

PERSONALITY, INTERNET EXPERIENCE, AND E-COMMUNICATION PREFERENCE

Genevieve Marie Johnson, PhD

Department of Psychology, Grant MacEwan College Canada

Julia Ann Johnson, PhD

Department of Mathematics and Computer Science, Laurentian University, Canada

ABSTRACT

Ninety-three college students discussed four case studies using two CMC modes -- synchronous and asynchronous. Students completed a questionnaire that assessed: 1) perceptions and preferences with respect to CMC mode, 2) the personality characteristic of introversion-extroversion, and 3) previous experience using the Internet. Approximately 40% of students preferred synchronous chat rather than asynchronous discussion, 60% preferred face-to-face rather than synchronous chat, and 70% preferred face-to-face rather than asynchronous discussion. Introversion-extroversion was not related to student preference for synchronous chat versus asynchronous discussion but those who preferred face-to-face discussion were less extroverted than students who expressed the alternate preference. In general, students who preferred asynchronous chat had more experience with the Internet than students who preferred asynchronous discussion. Implications for e-learning are provided.

KEYWORDS

asynchronous discussion, synchronous chat, e-learning, introversion-extroversion, Internet.

1. INTRODUCTION.

There are two distinct modes of computer mediated communication (CMC) -- asynchronous and synchronous. Asynchronous CMC occurs in delayed-time (e.g., message boards) and does not require the simultaneous participation of discussants; synchronous CMC (e.g., chat rooms) occurs in real-time and requires the simultaneous participation of discussants (Thurlow, Lengel, & Tomic, 2004). Widely implemented in e-learning (Sabau, 2005), asynchronous CMC is reportedly useful for “encouraging in-depth, more thoughtful discussion; communicating with temporally diverse students; holding ongoing discussions where archiving is required; and allowing all students to respond to a topic” (Branon & Essex, 2001, p. 36). Burnett (2003) noted that “synchronous online chat has been largely ignored as a medium for productive group discussion between distance learning students and their tutors” (p. 247). However, synchronous CMC is increasingly recommended as an appropriate discussion format in higher education (National Center for Accessible Media, 2005).

1.1 Synchronous CMC: Instructional Viability and Student Satisfaction.

A considerable volume of research has examined the instructional utility of text-based synchronous discussion. Dickey (2003) described a study in which teachers and students made extensive use of synchronous chat. Reportedly, “learners often came to each other’s aid with explanations and clarification” (p. 112). Shotsberger (2000) evaluated a professional development program aimed at helping mathematics teachers implement professional standards. The program included WebBoard weekly synchronous chats that required participants to read material, brainstorm ideas for teaching, and reflect on implementation of standards. “All participants rated the opportunity to interact with other teachers on a routine basis and to share news about implementation efforts as either very effective or effective” (p. 54). Lobel, Neubauer, and

Swedburg (2002) evaluated an undergraduate course in which text and image-based lecture material were posted in real-time and students had real-time opportunities to branch into discussion groups. Approximately 70% of students participated in synchronous discussions with 331 interactions per hour, averaging 22 words per message. "There was no indication that students found it difficult to receive, assess, and respond to the information generated by the observed 'parallel communication' interactions" (p. 12). The authors speculated that high rates of synchronous discussion were the result of a learning environment that circumvented face-to-face social cues, thereby providing learners with less risk in self-disclosure.

Duemer and colleagues (2002) reported that synchronous chat was effective in developing a sense of community among engineering students. In a Multi-user Object-Oriented environment, first-year students discussed specific books related to their English literature course requirement. Students were required to participate in three of six real-time discussions led by graduate student mentors. All chat sessions were transcribed and analyzed to gain understanding of community formation in synchronous discussion groups. When pressured to adhere to deadlines, groups failed to advance to sophisticated levels of interaction. "Mentors who acted as authority figures were found to be detrimental to interactive behaviors such as exchanging and debating ideas, or sharing interpersonal information" (p. 6). Similarly, Burnett (2003) archived and analyzed online chat sessions in a distance education teacher training program. Chats occurred monthly and were intended to encourage student reflection on the relationship between theory and practice. "The study demonstrated that it is possible for tutors to address social, organizational, and intellectual aspects of discussion through online chat" (p. 258). However, some tutor communication (i.e., directing and summarizing) was interpreted as an attempt to reassert the uneven teacher-student power relationship -- a relationship that the medium appears to challenge.

