Available online at www.sciencedirect.com
ScienceDirect
Computers & Education 51 (2008) 109–128
COMPUTERS & EDUCATION
www.elsevier.com/locate/compedu

The influence of students and teachers characteristics on the efficacy of face-to-face and computer supported collaborative learning

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Received 21 December 2006; received in revised form 21 March 2007; accepted 22 April 2007

Abstract

In this paper we compared the efficacy of face-to-face and computer supported collaborative learning (CSCL) in increasing academic knowledge and professional competences. We also explored how students' personality characteristics and learning strategies and teachers' characteristics were associated with better learning outcomes in online or face-to-face contexts. One hundred and seventy students participated in 10 community psychology seminars, five online and five face-to-face. Academic and professional learning increased for participants in both settings. Tutors' characteristics did not influence students' learning. Students who performed better in online and in face-to-face contexts differed in some psychological variables and in their learning strategies. Overall results show that asynchronous collaborative learning online can increase professional competences normally learnt only in small face-to-face educational settings, and that CSCL can be used to provide innovative educational opportunities that fit particular needs of students with low anxiety, high problem solving efficacy, who have time management problems in their learning strategies.

Keywords: Cooperative/collaborative learning; Evaluation methodologies; Teaching/learning strategies; Personality traits; Asynchronous communication

1. Introduction

Up until the late 1980s most experiments on computer-supported education of the first and second generation were based on a solo-learner model, and the opportunities to individualize learning processes were supposed to be the crucial feature of computer-aided instruction. Instead, more recently Computer Supported Collaborative Learning (CSCL) has attracted the attention of experts of different disciplines because it enables

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doi:10.1016/j.compedu.2007.04.003

both independent as well as group learning. CSCL is based on the contributions of cooperative and constructivist learning theories, which focus on social interdependence and maintain that students consolidate their learning also by teaching one another (Alavi, 1994; Benbunan-Fich & Hiltz, 1999; Harasim, 1990; Hass, 1996; Hiltz, 1994; Johnson & Johnson, 1989; Olson, 1994; Ragan, 1996; Trending, 1997). The application of cooperative and constructivist models online was made possible by the new technologies offered by software platforms, which include multiple communication modalities that can facilitate social interaction between teacher and students, and among students (Anderson, Rourke, Archer, & Garrison, 2001; Aviv, 2000; Garrison, Anderson, & Archer, 2000; Kanuka, 2002; Katz, 2002; Molinari, 2004; Moore, 1991; Rourke, Anderson, Garrison, & Archer, 1999). Computer technologies have been configured to facilitate both collaborative learning (Ligorio, 2001) and collaborative argumentation (de Vries, Lund, & Baker, 2002), as well as a variety of other knowledge-building methods that emphasize collaboration (Scardamalia & Bereiter, 1996).

E-Learning has been described as the use of electronic technology to deliver, support and enhance teaching and learning (Learning Technologies, 2003). Strong optimism for its growth contrasts sharply with some of the experiences of consumers. Massy (2003) reports the results of a European survey conducted by CEDEFOP in 2002, which found that 61% of respondents rated the quality of e-learning negatively – as 'fair' or 'poor', while a mere one percent rated what they had experienced as 'excellent' and only five percent 'very good'. Another survey reports that, "Early on we witnessed a series of claims that e-learning was the ultimate panacea, but... many commentators are suggesting that this early optimism was grossly misplaced" (Chartered Institute of Personnel & Development, 2003, 1).

Not only consumers, but also many university professors still have misgivings about e-learning: "The rush of educational institutions to offer Internet-based courses for distance education raises some very interesting issues concerning their quality. The promise of distance education through virtual environments being able to provide high quality education has yet to be realized" (Barbera, 2004, p. 13). Opponents of virtual environments argue that teaching via an online environment is not appropriate because the quality of education in an online course can be compromised because teaching and learning are dynamic processes that benefit from nonverbal cues present only in face-to-face settings. As Walther, Loh, and Granka (2005) underline "two prevailing positions have arisen with respect to this issue. The absence of nonverbal vocal and physical cues denies users important information about partners' characteristics, emotions, and attitudes, resulting in less sociable, relational, understandable and/or effective communication". The other position is "that people adapt to the medium, allowing for normal or enhanced communication to accrue" (p. 37).

