The Impact of Collaboration Tools on Student Engagement

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Abstract

The purpose of this research was to examine the impact of collaboration tools on student engagement in an online educational context by analyzing current research and their results on the topic. The paper explores student engagement and its three levels namely behavior, emotion and cognitive. It further explores its relationship to collaboration to analyze the impact of such tools on all the three levels. The overall impact of collaboration tools on student engagement was found to be positive and they do help foster student engagement in an online setting. The findings also show that teacher intervention is essential for successfully achieving student engagement.

Information technology has become an inevitable part of education. Its advancement and innovation in computer hardware, software and communication technologies have enabled more universities and schools to conduct online programs and the number is increasing rapidly. A study conducted by Sloan Consortium (2009) reports that: (1) over 3.9 million students were taking at least one online course during the Fall 2007 term, a 12 percent increase over the number reported the previous year; (2) the 12.9 percent growth rate for online enrolments far exceeds the 1.2 percent growth of the overall higher education student population; and (3) over twenty percent of all U.S. higher education students were taking at least one online course in the Fall of 2007.

Many students choose online learning due to the benefit of being able to learn anytime at anyplace. But this separation of time and space may make the learner isolated and disengaged from learning. To overcome this problem, teachers create an environment inside the learning management system where people may interact and build relationships while participating in learning activities. As part of their course delivery method, online educational programs use collaboration tools like discussion forums, wikis, blogs, chat messaging, web/video conferencing, and online collaborative work spaces like Google Docs to enable student interaction and engagement. These tools provide a centralized location for students who are separated by distance and time, to work and learn online in a collaborative manner. Owing to the increase in the inclusion of collaborative activities in online courses, it is important for the educators to understand the effectiveness of these tools in achieving learning outcome. Do these collaborative tools succeed in properly engaging students in the learning process? This is an important question as students who are engaged in learning persist, despite challenges and obstacles and take a visible delight in accomplishing their work (Strong, Silver, & Robinson, 1995).

The purpose of this paper is to examine the question: how do online collaboration tools impact student engagement? This question is examined by analyzing current research on the topic to provide a reasonable answer. The paper will: (1) define computer mediated collaboration also known as collaboration tools; (2) analyze the relationship between online collaboration and student engagement; (3) define student engagement and its different levels: namely, behavioral, emotional and cognitive engagement; (4) analyze the impact of collaboration tools on these three levels of engagement; and (5) finally present the findings.

Computer Mediated Collaboration

Computer mediated collaboration can be defined as a 'group activity' where people who are separated by distance and/or time work together towards a common goal using computers and the internet. In the case of education, this can be a 'group activity' where students work together using the internet towards completing an academic task to promote learning. Computer mediated collaboration has become the primary method of interaction between student-to-student and student-to-teacher in online courses. This collaboration may vary from using a simple asynchronous communication tools such as email or discussion forum, to using synchronous tools such as instant messenger, web conferencing or audio/video conferencing. An asynchronous tool enables any-time, any-place collaboration, enabling the learners to participate in collaborative activities at their own time and space. A synchronous tool, on the other hand, enables real time collaboration providing immediacy to the learners. The tool referred here may be a piece of hardware, application software and computer networks that enable remote collaboration. Most learning management systems such as Blackboard, WebCT, Angel, and D2L include some form of collaboration tool or the instructor may suggest an external tool such as a wiki, blog or GoogleDocs. These tools as a communication medium, provide learners with the opportunity to exchange ideas and receive feedback from their peers. In a typical educational context, these tools allow learners to contact instructors individually, collaborate with peers and instructors, exchange resources, share experiences and ideas, provide feedback to each other, raise questions, and participate in debates and discussions. At the same time, they allow the instructors to contact their students individually, address them together, provide feedback and answers to individuals, facilitate collaboration activities, and provide remainders to deadlines. A good collaboration tool should promote communication; share a diagram, photograph, paper, or similar objects; allow natural interactions; and be easy to use and learn (Lomas, Burke, & Page, 2008).