1.2 Combining Asynchronous and Synchronous CMC.

Synchronous and asynchronous online discussion has been combined and contrasted in a variety of ways. Ohlund, Yu, Jannsch-Pennell, and Digangi (2000) presented teachers with online learning that including both email and chat sessions. Participants included 161 educators engaged in the development of collaborative teaching and Internet skills. Group leaders facilitated bimonthly chats and biweekly email exchanges. Use of the two communication tools was logged and coded into four binary variables: 1) use of email; 2) use of chat; 3) use of both email and chat; and 4) use of neither email nor chat. Individuals who used both synchronous and asynchronous forms of online discussion were the most likely to complete required course activities. Apparently, combined synchronous and asynchronous online discussion maximized personal engagement in learning.

Abrams (2003) compared the performance of students in a German language course under three instructional conditions: 1) synchronous WebCT chat; 2) asynchronous WebCT discussion postings; and 3) face-to-face small group collaborative assignments. Students in the synchronous chat rooms demonstrated the greatest increase in quantity of oral language production. However, "analyses of the quality of language indicated no significant difference among the 3 groups either lexically or syntactically" (p 157). To facilitate Spanish language learning, Pérez (2003) required first-year university students to engage in both synchronous online chat and asynchronous email dialog journals. While a higher number of words were produced in the chat rooms, there was no significant difference in new vocabulary across the two groups. Schwienhorst (2003) described a tandem learning network in which learners provided and received foreign language support using asynchronous email and synchronous chat. Reportedly, students in asynchronous tandem networks were more likely to complete required tasks than were students in synchronous networks. The researcher speculated that this was because student "attention is more focused on the task" and asynchronous email is more clearly "an act of learner autonomy" (p. 437).

Davidson-Shivers, Muilenburg, and Tanner (2001) assigned graduate students to either small group chat or threaded discussions to debate a designated topic. After one week, the groups switched discussion modes and another topic was assigned. During both weekly sessions, student chat sessions reflected more substantive messages (i.e., directly related to the prescribed topic) than did the asynchronous discussions. With regard to student evaluation, however, "results of the study indicate that both types of discussion are liked and should be considered viable options in on-line learning communities" (p. 351). In contrast, Shapira and Youtie (2001) reported an evaluative case study in which students ranked asynchronous discussion

higher than synchronous chat. Volet and Wosnitza (2004) analyzed transcriptions of synchronous and asynchronous cross-national student online discussion and found that both interactive mediums “showed a substantial amount of social interchange and meaningful learning” (p. 5).

Ligorio (2001) described a qualitative analysis of activities undertaken in a virtual world called *Euroland*. Communication formats available in *Euroland* included synchronous chat, asynchronous discussion, and visuals (e.g., virtual objects and photos). *Euroland* was designed, implemented, and evaluated by students, teachers, and researchers performing educational, cross-cultural, and interdisciplinary activities. Analysis of visual-iconic versus text-based communication and synchronous versus asynchronous communication suggested that an integration of modes provided for mutual enhancement of tool use. The interdependent nature of virtual tasks triggered both synchronous and asynchronous discussion which re-directed creative processes. Discussion boards (where ideas were stored for subsequent reflection) compensated for the immediacy of synchronous chat. “Once this complex reciprocal influence is activated, the community is able to undertake new activities combining and integrating the various communication tools available and thereby utilize all input available during each interaction” (p. 122).