Wang (2007) maintains that Internet, integrated into university courses, increases the interaction of student-to-instructor, student-to-student, student-to-material, and student-to-expert/practitioner. Other supporters of CSCL think that the social interaction available online can produce interpersonal effects even superior to those found in face-to-face groups, because much of the interpersonal "noise" in the form of various irrelevant "realities" have been removed from the relationship (Biuk-Aghai & Simoff, 2004; Davie & Wells, 1992; Kanuka & Anderson, 1998). Some argue that it has the potential to move not only undergraduate but also even graduate training beyond the physical classroom, providing new, first class educational opportunities to teach professional skills, normally taught only in small face-to-face graduate or professional schools. For instance, Rudestam (2004) thinks that certain key features of CSCL such asynchronous small group discussions, collaborative problem solving, reflective inquiry, competency based outcomes and the facilitator role of the instructor could be very helpful in the training of clinical psychologists. Rudestam underlines several important differences in face-to-face and online methods: "The way in which knowledge is socially constructed becomes readily apparent in the online classroom. Students regularly form different opinions and interpretations regarding the same reading material, and these individual differences in perspective are more sculpted and preserved than in the spontaneous verbalizations that take place in a real-time discussion. Moreover, faculty (and students) have the advantage of creating a permanent written record of the entire classroom experience as an ongoing source of reflection, evaluation and learning ... there is more opportunity for students to be reflective and deliberate in their discussion using asynchronous communication. In the asynchronous world, they have ample time to consult source material and analyze the comments of others before contributing (posting) their own views" (Rudestam, 2004, p. 428).

To which of these contrasting theoretical positions do empirical data provide more support? This question is not easy to answer for several reasons. Most published efficacy reviews lump together studies that use first,

second and third generation methods of learning delivery, which differ widely in the kinds of social interaction they allow or promote. Even studies focused solely on CSCL learning sometimes do not distinguish between synchronous and asynchronous modes of communication, or do not consider key variables like degree of cooperation required, and teachers' and students' characteristics.

2. How effective is CSCL compared to face-to-face (F2F) education?

Several reviews of the literature on the effectiveness of distance education have found no significant differences between distance education and F2F education. For instance Russell (1999) examined 335 studies and found that 90% of them reported no significant differences in students' academic success (final course grades), between traditional F2F and distance education. His review did not distinguish between different types of distance education, ranging from correspondence to web-based courses. Phipps and Merisotis (1999) sampled about 40 studies, a majority of which focused on types of distance learning of the first and second generation (one-way broadcast, two way interactive video). They remarked that most had serious methodological limits, like not using randomly selected subjects, or not including a theoretical and conceptual framework. Phipps and Merisotis's review evidences a typical flaw of in this field, they lumped together all computer-mediated learning studies (only 28% of total studies reviewed) without distinguishing whether they were based on solo learner or collaborative learning models.

Lehtinen, Hakkarainen, Lipponen, Rahikainen, and Muukkonen (1999) after making an ample review of only CSCL literature note that most studies on the efficacy of CSCL have been made without control F2F groups, in which very relevant variables such as theoretical and pedagogical models, students' and teachers' characteristics, collaborative modalities employed, types of communication (synchronous or asynchronous) and subject matter taught were held constant.

Since 1999, major reviews of distance education compared to F2F in university or other adult settings have not focused primarily on CSCL, but have included many other types of distance education, and have used different outcome measures. Machtmes and Asher (2000) compared live and pre-produced adult tele-courses with their classroom equivalent on student achievement. They coded 19 studies published from 1943 to 1997 for effect size and study features. The overall weighted effect size for these comparisons was −0.0093 (not significant, ranging from +1.50 to −0.005). However, when they coded studies according to the decade in which they were conducted, they found that the effect sizes increased and moved toward positive values. They attributed this change of effectiveness to improvements in technology that allowed for greater interaction. Cavanaugh's (2001) meta-analysis examined videoconferencing and telecommunication distance education (DE) technologies in K-12 learning in 19 studies published between 1980 and 1998. She found a slight but not significant difference in student achievement in favor of DE. Using measures of student satisfaction, Allen, Bourihis, Burrell, and Mabry (2002) examined 25 empirical studies and found a slight correlation favoring, instead, traditional classroom instruction. No effects were found for "channel of communication" (video, audio and written) nor for "availability of interaction".