Online Collaboration and Student Engagement

Teachers constantly strive to create an environment where students are actively engaged in the learning process. Student engagement is essential for motivating them to acquire knowledge. When a study raised a question about the kind of work that engages students and teachers the most, both of them responded overwhelmingly that the most engaging work was often collaborative as it allowed for creativity, sparked curiosity, and resulted in a feeling of accomplishment (Strong, Silver, & Robinson,

1995). Students often collaborate to solve problems or achieve more effective learning through cooperation (Johnson & Johnson, 1998). Even shy students may be very active and engaged online, as there is no time restriction or interruption for their online participation in class activities (Harasim, 1990). One of the best ways to achieve a deeper understanding, or a higher level of learning, is through online collaborative learning (Klemm & Snell, 1996). This is in agreement with Vygotsky's (1978) zone of teaching proximal development which focuses on cognitive development and presents the view that learning in a social context enables learners to refine their thinking, building or 'constructing' new ideas from their existing knowledge and achieving a deeper understanding than if they were learning alone. Educational research suggests that interaction is one of the most important components of teaching and learning experiences (Moore, 1993; Vygotsky, 1978). Online educational environments use collaborative tools to facilitate interactions by providing an arena where the learners can interact with peers or mentors who challenge and scaffold their learning. Instruction ideally occurs in an environment where learners use socially mediated and intellectual tools to achieve cognitive development (Rogoff, 1990). Before delving into the impact of collaboration tools on student engagement, it is essential to understand student engagement in detail.

Student Engagement: Defined

Early studies often assessed 'student engagement rates' based on time-based indices (Fisher, Berliner, Filby, Marliave, Cahen, & Dishaw, 1980; McIntyre, Copenhaver, Byrd, & Norris, 1983; Brophy, 1983). Motivation and engagement are used synonymously and the words are used interchangeably (National Research Council & Institute of Medicine, 2004). Student motivation is defined as "student's willingness, need, desire and compulsion to participate in, and be successful in, the learning process," (Bomia, Beluzo, Demeester, Elander, Johnson, & Sheldon, 1997, p. 3). Students must be actively engaged in the learning process rather than passive receivers of knowledge. Newmann (1992) describes student engagement as "psychological investment in learning" (p. 3). He also characterizes 'meaningful engagement' as "active involvement, commitment, and concentrated attention, in contrast to superficial participation, apathy or lack of interest" (p. 11).

Levels of Engagement

Research suggests that engagement in the context of student learning happens at multiple levels or domains. It is conceived as the interaction or fusion of behavior, emotion and cognition in the process of learning (Fredricks, Blumenfeld, & Paris, 2004). Skinner & Belmont (1993) foretold the same as children who are engaged in learning show sustained behavioral involvement in learning activities accompanied by a positive emotional tone. Therefore research portrays student engagement as a multifaceted construct and divides it into behavioral, emotional and cognitive engagement. However, Fredricks, Blumenfeld, and Paris, (2004) consider that these factors are dynamically interrelated within the individuals and that they are not isolated processes.

Finn (1993) identifies behavioral engagement as regular participation in classroom and school activities. By participation, he means, paying attention to the teacher, responding to directions or questions initiated by the teacher, and initiating questions and dialogue with the teacher. He also emphasizes positive conduct such as effort, persistence, concentration and attention and concludes that negative conduct such as inattentiveness or withdrawn behavior will lead to detraction from learning. Behavioral engagement also concerns involvement in learning and academic tasks, and includes behaviours such as effort, persistence, concentration, attention, questioning, and contributing to class discussion (Birch & Ladd, 1997; Finn, Pannozzo, & Voelkl, 1995; Skinner & Belmont, 1993). Thus behavioral engagement may be summarized as rule-following, adherence to norms, participation, attention, and persistence.

Emotional engagement refers to students' affective reactions in the classroom, to classmates, learning and school, including interest, boredom, happiness, sadness, and anxiety (Connell & Wellbom, 1991; Skinner & Belmont, 1993). Affective reactions include student attitudes towards learning, and sense of belonging in school. Emotional engagement can range from simple liking to deep valuing of, or identification with the institution (Fredricks, Blumenfeld, & Paris, 2004). Identification refers to a sense of belonging and value with the institution. Therefore emotional engagement can be summarized by positive and negative reactions emoted by students in the classroom such as interest, anxiety, and boredom.