1.3 Student Characteristics and E-Learning.

Research has demonstrated that a range of student characteristics influence e-learning preference and behavior. Johnson (2005) found that increased WebCT use in a hybrid learning environment was associated with inadequate peer relations. Cadieux (2002) reported that college students in face-to-face learning groups had stronger feelings of trust and interaction effectiveness than students in online learning groups, although “no significant relationship was found between sense of community and course grades” (p. 1). McConnell (2005), examining the dynamics of collaborative e-learning groups, noted that students’ sense of personal identity, control, and security were related to effective group functioning. Johnson, Howell, and Code (2005) proposed a range of student characteristics (e.g., anxiety, self-efficacy) by which learning is both positively and negatively affected in the context of online discussion groups. Reportedly, aspects of classroom climate (e.g., perception of teacher and peer support, academic alienation, orientation to learning) influence student behavior in online learning environments (Johnson, 2006).

Johnson (in press-a) reported a study in which college students made asynchronous postings in online study groups. Students permitted their course marks to be used for research purposes and completed a questionnaire that assessed a range of psycho-educational characteristics as well as personal interpretation of the online study group experience. Not all students equally perceived the benefits of online study groups, but such evaluation was not associated with academic achievement. Students who agreed with the questionnaire item, *I prefer face-to-face study groups rather than online study groups*, had the lowest course satisfaction, lowest internal locus of control, highest achievement anxiety, lowest perception of teacher support, and lowest academic self esteem. Apparently, preference for face-to-face interaction is not necessarily indicative of student psychological health or academic competence.

The personality dimension of introversion-extroversion has been linked to student satisfaction in online learning environments (Daughenbaugh, Ensminger, Frederick, & Surry, 2002; Kelly & Schorger, 2002; MacGregor, 2002). Extroverts tend to focus on the outer world of people and external events while introverts “focus on their own inner world of ideas and experiences” (Myers, 1993, p.4). Soles and Moller (2002) proposed that synchronous CMC is best suited to extroverts while asynchronous CMC is best suited to introverts. Daughenbaugh, Daughenbaugh, Surry, and Islam (2002) compared student satisfaction in online and traditional introductory computer science courses in terms of a range of personality characteristics including introversion-extroversion. Reportedly, “the data indicated that students rated as extroverts, rather than introverts, showed a stronger preference for the ways in which information is presented in online courses” (p. 72). Extroverts enjoyed synchronous and asynchronous CMC. Introverts, on the other hand, rarely engaged in synchronous chat and asynchronous discussion although some use of email was noted.

Predictably, experience with the Internet mediates student satisfaction with e-learning (Sharpe & Greg, 2005). An inverse relationship between Internet experience and Internet anxiety has often been reported (Chou, 2003; Joiner, Gavin, Duffield, et al., 2005). Rodriguez, Ooms, Montanez, and Yan (2005) surveyed 700 professional and graduate education students and reported that “comfort with technology was related to satisfaction with online course experience which was related to perceived quality; motivation to learn more about technology was also related to satisfaction of online learning experience” (p. 1). Johnson and Howell

(2005) compared two groups of education students; those whose use of WebCT was required for completion of course assignments and those whose use of WebCT was entirely optional. All students made pre- and post-course ratings of the perceived value of instructional technology. Reportedly, students required to use WebCT showed a greater overall change in attitude toward technology and made greater use of optional online course material relative to students whose use of WebCT was optional. "Requiring the use of technology in course work may generate favorable attitudes toward technology and thereby foster greater utilization of other available computer-based applications" (p. 179).

2. RESEARCH ISSUES AND QUESTIONS.

In a comprehensive review of the literature, Johnson (in press-b) concluded that "systematic and objective research on the instructional applications of synchronous online discussion is required." An important issue in addressing the instructional utility of synchronous CMC is exploration of student perception of and preferences for various forms of discussion (e.g., face-to-face, synchronous e-communication, and asynchronous e-communication) and determination of the characteristics that mediate such perceptions and preferences.