Conflicting results emerge also from other recent quantitative syntheses. Shachar and Neumann (2003) examined 86 studies, dated between 1990 and 2002, and found a positive effect size for student achievement in favor of distance education. On the contrary, Ungerleider and Burns (2003) found an effect size of zero for achievement comparing F2F and online learning settings. Zhao, Lei, Yan, and Tan (2004) reviewed 51 studies published between 1966 and 2002, and found no significant difference between distance education and F2F. However when they differentiated the studies by publication years, they noticed that researches, using Internet technologies that favor communication, published after 1998 were more effective than their F2F counterparts.

Bernard et al. (2004) sampled 232 studies dated from 1985 to 2002 focusing on achievement, student attitudes and retention rates. They considered all studies that involve an empirical comparison of DE (including satellite/TV/radio broadcast, telephone/e-mail, email based correspondence, text-based correspondence + telephone, web/audio/video based two-way communication) with F2F classroom instructions (including lectures, seminars, tutorials and laboratory sessions). They studied several pedagogical features that allow or promote social interaction such as opportunities for F2F or mediated contact with teachers and peers, and also whether student and teachers contact were encouraged through activities or course design. They

found there was a small but significant effect favoring distance education on achievement outcomes. However, they noted that "the variability surrounding this mean is wide and significant" (p. 30). Opportunities for communication with teachers and peers and the use of problem-based learning strategies significantly predicted achievement and positive attitudes toward distance education.

One very recent review (Jahng, Krug, & Zhang, 2007) blamed the low quality on primary studies included in the previous meta-analyses for the significant heterogeneity of the effect sizes. So they used more stringent criteria, including only web based courses, articles published between 1995 and 2004, experimental or quasi-experimental studies, which included enough statistical information for computing effect sizes. They also tried to select studies which had pre-tests, since they believe that the control prior knowledge is especially needed for comparing achievement, when measuring knowledge gained through a course: only nine out of the 20 studies selected met this criterion. They found no significant differences between online and F2F settings. Ten studies reported positive results for distance education and the other half had negative effect sizes. However, results indicated a more positive effect size, when they compared studies with pre-test group scores with those that did not have pre-tests. The pre-test online students had significantly higher scores on achievement than their counterparts in F2F settings. The authors suggest that in future studies the gap between pre-test and post-test scores should be measured and compared.

Jahng et al. (2007) also found that there no were no significant differences for students' achievement depending on different subject areas. Instead, they discovered that online graduate courses were less effective than face-to-face ones, while undergraduate courses online showed higher achievement than their F2F counterparts. Their findings confirm previous results of other meta-analysis studies that reported more positive effect size for distance education at the undergraduate than a graduate level (Bernard et al., 2004; Zhao et al., 2004). Zhao et al. (2004) contended that undergraduate courses usually encompass the acquisition of content knowledge and skills while graduate courses tend to deal with higher level thinking or idea based discussion that demanded greater communication with instructor and classmates. They assumed that "the advantage of distance education in delivering learning content in college level courses may not work as well for graduate courses where more complex ideas are explored" (Zhao et al., 2004, p. 43).

On the contrary, we postulate that asynchronous CSCL could be a very good medium for graduate teaching. Poor results in meta-analysis studies with graduate students could be due to the fact that most research did not distinguish among the theoretical pedagogical models on which the teaching was based, and especially did not differentiate between synchronous and asynchronous communication and the kind of collaborative learning that was promoted. This is a major limit, since there are different levels of collaborative learning: "On the low end of the continuum, a group might be brought together involuntarily, might have members who do not value collaboration, and might be given tasks and assessment that discourage collective behavior. At the high end of the continuum, a group might be created voluntarily, might be trained in specific collaborative techniques or have formal roles assigned. They might be asked to complete tasks that require cooperation and might have their individual assessment tied to those of their group members" (Sipusic et al., 1999, p. 3).