Corno and Mandinach (1983) argue that cognitive engagement is observable when the learners are giving sustained, engaged attention to a task requiring mental effort, and authentic useful learning is produced by extended engagement in optimally complex cognitive activities. Further, they suggest that the highest form of cognitive engagement is self-regulated learning, where learners plan and manage their own learning and have a high degree of personal control and autonomy. This means that the student is looking at a learning task or problem and plans to solve or complete the task strategically. Therefore, cognitive engagement can be summarized as a student's investment of time, self-regulated learning strategies, and mental efforts put forth willingly to interpret difficult and productive tasks or learning activities in order to achieve deep understanding and expertise.

Collaboration Tools on Behavioral Engagement

Participation in an online environment is often thought of as mere posting in discussion forums. However, actual participation involves actively taking part and exchanging dialogue. Evidence of participation includes paying attention to the teacher, responding to directions or questions initiated by the teacher, and initiating questions and dialogue with both the teacher and fellow learners. Learner participation is considered as an essential component for active and engaged learning by researchers. Collaboration tools enable learners' participation by engaging the teacher and learners in high levels of interactivity, while simultaneously maintaining freedom of time and place. By analyzing data from online discussions using the method of content analysis, student behaviors during the learning process can be demonstrated.

Zhu (2006) noticed two types of interaction in asynchronous online discussions: namely, star and interconnected. The star type of interaction was centralized. One person either a student or instructor who proposed a discussion topic or question acts as the point of centrality and connects members in the network while others remained isolated. The interconnected web type of interaction had more members with centrality. This type of interaction allows students to exchange, elaborate on, and challenge each other's ideas more frequently. Zhu concluded that while interaction can benefit learning and teaching, it needs to be nurtured carefully in accordance with course goals and learning objectives. Dennen (2005) also argues that discussion participation will not just happen on its own and that learners look to instructors to shape their interactions. This study examined how the design and facilitation of different types of asynchronous discussion activities impact student participation in terms of quantity, quality, timing, and nature of messages posted using a case study methodology on nine different online courses. The study indicated that: (1) interaction was higher when the instructors were actively involved in the discussion; (2) lack of structure in assignments affected student participation; (3) students did not know how much they had to contribute; (4) instructor feedback played an important part in students' motivation to participate in discussion; and (5) students showed motivation to interact when grade was attached.

Hara, Bonk, and Angeli (2000) observed that asynchronous conferencing was mostly student centered when the instructor forced students to assume the roles of teacher and discussion participants. However, most students posted just one message per week in order to satisfy the minimum course requirement. Most students did not make extensive use of the conferencing tool, but participated in this online discussion primarily to meet a course requirement.

Wang (2004) investigated the relationship between graduate student online visibility where visibility refers to the student's cognitive, social and emotive presence (measured as number of Blackboard discussion postings) and final course grades. The collaborative setting in this study included discussion board, live online chat, email and online profiles. A strong correlation was reported, suggesting that students with high academic visibility outperformed students who were less asynchronously active. On the contrary, Johnson (2005) found that even though students with fewer number of discussion postings predicted the lowest student achievement; students with higher numbers of discussion postings did not predict the highest student achievement. However, Johnson speculated that the limited asynchronous postings may have affected student achievement by reducing active involvement in e-learning. One of the negative aspects of asynchronous computer-mediated collaboration is the lack of continuity. Learners are often frustrated by the low frequency of participation or even non-participation by other members (Smith and Vanecek, 1988; Dufner, Hiltz, & Turoff, 1994). Dufner et al. (1994) even calls this "login-lags" and comments that it tends to create confusion and dissatisfaction among team members.

In another study, Chou (2002) scrutinized patterns of learner-learner interaction in a distance learning environment and compared interactions in synchronous and asynchronous systems. Students spent more time in task-oriented interaction in

asynchronous discussions than in synchronous mode. While synchronous communication showed more spontaneous frequent interaction, students in asynchronous communication mode gave more information than just asking questions. Similarly Mabrito (2006) observed that asynchronous sessions were more effective for collaborative writing than synchronous sessions wherein students spent less time focusing on course tasks. This study focused on examining the amount, pattern, and focus of interactions, as well as assessing students' attitudes toward communicating in the two different environments. The amount of interaction was more in synchronous communication where new topics were discussed with little or no follow up. However, in asynchronous sessions the students conversed less but ideas were more fully explored and students spent a longer time providing supporting evidence to other student's initial claims. The asynchronous interaction was also more productive compared to the synchronous interaction. This same argument is also echoed by other researchers who agree that discussions using asynchronous collaboration tools, such as discussion forums and email, are more serious, on task, and useful for group interaction than do synchronous tools such as online chat (Aitken & Shedletsky, 2002; Honeycutt, 2001).