If given extensive, repeated, and equivalent e-learning experience with synchronous and asynchronous CMC:

1. What proportion of students report that they *most enjoyed* chat versus discussion? Does experience with the Internet and the personality characteristic introversion-extroversion relate to such perception?
2. What proportion of students express the perception that they *learned best* with chat versus discussion? Does experience with the Internet and the personality characteristic introversion-extroversion relate to such perception?
3. What proportion of students report a preference for face-to-face discussion rather than synchronous online discussion? Does experience with the Internet and the personality characteristic introversion-extroversion relate to such preference?
4. What proportion of students report a preference for face-to-face discussion rather than asynchronous online discussion? Does experience with the Internet and the personality characteristic introversion-extroversion relate to such preference?

3. RESEARCH METHODS.

Ninety-three college students used two WebCT communication tools (synchronous chat and asynchronous discussion) to discuss four case studies. Students ranged in age from 17 to 42 years (mean 21.4 years). Approximately 73% of the sample was female which is characteristic of the student population in the participating college. Comprehension of the four case studies was assessed with multiple-choice items on four in-class examinations, thereby maintaining student motivation to participate in the online discussions. To discuss the four case studies, students were randomly assigned to Discussion-Chat-Discussion-Chat or Chat-Discussion-Chat-Discussion. Alternating CMC mode in this manner resulted in half of the students engaged in synchronous chat and half of the students engaged in asynchronous discussion for each case study. This alleviated some of the challenges of scheduling real-time chat as well as providing students with equivalent learning experiences across the academic term.

A questionnaire was developed specifically for the study. Two questionnaire items assessed student perception of synchronous versus asynchronous online discussion. In response to the items, *during this class, I most enjoyed* and *I learned the case studies best when using*, students selected either synchronous chat or asynchronous discussion. Two items determined student preference for face-to-face discussion relative to both modes of CMC. For example, students selected yes or no in response to the item *I prefer face-to-face discussion rather than synchronous chat*. Four items assessed student previous experience with the Internet. Students rated each of these items on a 5-point scale (i.e., never, rarely, a few times a month, a few times a week, every day or almost every day). Table 1 presents the proportion of students selecting each rating-option for the Internet-use items.

Table 1. Previous Internet experience: Percentage of students selecting each rating-option.

Questionnaire Item	Never	Rarely	Monthly	Weekly	Daily
Prior to this class, I used the Internet.	0.0%	6.5%	11.8%	35.5%	46.2%
Prior to this class, I visited websites.	1.1%	4.3%	11.8%	40.9%	41.9%
Prior to this class, I played online games.	32.3%	36.6%	17.2%	10.8%	3.2%
Prior to this, class, I communicated online.	7.5%	12.9%	11.8%	36.6%	31.2%

NOTE. Unabbreviated rating-options: never, rarely, a few times a month, a few times a week, every day or almost every day.

The questionnaire included ten items from the *Eysenck Personality Inventory* (Eysenck & Eysenck, 1963) that measured student position on the introversion-extroversion continuum. Students selected yes or no in response to ten items (e.g., *I like working alone* and *I like plenty of excitement and bustle around me*). Summation of responses (in some cases reversed scored to ensure consistency of rating direction) resulted in scores that potentially ranged from 10 (extremely introverted) to 20 (extremely extroverted). For the sample of college students, introversion-extroversion scores ranged from 11 to 19 (mean 14.3, SD 1.9).

All CMC preference items required students to select one or two options (i.e., synchronous chat or asynchronous discussion, yes or no). This allowed categorization of students into two independent groups. Independent-sample t-tests compared the following groups: 1) Internet experience and introversion-extroversion scores for students who reported most enjoying synchronous chat and those who reported most enjoying asynchronous discussion; 2) Internet experience and introversion-extroversion scores for students who reported learning best with synchronous chat and those who reported learning best with asynchronous discussion, 3) Internet experience and introversion-extroversion scores for students who reported preference for face-to-face discussion rather than synchronous chat, and 4) Internet experience and introversion-extroversion scores for students who reported preference for face-to-face discussion rather than asynchronous chat.