Only a few individual studies have begun to compare as Lehtinen et al. (1999) suggested the efficacy of CSCL with control F2F groups, in which very relevant variables such as theoretical and pedagogical models, students' characteristics, teachers, collaborative modalities employed, types of communication (synchronous or asynchronous) and subject matter taught were held constant. Even recent outstanding studies still exhibit at least some of these common flaws such as not assigning students randomly, not using the same teacher, having very small samples, or varying in the degree of collaboration required or promoted in F2F and online, not controlling for synchronous and asynchronous modes of communication, and not holding assessment procedures constant.

Wang and Newlin (2000) found that students enrolled in web statistical classes earned lower grades than their counterpart in traditional classes. Since, however, they used individual learning modalities and assessment in the traditional classes, and encouraged group interactions only online, but gave final exams individually for students of both settings, their results, as the authors recognize, are confounded by several possible intervening factors.

Sipusic et al. (1999) compared face-to-face tutored video instructions (TVI) and distributed tutored video instruction (DTVI). They held constant the collaborative learning methodology in which a small group of

students studies a videotape of a lecture. They used a large sample of 700 students, taking different subjects and controlled for tutor effects, all tutors led both a TVI section and DTVI section. They found no difference in the course grade outcome. However, they could not make a complete random assignment of students for both conditions. Moreover, in at least one course the tutor personally evaluated his students, while tutors were not supposed to grade students whose work they were facilitating. A meta-study (Lou, Abrami, & d'Apollonia, 2001), involving 11,000 students from diverse educational levels (kindergarten, elementary school, pre-college level, post-secondary level, high school, college, and university) and studying a variety of subjects (math, science, reading/writing, language arts, computer skills, and social studies), found that a majority of these studies were well controlled, employing either random assignment of students to experimental and control conditions or using statistical control for quasi-experimental studies. Results showed that students learning in groups online increased their knowledge more than students studying individually online, but most studies did not compare CSCL vs. F2F collaborative learning.

Poirier and Feldman (2004) assigned introductory psychology students randomly to a traditional course or to an online course from a population of students who indicated that either course type was acceptable using a "waiting list" experimental design. Students in the online course performed better on exams and equally well on paper assignments compared to students in the traditional course. Online students also showed greater satisfaction with the course than those in the traditional course. In none of these studies was collaborative learning actually promoted, when it occurred it was left to students' initiatives, so the amount of collaborative work varied.

Morris and Zuluaga (2003) compared various computer programming courses, which were offered on campus with traditional lectures, tutorials and laboratory classes, and online through e-mail and online chat discussions organized by students groups. Using large samples with the same assignment and final exams, they found that online students achieved higher grades than on campus students. However, in this study students were not assigned randomly to the two learning settings, and online students were initially less qualified. Morris and Zuluaga attribute the outstanding gains made by online students to the quality of their online delivery processes that encouraged frequent student/staff interaction. Since they did not have the same teachers deliver both on campus and online courses, their results may be due to more dedicated, or better teachers and tutors involved in online courses.

3. Can graduate training benefit from asynchronous CSCL?

According to McPherson and Nunes (2004) the need for continuing professional distance education (CPDE) is also increasing in the information society that requires life-long learning. CPDE now encompasses not only the transference of subject specific knowledge but also the capability of promoting specific professional skills. Several authors (Smith & Senior, 2001) maintain that graduate training could benefit from the use of CSCL. Other authors theorize that asynchronous CSCL lends itself to the development of professional skills. For instance, Benbunan-Fich and Hiltz (1999) have argued that asynchronous learning networks provide an excellent vehicle for discussion-based learning activities. Increased reflection time and more democratic participation can produce learning equivalent, or better, than that of F2F classrooms. Rudestam (2004) theorizes that asynchronous computer mediated environments favor the development of meta-skills of critical analysis, of giving and receiving feedback, and of managing time. Online students become aware of how group dynamics evolve, whether or not the instructors explicitly favors it. Certainly many of these meta-skills can be developed in the traditional F2F classroom as well, but Rudestam contends that they seem to be particularly evident in the online setting and that this promotes perceived quality of courses.