When comparing two courses delivered asynchronously, while one was complemented with instant messaging, Hrastinski (2006) noticed that the class which used only asynchronous communication operated with higher levels of participation. However, when comparing students that adopted the instant messaging system with those that did not within the other class which had optional use of instant messaging system, it was found that the adopters operated with a higher level of participation. Therefore the findings were inconclusive.

Many researchers find using both asynchronous and synchronous collaboration tools in an online class yields better participation results. Locatis and his colleagues (2003) concluded that it is technically feasible to simultaneously stream videoconferences to large audiences and expand participation by chat. The participants connected using a multipoint video-conference that was webcast live and communicated with conference panellists and with each other via synchronous chat messaging. The videoconference, webcast and chat were entirely done over the internet. Ohlund, Yu, Jannssch-Pennell and Digangi (2000) also indicate that combinations of asynchronous and synchronous online discussions can maximize personal engagement. This study also concluded that those who used both modes of communication were also most likely to complete the required course activities.

Studies examined so far demonstrated that collaboration tools can foster behavior engagement. However, its effectiveness may be increased when the teacher is involved. The teacher may utilize many techniques to achieve this. Some of them may include: (1) planning and incorporating 'interconnected web' type of interaction; (2) aligning interaction in accordance with course goals and learning objectives; (3) actively involving in interaction with students by posting questions that raise curiosity; (4) providing feedbacks; (5) attaching rewards with interaction to increase motivation; (6) monitoring login-lags or low participation frequency by being a model; (7) steering

interaction towards productive tasks; and (8) understanding when and how to use asynchronous or synchronous tools during the course.

Collaboration Tools on Emotional Engagement

In internet terms, expression of emotions such as interest, boredom, sadness, anxiety, mood and other feelings can be described as social presence in online communities. Positive conduct is fundamental in cognitive organization, decision making, and thought processes. It also plays an important role to improve creativity and flexibility in thinking and problem solving (Isen, 1993). Previously, it was believed that collaboration tools do not have the capacity to support social and affective interaction, especially in text based asynchronous tools where the absence of visual cues was thought to reduce the possibilities for socio-emotional expressions. However, this argument has been disproved in later studies. While examining the kind of communications emerging during a graduate seminar in which the discussions were conducted using a listserv, Weiss and Morrison (1998), who initially expected a dry dialogue devoid of emotions, were surprised to find several instances of humor (54 instances out of a total of 464 messages), and some episodes of hurt feelings. Although the number of messages with emotion was small, this study proved that emotions were revealed in the communications.

Rourke (2000) explored the relationship between asynchronous, text-based forms of social communication and students' perceptions of the social climate of computer conferences. This study, a 21-item questionnaire, was administered to 74 students from 4 faculties. The study noted an increase in the perceived frequency of social expression, leading to positive ratings of social environment. Similarly, Hara, Bonk, and Angeli (2000) explored the frequency of social cues or acknowledgement in message transcripts from an online conference using asynchronous conferencing tool by content analysis. Social cues analyzed include a self-introduction, expression of feeling, greeting, closure, jokes, the use of symbolic icons, and compliments to others. The study showed that social cues were highest in the beginning weeks of the course and decreased as the course progressed and learners engaged in more intense online discussion and were highly focused on task. The early social cues helped participants feel more comfortable working together and to build common ground. This ability of the collaboration tools to create a social presence in an online learning environment remains central in forming an online community.

Collaboration activity can help to develop a sense of community, enabling the creation of an environment in which further collaborative work can happen. The relationship between collaboration and community are cyclical in nature where collaboration supports the creation of community and community supports the ability to collaborate (Palloff & Pratt, 2005). This is important as individual success or failure on the course depended upon the extent to which students were able to cross a threshold from feeling like outsiders to feeling like insiders (Wegerif, 1998).