4. RESULTS AND DISCUSSION

In the context of the current investigation, students discussed two cases studies synchronously and two case studies asynchronously. In this regard, students had extensive, repeated, and equivalent experience with synchronous and asynchronous CMC. With respect to the item, *I most enjoyed*, approximately 40% of the sample (38 students) selected synchronous chat and 60% (55 students) selected asynchronous discussion. Student who selected synchronous chat and those who selected asynchronous discussion were not significantly different with respect to the personality variable introversion-extroversion, scoring 14.3 and 14.4, respectively, on a scale that ranged from 10 to 20. However, student who selected synchronous chat and those who selected asynchronous discussion varied significantly in experience with the Internet. As presented in Table 2, students who most enjoyed chat as opposed to discussion had more Internet experience than students who expressed the alternate preference. Given the fast-paced and highly interactive nature of real-time CMC, Internet experience may have created a level of user familiarity and corresponding comfort that facilitated student appreciate of synchronous CMC.

Table 2. Internet experience: Students who most enjoyed synchronous versus asynchronous CMC.

Prior to this course, I ^a	In this course, I most enjoyed				
	Synchronous	Asynchronous			
used the internet.	4.53	4.00	$t = 2.90$	$df = 91$	$p = .005$
visited website.	4.47	3.98	$t = 2.73$	$df = 91$	$p = .008$
played online games.	2.47	1.95	$t = 2.34$	$df = 91$	$p = .022$
communicated online.	4.21	3.36	$t = 3.40$	$df = 91$	$p = .001$

^a Students rated each item on a 5-point scale ranging from 1 (never) to 5 (every day or almost every day).

With respect to the item, *I learned the case studies best when using*, approximately 43% of the sample (39 students) selected synchronous chat and 57% (51 students) selected asynchronous discussion (3 students

did not select either response-option). Student who selected synchronous chat and those who selected asynchronous discussion were not significantly different with respect to the personality variable introversion-extroversion, scoring 14.7 and 14.1, respectively, on a scale that ranged from 10 to 20. However, student who selected synchronous chat and those who selected asynchronous discussion varied significantly in experience with the Internet. As presented in Table 3, students who expressed the perception that they learned the case studies best when using chat as opposed to discussion had more general Internet experience and more experience communicating online than students who expressed the alternative perception. In terms of both enjoyment and perception of learning advantage, student Internet experience, but not personality, mediated CMC preference.

Table 3. Internet experience: Students who learned best with synchronous versus asynchronous CMC.

Prior to this course, I ^a	I learned the cases studies best when using				
	Synchronous	Asynchronous			
used the internet.	4.46	4.04	$t = 2.27$	$df = 88$	$p = .026$
visited website.	4.47	4.04			
played online games.	2.41	2.00			
communicated online.	4.08	3.43	$t = 2.50$	$df = 88$	$p = .014$

^a Students rated each item on a 5-point scale ranging from 1 (never) to 5 (every day or almost every day).

More than 61% of students responded in the affirmative to the questionnaire item, *I prefer face-to-face discussion rather than synchronous-chat discussion*. More than 71% of students responded in the affirmative to the questionnaire item, *I prefer face-to-face discussion rather than asynchronous discussion*. Apparently, the majority of college students continue to prefer face-to-face as opposed to electronic interaction. On the questionnaire item, *Prior to this course I used the Internet*, students who reported preference for face-to-face discussion rather than synchronous chat scored 4.07 on the 5-point scale; student who expressed preference for synchronous chat rather than face-to-face discussion scored 4.44 on the 5-point scale ($t = -1.07$, $df = 91$, $p = .049$). There were no other significant differences in Internet experience between students who reported preference for face-to-face rather than asynchronous discussion. However, as presented in Table 4, students who preferred face-to-face discussion over either e-discussion format tended to be less extroverted than students who expressed the alternate preference. As previously noted, extroverts focus on the outer world of people and external events (Myers, 1993). Apparently, the greater the outward focus, the greater the tendency to preference e-communication. Such a conclusion is consistent with previous research findings (Daughenbaugh, Daughenbaugh et al., 2002; Daughenbaugh, Ensminger et al., 2002).