Several studies have been conducted with undergraduate student comparing collaborative learning on online synchronous and asynchronous settings, providing evidence that asynchronous learning generates a high level of cognitive activity. For instance Shirani, Tafti, and Affisco (1999), comparing email to group support synchronous system (GSS) found that more basic ideas were generated using GSS, but groups using email performed a deeper problem analysis. However, reviewing the literature Heckman and Annabi (2005) writes that there has been little empirical research that explicitly and rigorously explores the similarities and differences between the learning processes that occur in the two settings. They observed 120 seniors during two case discussions, one a traditional classroom setting; the other conducted asynchronously using the bulletin board

of WEBCT. Using transcripts they examined four structuring processes: cognitive, social, teaching and discourse, adopting indicators from previous published work (Anderson et al., 2001; Aviv, 2000; Garrison et al., 2000; Rourke et al., 1999). They found that asynchronous discussion generates high levels of cognitive activity, at least equal to, and in some cases superior to cognitive processes in F2F classrooms. Also, they noticed that student-to-student interactions contain a greater proportion of high level-cognitive indicators than do student-to-teacher interactions. Also Johnson (2007) found that asynchronous dialogue within a web interface can provide an educational tool that is conducive to learning in that it helps students construct knowledge as a result of using and interacting within an online discussion board.

Fewer studies have involved graduate students. Meyer (2006) had 10 students, seven Afro-American ands three Caucasian, five males and five females, in a graduate-level course on Historical and Policy Perspectives in Higher Education hold F2F and online asynchronous discussions on five controversial topics. Results showed that when comparing the two settings "between three to six individuals felt there was no difference when evaluating their comfort, honesty, worry about hurting others' feelings, perception that they had the same feelings as others, and willingness to disagree. Five students preferred the F2F discussion, two preferred the online setting and three indicated no preference" (p. 179). She also found a slightly higher concern expressed for hurting others' feelings in the F2F settings and higher willingness to disagree with others in the online settings. Generally the shyer students and infrequent talkers were more likely to state a preference for online settings. Given the very small number of her subjects further research is needed to confirm her findings.

Fahy (2006) studied asynchronous online group interaction processes using Bales interaction process analysis (IPA) with a group of 25 graduate students, eight males and 17 females in Canadian University. He did not use a F2F control group, but compared his findings with those recorded by Bales (1950) in F2F groups. He found that his online group showed less negative-socio-emotional behavior, and the two groups were similar in the task-asking processes. The instructor in the online course asked for more opinions from students and gave more often his own opinions and information. This study did not show how these differences in interaction patterns in F2F and online groups were related to learning or students satisfaction. Obviously teachers' and students' characteristics in the two samples varied widely, so further research is needed to ascertain whether negative socio-emotional behavior occurs less often in asynchronous CSCL settings.

Rudestam's hypothesis that asynchronous CSCL could be used successfully used to train graduate students in psychology has been confirmed by the results of a small pilot study (Francescato et al., 2006). In this pilot study (Francescato et al., 2006) 50 psychology master students learnt the same professional skills (facilitating focus groups and interview methodologies) in two seminars taught over a 2-month period by the same teacher online and F2F. The teacher designed small group learning activities for a seminar series consisting of weekly modules, designed with precise learning objectives and tasks that could be completed either in a weekly 3-h meeting F2F or online during the same week. Results show that CSCL contexts not only promote traditional academic achievement; but also are at least as effective as F2F settings in transmitting content knowledge and professional competences, and in increasing various forms of self-efficacy, empowerment and personal growth. A second study with a larger group of psychology master students (Francescato, Mebane, Porcelli, Attanasio, & Pulino, 2007a) showed that online students not only learnt some professional psychological skills but also developed longer lasting friendships than their F2F colleagues. It would seem that the results of these studies show that CSCL can increase academic knowledge and even professional competences as efficiently as traditional F2F graduate settings.

However, to control for relevant variables in both studies the same teacher was used, this was an asset but also a limit. The teacher who taught both online and face-to-face students was a strong supporter of online education and fairly experienced online and could have unintentionally "favored" online students, since this was the very first course offered online in the psychology faculty at our university. Which characteristics should a teacher have to be successful online, in fact has been a very controversial topic.