Rovai (2002) determined in a study that there exists a relationship between sense of community and cognitive learning in an online educational environment. The study proved online learners who had a stronger sense of community and perceived greater cognitive learning felt less isolated and had greater satisfaction with their academic programs and possibly resulted in fewer dropouts. Collaboration tools integrated into the learning management system can prove to be essential for establishing a sense of community among online learners. While student using these collaborative tools strived to develop similar social relationships to those found in face-to-face classrooms, such relationships take longer to establish electronically (Hara, Bonk, & Angeli, 2000).

Johnson (2005) identified three types of alienation: peer alienation (i.e. I should get along with others better than I do); course alienation (i.e. the workload in this course is excessive, in this course, the marking system is unfair); and learning alienation (i.e. I get discouraged in school). In an investigation sought to understand the relationships between college students' alienation, academic achievement, and use of WebCT, he concludes that as peer alienation increased, all measures of student use of WebCT tended to increase. Apparently, as students experienced disconnection from peers, they sought virtual connection with course content using WebCT. As course alienation increased, students were less likely to utilize WebCT. Students alienated from the course may have been generally resistant to involvement with course materials and learning activities which included WebCT. As learning alienation increased, student use of WebCT tended to decrease. Students who rated themselves as discouraged in school accessed WebCT less than students who were not estranged from learning processes. Peer alienation and course alienation were not significantly correlated with any measure of academic achievement; learning alienation appeared most critical to student achievement, although all categories of alienation were related to student use of WebCT.

Wang and Newlin (2001) advocate simultaneous use of both asynchronous and synchronous communication for an online course to be successful. However, they indicate that the use of synchronous communication in web-based instruction can have a positive impact on the social interaction of the students and decrease the isolation felt by them in online classes. They: "…believe that online chats fulfill the promise of computer--mediated communication: it offers the opportunity for people who are geographically distant to feel interpersonally close to one another" (p. 3). They found that student interaction frequency for instructor query correlated significantly with final grades, and vice versa. Further, they note that instructors should monitor the frequency and type of chat room activity in order to predict student performance.

An investigation on the use of synchronous e-learning tools (Elluminate Live was used in the study) as a supplement to existing methods and strategies in online courses showed that the tool allowed educators to build connections with and among students more efficiently and increased the potential for interaction in online classroom (Schullo, Venable, Barron, Kromrey, Hilbelink, & Hohlfeld, 2005). Over ninety-one percent of the participant felt that the interactions with their classmates and/or instructor were effective when using the synchronous software. The study also revealed that the level of

technical skill of learner's and the availability of technical support impacted the students' perceptions about their ability to use the tool's interface. Also, the participants felt that the technology used enhanced their learning experience and did not seem to be resistant to it. The findings also attributed the success to the well planned structure of the session with clear learning objectives. These findings are in agreement with Schwier and Balbar (2002), who also confirmed that synchronous communication contributed to continuity and sense of community, but also concluded that these tools were less effective in dealing with content.

In his study, Chou (2002) observed a higher percentage of social-emotional interactions occurred in synchronous mode than in asynchronous mode. In synchronous mode, encouraged by the immediacy of message exchange, participants asked more personal questions and revealed more about their frustration or need for help with less hesitation. However, the social emotional interaction gradually reduced after the initial state of getting to know each other and concentration turned towards the task at hand.

Social presence, the degree to which participants in online environments feel affectively connected to each other, may also influence student satisfaction and ultimately lead to their success in the course. Student satisfaction in a collaborative learning environment can be described as the degree to which a student feels a positive association with his or her own learning experiences. It may have an effect on how they work together, such as whether everyone does his/her part of the work, whether group members can work with each other, whether group members remain on the task and whether there is a good working atmosphere in the group (Gunawardena, Nola, Wilson, Lopez-Islas, Ramı́rez-Angel, & Megchun-Alpı́zar, 2001). In general students using asynchronous collaboration tools were quite satisfied with learning collaboratively (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007). Dewiyanti and her colleagues in a study measured students' experiences with collaborative learning and assessed students' satisfaction after the course. The study results indicate that the average scores for all satisfaction variables are above the midpoint.

Swan and Shih (2005) explored in greater depth the nature of social presence and how it develops in online course discussions. Their study combined quantitative analysis of survey results from students enrolled in four online graduate courses, and qualitative comparisons of students with the highest and lowest perceptions of social presence. Results from both quantitative and qualitative analysis revealed significant correlations between perceived social presence and satisfaction with online discussions. The findings indicate that the perceived presence of instructors may be a more influential factor in determining student satisfaction than the perceived presence of peers.