Table 4. Introversion-extroversion differences: Students preference for face-to-face versus CMC.

	Yes	No			
I prefer face-to-face discussion rather than synchronous chat.	13.9	15.0	$t = -2.80$	$df = 91$	$p = .006$
I prefer face-to-face rather than asynchronous discussion	14.0	15.3	$t = -3.33$	$df = 91$	$p = .001$

5. IMPLICATIONS FOR E-LEARNING PRACTICE.

From an instructional perspective, asynchronous discussion is easily implemented in higher education. Synchronous chat, however, places extreme demands on both instructors and students. The number of people participating in a chat room must be limited in order that all students have opportunities for meaningful participation. Such discussion is scheduled in real-time, which is problematic for students who have other commitments. Potential solutions to these instructional challenges may be to develop an instructor interface that allows for easy access to multiple chat rooms and provides mechanisms to ensure equitable student participation. Additionally, in the same way that students schedule labs during course registration, times might be scheduled in those courses using real-time communication tools.

Participating college students who had extensive Internet experience, particularly in playing games and communicating, tended to prefer synchronous as opposed to asynchronous CMC. As e-communication technologies are increasing implemented in higher education, students with recreational Internet experience may be at an educational advantage. In this regard, educators should consider student background Internet

competencies in selection of e-communication tools. It may be assumed that less experienced users are best introduced to real-time CMC by optional use. Johnson and Howell (2005), however, reported that “student anxiety regarding course requirements that can only be satisfied via computer technology ... ultimately give rise to feelings of mastery, empowerment, self-efficacy, and personal control” (p. 651).

In the context of the current investigation, college students who preferred either synchronous or asynchronous CMC over face-to-face discussion tended to be more extroverted than those who preferred face-to-face discussion. “Extroversion is the tendency to be sociable, active, and willing to take risks” (Westen, 1999, p. 468). E-communication is often conceptualized, accurately or inaccurately, as more risky than face-to-face communication because social cues are lacking and interaction is often uninvited (Bucher, 2002). Daughenbaugh and colleagues (2002) reported that “extroverts liked involvement of the chat rooms, threaded discussion and email correspondence of the online course. The introverts, by contrast, had little participation in chatting and threaded discussions” (p. 72). Indeed, pressing enter may be the ultimate manifestation of sociability and risk-taking. E-communication is potentially with millions of people, some of whom, no doubt, have questionable character.

Almost 40% of the sample of college students indicated that they would have preferred to discuss the case studies using synchronous chat rather than in face-to-face discussion groups. Approximately 30% indicated that they would have preferred to discuss the case studies in online delayed-time rather than in face-to-face groups. Jones and Madden (2002) argued that college students are an ideal sample for Internet research because they “are heavy users of the Internet compared to the general population” (p. 2) and because they “have been at the forefront of social change since the end of World War II” (p. 5). In view of the sample used in the current investigation, results may be indicative of future social trends. While it seems unlikely that e-communication will ever entirely replace face-to-face communication, recent trends clearly indicate increasing use of the Internet for impersonal interactions associated with business, industry, and finance (Nie, Simper, Stepanikova, & Zheng, 2005). Conceptualization of the nature of teacher-student and student-student interaction may ultimately determine the extent to which technology will replace face-to-face instructional discussion.