4. Which teachers do better online and face-to-face?

Some authors maintain that not only online technology permits better access to reliable data about what happened in the classroom than traditional note taking, but also that the method of instruction is changed

by the presence of continuously available shared records. Harasim and Yung (1993) asked 176 teachers with online and F2F teaching experiences to evaluate the two settings. Ninety percent of the respondents reported that online the teacher becomes more a facilitator and a mentor, that students become active participants in discussion, grow more independent and develop more group interactions and have more time to reflect on ideas and exchange ideas. Moreover, teachers and students operate more as equals with less hierarchy, and learning and teaching become more collaborative. Young (2004), in a 2-year longitudinal study, found strong support for Pickering's (1995) prediction that online teaching would favor the emergence of informal, subject-oriented groups of learner/teachers. The new Web teachers are returning education to more convivial and less authoritarian practices.

Different authors (Berge & Collins, 1996; Bocconi & Pozzi, 1999; Draves, 2000; Gokhale, 1995; McGee & Boyd, 1995; Nelson & McFadzean, 1998; Shepherd, 2000a, 2000b; Zorfass, 1998) report that online teachers with respect to traditional F2F teachers need to have also specific training competencies on both communications' technology and group facilitating skills. McPherson and Nunes (2004) outline four main types of roles (pedagogical, social, managerial and technical) that online teachers have to play to maximize the benefits of learning environments for students. However, they underline that often online teachers had not been properly equipped with the basic skills to support students: "Learners are expected to develop high cognitive skills such as negotiation of meaning, life-long learning, reflective analysis and meta-cognition supported by tutors, who often lack the same skills themselves". Gray, Ryan, and Coulon (2004) have attempted to explore how online teachers are trained to become skilled online tutors. They selected 25 case studies in seven countries, only three involving collaborative learning. They found that in most cases tutors were trained through experiential learning where virtual tutors were trained in exactly the same environment as their learners. Gray et al. (2004) provide no data on the effectiveness of this kind of training. In fact, very few empirical evaluation studies have been done comparing tutors which different training, or experience levels. Some research has shown that tutor led online learning groups fare better than untutored learning settings (Lombardi, Forte, Di Nocera, Sementina, & Renzi, 2004) but emphasize the importance of taking into consideration students' characteristics such as motivation.

Klobas and Renzi (2000) have shown that benefits of online learning are obtained if teachers have a favorable attitude toward new learning technologies, are competent in their use and do not employ only traditional teaching methods but promote collaborative learning. However, most authors, who have described the specific functions online teachers have to carry out to stimulate active collaborative learning among students, underline the scarcity of empirical evaluation studies (Chickering & Gamson, 1998; Gray et al., 2004; Ligorio, Talamo, & Simons, 2002; McPherson & Nunes, 2004; Salmon, 2000). There seems to be a lack of well-controlled studies comparing the efficacy of teachers with different levels of competence and years of experience teaching in online and face-to-face contexts.

5. Which students fare better in face-to-face or online?

Schrum and Hong (2002) have identified seven dimensions that may favor the success of an online student: (1) access to technological and multimedia instruments; (2) experience in the use of technology; (3) learning styles; (4) study habits; (5) motivation; (6) aspects related to life style (hours dedicated weekly to the online course, the support of family, friends and colleagues); (7) individual characteristics. For La Noce (2002) successful online students have a high capacity for tolerance and ambiguity, a low level of anxiety, an active approach towards learning, a meta-cognitive competence, self-regulation, and a high level of motivation and capacity of learning from past experiences. Several studies have explored how students perceive distance education compared to traditional learning. Beare (1989) found that students had a preference for live interaction. Wong (1990) on the contrary found that students' attitudes toward televised classes were positive. Sounder (1993) discovered that telecourse students even perceived a greater level of connection between the professor and other students than their counterparts in traditional classrooms. Whiteman, Scott, and McElnay (1994) found that students have positive attitudes toward distant education. Bisciglia and Monk-Turner (2002) found that students who attend class off campus and who work full time have a more positive attitude toward distance education, and are more likely to be motivated and willing to take other distance education course than their on-site peers. Hannay and Newvine (2006) found that students

enrolled in criminal justice courses preferred distance education, because it allows them to balance their other commitments more easily. Respondents also thought they achieve higher quality educational outcomes in the distance learning environment.