Summarizing the facts presented in this section, despite earlier beliefs, the collaboration tools including asynchronous text-based tools promote emotional engagement. It was also established that synchronous tools were better at promoting emotional engagement than asynchronous tools. Some of the revealed emotions include self-introduction, expression of feeling, greeting, closure, jokes and compliments. These emotions in turn: (1) created a stronger sense of belonging; (2) increased social

presence; (2) eliminated isolation among learners; (3) increased student satisfaction; and (4) encouraged participation.

It is recommended that teachers may use synchronous tools in the beginning of the course to increase social presence, relationships and to avoid learner alienation. He may use asynchronous tools in later stages to increase on-task course activities. Simultaneous use of both kinds of tools is also suggested by some researchers to achieve the same results. It is also suggested that teachers make sure that all students are trained in using the tools earlier in the course. They may also make sure that resources such as training materials for the tools are accessible to the students. Lastly, the studies also suggest that presence of teacher during on-line education increases student's satisfaction.

Collaboration Tools on Cognitive Engagement

According to Zimmerman (2000), meta-cognitive strategies are prerequisites for self-regulated learning and are achieved in cycles consisting of (1) forethought, (2) performance, and (3) self-reflection. Meta-cognition and self-regulated learning are related and can be used synonymously. Meta-cognitive activities include planning how to approach a given learning task (strategy use, investment of time), monitoring one's understanding (self reflection on comprehension), and evaluating progress towards the completion of a task. This is basically the same as strategically approaching a problem which forms the basis for self-regulated learning.

Do collaborative tools foster the above qualities in learners? Self-regulated learning in a traditional teaching setting has proven to improve academic achievement (Zimmerman & Schunk, 1998). Does the use of online collaborative tools achieve the same results by fostering cognitive engagement? Using quantitative data analysis, Dabbagh and Kitsantas (2005) confirmed that collaborative and communication tools specifically email and discussion features embedded in learning management systems, support self-regulated learning processes such as goal setting, time management, and help-seeking. Further qualitative analysis amended the above findings with self evaluation and self monitoring. The study focused on different kinds of learning tasks, such as exploratory, dialogical, and collaborative learning tasks, and investigated the effectiveness of different web-based pedagogical tools embedded in learning management systems using quantitative and qualitative data analysis. Students perceived that collaborative and communication tools were primarily useful in supporting the self-regulated learning process of help seeking while completing assignments involving dialogical learning tasks and supported self-regulated learning processes of time planning and management and help seeking while completing collaborative learning tasks. The discussion feature allowed students to seek help in understanding the suggested readings by viewing others' postings, self monitor their understanding of the readings by reflecting on their progress during the discussion period, and articulating their understanding of the readings at their own pace.

The process of reading and reflecting was also foretold by Harasim (1990) that asynchronous learning networks can facilitate self-pacing and self directed learning and increase the time spent on task by reading and rereading a message and formulate a comment. It follows from this study that one size does not fit all, and that different learning tasks call for different types of pedagogical tools. Teachers as facilitators of learning should take this into consideration when planning activities on web based environments.

In a field experiment on undergraduate students to determine the joint effects of communication medium and teamwork, Benbunan-Fich and Hiltz (1999) found that the use of an asynchronous learning network enhances task performance, due to deeper reflection in asynchronous work. Here "asynchronous learning network" refers to the use of computer-mediated communication systems such as computer conferencing or news groups via the internet. The students were asked to develop a report solving an ethical case scenario with and without an asynchronous learning network. Quality of report was judged by clarity and organization of the ideas, concept application, correctness of the answers to the questions, and effectiveness of the recommendations. The studies show that the groups using an asynchronous learning network submitted better and longer reports than their manual counterparts. The use of the asynchronous learning network system enhanced task performance at the objective level (length of the final report) due to the ease of entering and editing the reports, and at the subjective level (quality of reports), due to the in-depth analysis and reflection of topics in an asynchronous environment. Also the combination of work in groups with the use of system resulted in higher perceptions of self-reported learning. Evidently asynchronous collaboration tools support self reflection of knowledge acquired, organization of ideas, student investment of time on task (evident from the length of report) and helps learners enhance task performance.