REFERENCES

- Abrams, Z. I. (2003). The effects of synchronous and asynchronous CMC on oral performance in German. *The Modern Language Journal*, 87, 157-167.
- Branon, R. F., & Essex, C. (2001). Synchronous and asynchronous communication tools in distance education: A survey of instructors. *TechTrends*, 45, 36, 42.
- Bucher, H. J. (2002). Crisis communication and the Internet: Risk and trust in a global media. *First Monday*, 7. Available at http://www.firstmonday.org/issues/issue7_4/bucher/index.html.
- Burnett, C. (2003). Learning to chat: Tutor participation in synchronous online chat. *Teaching in Higher Education*, 8, 247-261.
- Cadieux, C. P. (2002). *Variables associated with a sense of classroom community and academic persistence in an urban community college online setting*. Doctoral dissertation submitted to Old Dominion University, Virginia. (ERIC Document Reproduction Service No. Ed474545).
- Chou, C. (2003). Incidences and correlates of Internet anxiety among high school teachers in Taiwan. *Computers in Human Behavior*, 19, 731-749.
- Daughenbaugh, R., Daughenbaugh, D., Surry, D., & Islam, M. (2002). Personality type and online versus in-class course satisfaction. *Educause Quarterly*, 3, 71-72. Available at <http://www.educause.edu/ir/library/pdf/EQM02312.pdf>.
- Daughenbaugh, R., Ensminger, D., Frederick, L., & Surry, D. (2002). Does personality type effect online versus in-class course satisfaction? *Proceedings of the Annual Mid-South Instructional Technology Conference*. Murfreesboro, TN. (ERIC Document Reproduction Service No. ED464631).
- Davidson-Shivers, G. V., Muilenburg, L. Y., & Tanner, E. J. (2001). How do students participate in synchronous and asynchronous online discussions? *Journal of Educational Computing Research*, 25, 351-366.
- Dickey, M. D. (2003). Teaching in 3D: Pedagogical affordances and constraints of 3D virtual worlds for synchronous distance learning. *Distance Education*, 24, 105-121.
- Duemer, L., Fontenot, D., Gumfory, K., Kallus, M., Larsen, J., Schafer, S., et al., (2002). The use of online synchronous discussion groups to enhance community formation and professional identity development. *Journal of Interactive Online Learning*, 1, Available at <http://www.ncolr.org/jiol/ARCHIVES/2002/2/04/index.html>.
- Eysenck, H. J., & Eysenck, S. B. (1963). *Eysenck Personality Inventory: Form B*. San Diego, CA: Educational and Industrial Testing Services.