Reviewing the literature on students' characteristics, one can notice that there are several studies that have explored the cognitive and learning styles of students who prefer and perform well in online settings, while fewer studies have examined the impact of personality variables and learning strategies. With respect to cognitive styles, Workman (2004) has found that students with high global cognitive styles performed better in a collaborative rather than individual setting. Chen (2002) reviewing the numerous studies, on field dependent or independent cognitive styles, documented that field dependent students have more problems and need more guidance following online courses than field independent students.

Calcaterra, Antonietti, and Underwood (2005) examined the influence of cognitive style, spatial orientation and computer expertise on hypertext navigation patterns and learning outcomes when participants interacted with a hypermedia presentation. Forty students were selected, forming four groups with the following characteristics: (1) 10 high level computer users – sequential thinkers, (2) 10 high level computer users – holistic thinkers, (3) 10 low level computer users – sequential thinkers and (4) 10 low level computer users – holistic thinkers. All participants completed a self-report questionnaire measuring spatial orientation and were then requested to browse freely a hypermedia presentation on the ancient Mayan civilization. Results indicated that hypermedia navigation behavior was linked to computer skills rather than to cognitive style and that learning outcomes were unaffected by cognitive style or by computer skills. However, learning outcomes were positively affected by specific search patterns that are achieved by re-visiting hypermedia sections and visiting overview sections in the early stages of hypermedia browsing. The impact of cognitive style on learning outcomes was proved to be less important than initially predicted.

With regard to learning styles, defined as stable, physiologically based preferred modalities of learning, empirical studies also yield contradictory results. Ross, Drysdale, and Schulz (2001) found in a computer science course that students with a sequential learning style gained better grades than those who have a random learning style. Instead Miller's (2005) research revealed opposite results: students with a random learning style performed better online. Aragon, Johnson, and Shaik (2002) found significant differences in the learning styles preferences of the online students and those of F2F students. Online students scored higher on reflective observation (learning by watching and listening) and abstract conceptualization (learning by thinking), while F2F students reported higher use of active experimentation (learning by doing). However, Aragon et al. (2002) discovered students could learn equally well in either delivery format, regardless of their learning style. Sonnenwald and Li (2003) in their study have shown that students characterized by a competitive learning style perceive online contexts more favorably than face-to-face settings. Students with an individual learning style have a more negative perception of online settings. Moreover, persons with a collaborative style perceive positively both settings.

Personality traits have been theorized by Eysenck (1971) to be correlated with academic learning. De Fruyt and Mervielde (1996) have in fact found using the BIG Five questionnaire that conscientiousness with its components of precision and persistence was the best predictor of academic performance. Only a few studies have explored the relationship between personality traits and online learning, and they present contradictory findings. Carey and Kacmar (1997) using a Jungian theoretical framework,[1] report that subjects who use a combined sensing-thinking type approach show a higher level of satisfaction with teleconference communication than intuitive-feeling types. However, Mawhinney and Lederer (1996) state that intuitive-feeling managers spend more time using computers than sensing-thinking managers. Wilson (2000) documented that sensing-thinking subjects showed significantly greater computer-mediated communication systems (CMCS) usage, sending almost twice as many messages and twice as much message content as intuitive-feeling subjects. Palloff and Pratt (2001) indicate that students who might be best suited to learning online are ones who "need time to think and reflect before responding to questions and ideas" (p. 108), while Day and Batson (1995) found that "reticent students ... do not participate (in face-to-face-class discussion), simply because they do not "think

[1] The Jungian typology measures four dimensions of personality (Keirsey & Bates, 1984): (1) extroversion–introversion; (2) intuitive–sensing; (3) thinking–feeling; and (4) judging–perceiving.

on their feet'' as quickly as some of the other students'' (p. 38). Ellis (2003) found that in asynchronous learning, students with introverted thinking appear more willing to contribute than extraverted thinkers, while those with feeling judgment (whether dominant or auxiliary) much prefer the F2F environment. Sensing types may need time to understand conceptual ideas and formulate responses, thus the asynchronous nature of the forum lent itself to their personality type.

