tools were also identified. Student comments have been used to refine the design of the courses in preparation for their next iteration.

Conclusion

Within their course feedback and without researcher prompting, students identified the major hallmarks of constructivist learning as having contributed to their successful learning in the online environment. This indicates that the collaborative learning techniques and technologies used in the new courses did support constructivist learning. These hallmarks include the instructor acting as a learning facilitator, support for peer-to-peer interaction and learning, student control (in the sense of students taking an active role in planning and guiding their own learning), and learning as a social process, with increased personalization of the learning environment, and the development of a sense of community among the online students

These various insights from student course feedback, as summarized in Table 1 above, can serve as a useful framework for the successful maximization of collaboration and knowledge sharing in the design of online courses. Working to support the sub-themes represented in the first two sections of the framework (keys to success and educational benefits) while aiming to reduce the drawbacks represented in the third section can result in more interactive online courses that can provide students with many of the benefits of constructivist educational learning models and better prepare them for success in today's highly collaborative workforce.

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