While examining collaborative learning as a process of knowledge construction in four studies involving different tasks, students, tutors and computer mediated collaboration systems, Veerman and Veldhuis-Diermanse (2001), found out that asynchronous media can provide student groups with more options to think and reflect on information, to organize and keep track of discussions and to engage in large-group discussions compared to synchronous media. Students using synchronous media underwent technical difficulties and had a hard time carrying out the tasks while the user friendly and transparent asynchronous media helped students exchange more constructive messages.

Does working in collaborative tools have an impact on cognitive processing? Schellens and Valcke (2005) confirm that interaction in asynchronous electronic discussion groups is very task-oriented, and reflect high phases in knowledge construction. The study observed that the proportions of task-oriented communication were larger when learners were given clear guidelines about discussion behavior expected of them and when discussions were monitored and evaluated by a teacher. It was also evident in the groups with a higher discussion activity with more messages performed at qualitatively higher level of knowledge constructions. This implies that stimulating

students in asynchronous discussion forums may lead to better learning results. Individual levels of cognitive engagement may be influenced by the instructor's encouragement and discussion facilitation, as well as by intrinsic motivation (Corno & Mandinach, 1983).

Investigating collaborative learning among non-proximate team members interacting at the same time by using desktop video conferencing, Alavi, Wheeler, and Valacich, (1995) observed that the distant teams showed higher critical skills and more commitment to their groups. One possible explanation for these effects as confirmed by them is the motivation derived from being able to interact in a rich collaborative environment with remote learners. Learners mentally engaged and educated each other through voice, video and shared software using the collaborative tool.

In a face-to-face learning environment cognitive engagement is observable when learners give sustained attention to a task requiring mental efforts. One way to identify sustained attention to task in an online learning environment is by examining the messages from asynchronous discussion forums for cognitive efforts such as attention to specific information, interpretation of concepts, analysis and synthesis of information, critiquing and reasoning various opinions and arguments, and making decisions. In a study of four university online classes, using content analysis (examining messages from online discussions) as a method of measuring cognitive engagement, Zhu (2006) found the levels of cognitive engagement ranged from low to high. The discussion messages providing explanation, analysis, and evaluation of course content showed higher levels of cognitive engagement. The activities of analysis and synthesis that are based on information and facts are evident in the transcripts. In contrast, the discussion messages providing or retrieving factual information, demonstrated predominantly low levels of cognitive engagement and surface level of information processing. Zhu also observed that the action of social sharing and knowledge construction did not come naturally because of the online discussions or the online learning environment, but because of the careful planning of learning activities and facilitation during the learning process. Further, for online class discussion to be effective, the discussion activity, as any other learning activities, has to be closely connected with student learning goals and course objectives.

A review of the studies examined in this section state that the collaboration tools, particularly asynchronous text-based tools support cognitive engagement in an online learning environment. Some of the aspects of learning process aided by these tools are goal setting, planning activities, time management, help seeking, self monitoring, self evaluation, self-pacing, deepening reflection, organization of ideas, and group discussions. These studies also suggest that the above stated aspects were further improved when the teacher carefully plans the learning activities and sets clear guidelines on the expected student behavior.

Conclusion

Advances in technology have changed the way today's world communicates and socializes. This is very relevant to the field of education too, and learners have adapted to new ways of researching, organizing, and processing information using technological tools.   In response to this change, educators are changing their educational environment and almost every institution has invested in learning management software with integrated collaboration tools. Knowing the impact of these pedagogical tools can be critical to the overall success of integrating them in course delivery to achieve educational success.

Although, some of the findings in this paper were inconclusive towards the impact of collaboration tools on student engagement, overall the findings suggest that these tools cultivate behavior, emotional and cognitive engagement in an online educational environment. The finding recommends choosing the right kind of collaboration tool in accordance to course needs as different tools are better in achieving different engagement levels. The findings are important as this will help us in identifying the gaps in the current tools and development of better tools to further improve student engagement. Another important aspect of the finding is to understand the teacher's role. Most of the studies prove that student engagement will increase with the use of collaboration tools if the instructor was present on the scene. It concludes that the collaboration tools provide an enriched play ground for online learning by improving student engagement. However, it is the responsibility of the teacher to plan and guide the learner to a deeper level of processing and understanding.

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