- Johnson, G. M. (in press-a). College student psycho-educational functioning and satisfaction with online study groups. *Educational Psychology*.
- Johnson, G. M. (in press-b). Synchronous and asynchronous text-based CMC in educational contexts: A review of recent research. *TechTrends*.
- Johnson, G. M. (2005). Student alienation, academic achievement, and WebCT use. *Educational Technology and Society*, 8, 179-189.
- Johnson, G. M. (2006). Perception of classroom climate, use of WebCT, and academic achievement. *Journal of Computing in Higher Education*, 17, 25-46.
- Johnson, G. M., & Howell, A. J. (2005). Attitude toward instructional technology following required vs. optional WebCT usage. *Journal of Technology and Teacher Education*, 13, 643-654.
- Johnson, G. M., Howell, A. J., & Code, J. R. (2005). Online discussion and college student learning: Toward a model of influence. *Technology, Pedagogy and Education*, 14, 61-75.
- Joiner, R., Gavin, J., Duffield, J., et al. (2005). Gender, Internet identification, and Internet anxiety: Correlates of Internet use. *Cyber Psychology & Behavior*, 8, 371-378.
- Jones, S., & Madden, M. (2002). *The Internet goes to college: How students are living in the future with today's technology*. Washington, DC: Pew Internet and American Life Project. Available at http://www.pewinternet.org/PPF/r/71/report_display.asp.
- Kelly, K. L., & Schorger, J. (2002). *Online learning: Personalities, Preferences and perceptions*. U.S. Department of Education. (ERIC Document Reproduction Service No. ED470663).
- Ligorio, M. B. (2001). Integrating communication formats: Synchronous versus asynchronous and text-based versus visual. *Computers & Education*, 37, 103-125.
- Lobel, M., Neubauer, M., & Swedburg, R. (2002). Elements of group interaction in a real-time synchronous online learning-by-doing classroom without F2F participation. *USDLA Journal*, 16. Available at http://www.usdla.org/html/journal/APR02_Issue/article01.html.
- MacGregor, C. J. (2002). Personality differences between online and face-to-face students. *Journal of Continuing Higher Education*, 50, 14-23.
- McConnell, D. (2005). Examining the dynamics of networked e-learning groups and communities. *Studies in Higher Education*, 30, 25-42.
- Myers, I. B. (1993). *Introduction to type*. Palo Alto, CA: Consulting Psychologists Press.
- National Center for Accessible Media (2005). *Guidelines for developing accessible synchronous communication and collaboration tools*. Available at <http://ncam.wgbh.org/salt/guidelines/sec7.html>.
- Nie, N. H., Simpson, A., Stepanikova, I., & Zheng, L. (2005). *Ten years after the birth of the Internet, how do Americans use the Internet in their daily lives?* Stanford Center for the Quantitative Study of Society. Available at <http://www.stanford.edu/group/siqss>.
- Ohlund, B., Yu, C. H., Jannsch-Pennell, A., & Digangi, S. A. (2000). Impact of asynchronous and synchronous internet-based communication on collaboration and performance among K-12 teachers. *Journal of Educational Computing Research*, 23, 405-420.
- Pérez, L. C. (2003). Foreign language productivity in synchronous versus asynchronous computer-mediated communication. *CAICO Journal*, 21, 89-104.
- Rodriguez, M. C., Ooms, A., Montanez, M., & Yan, Y. L. (2005). *Perceptions of online learning quality given comfort with technology, motivation to learn technology skills, satisfaction, and online learning experience*. Paper presented at the Annual Meeting of the American Educational Research Association. Montreal, QC. (ERIC Document Reproduction Service No. ED491688).
- Sabau, I. (2005). *Effective asynchronous communication online*. Available at <http://breeze.ucalgary.ca/p52308523>.
- Schwienhorst, K. (2003). Learner autonomy and tandem learning: Putting principles into practice in synchronous and asynchronous telecommunications environments. *Computer Assisted Language Learning*, 16, 427-443.
- Shapira, P., & Youtie, J. (2001). Teaching with Internet and multimedia technologies: Insights from an online seminar on industrial modernization. *Journal of Planning Education and Research*, 21, 71-83.
- Sharpe, R. & Greg, B. (2005). The student experience of e-learning in higher education: A review of the literature. *Brookes eJournal of Learning and Teaching*, 1. Available at http://www.brookes.ac.uk/publications/bejlt/volume1issue3/academic/sharpe_benfield.html.
- Shotsberger, P. G. (2000, January/February). The human touch: Synchronous communication in web-based learning. *Educational Technology*, 53-55.
- Soles, C., & Moller, L. (2002). Myers Briggs type preferences in distance learning education. *International Journal of Educational technology*, 2. Available at <http://smi.curtin.edu.au/ijet/v2n2/soles/index.html>.
- Thurlow, C., Lengel, L., & Tomic, A. (2004). *Computer mediated communication*. Thousand Oaks, CA: Sage.
- Volet, S., & Wosnitza, M. (2004). Social affordances and students' engagement in cross-national online learning: An exploratory study. *Journal of Research in International Education*, 3, 5-29.
- Westen, D. (1999). *Psychology: Mind, brain, and culture*. New York: John Wiley.