Studies using standardized measures of personality also gave conflicting results. Santo (2001) points out that students who prefer online training tend to have lower levels of extraversion and higher levels of openness and conscientiousness compared to students who prefer traditional forms of training. But his results are in part contradicted by Zobdeh-Asadi (2004) who found that students who prefer traditional F2F teaching methodologies had higher levels of openness and conscientiousness that those that prefer online settings.

A research of Wang and Newlin (2000) shows that students that have an internal locus of control had better grades in an online statistical course, while F2F students who performed better had higher levels of external locus of control. DeTure (2004), on the contrary, found students who were more field independent tended to have higher online technologies self-efficacy, but did not receive higher grades than those students who were field dependent and had lower online technology self-efficacy. Cognitive style scores and online technologies self-efficacy scores were poor predictors of student success in online courses of distance education.

Further studies are clearly needed to assess the personality traits and other psychological characteristics such as convictions of being able to succeed in solving problems, succeed in academic and social tasks, as well as feelings of empowerment or disempowerment of students, who not only prefer but also perform better in traditional or online learning environments. A potentially promising area of research has investigated the relation between learning strategies, defined as modalities developed by students to face different learning tasks, and performance in on online and traditional learning settings. In addition, there are few studies which have explored the separate effects of affective and cognitive learning strategies, which are both considered important components of learning competence in students as theorized by Pellerey (1996).

A review of the literature also shows the need for more focused studies that compare, for instance, the efficacy of F2F and asynchronous online settings in increasing graduate students' academic and professional performances, when students are assigned randomly to the two settings, and are taught by teachers with different levels of technical competence and teaching experience. It appears that more data are necessary to understand which learning strategies, and which psychological variables differentiate students who do better in asynchronous online or in F2F collaborative learning contexts.

6. Objectives of the present research

(1) To compare the efficacy of F2F and CSCL in increasing academic performance and professional psychological skills of university master level students assigned randomly to the two conditions.
(2) To explore how some teachers' characteristics (having Master or Ph.D.'s, shorter or longer experience in teaching online and face-to-face) influence students' learning.
(3) To ascertain if learning strategies, personality traits and other psychological variables (such as problem solving, academic and social efficacy and empowerment levels) differentiate students who do better in online or face-to-face collaborative learning contexts.

7. Participants

One hundred and seventy psychology majors, attending the fifth year of their 5-year master training program, were divided into 10 small groups, homogenous for gender, age, and grade average, and then five groups (82 students) were randomly assigned to online and five groups (88 students) to face-to-face community psychology seminars. Students mean age was 24, 88% were females and 12% males, reflecting the gender composition of psychology majors in Italy (85% female and 15% male).

8. Design and procedures

Five teachers taught one online and one face-to-face seminar. They all were psychology graduates, had also completed a 2-year Master in Community Psychology, in which they had used collaborative learning modalities in a face-to-face setting and also had all followed a 2-month training on CSCL. They differ in their educational and job credentials ranging from doctoral students to Ph.D.'s holding teaching assistants, and they also varied in the number of years of experience in teaching collaborative learning face-to-face and online. They had the following characteristics:

(1) Teaching assistant with Ph.D., high experience online, high experience face-to-face.
(2) Teaching assistant with Ph.D., low experience online, high experience face-to-face.
(3) Doctoral student, high experience online, low experience face-to-face.
(4) Teaching assistant with Ph.D., medium experience both online and face-to-face.
(5) Doctoral student, low experience both face-to-face and online.

In all 10 seminars students learnt a community analysis methodology that allows to identify strong and weak points of a local community, through interviews with key members and focus groups with dominant and minority members. Each seminar was divided into eight modules. The modules were designed with specific learning objectives and group tasks that could be completed either in a weekly 3-h face-to-face meeting or online during the same week.

Face-to-face students met eight times (for 3 h each week) in a university classroom, and were divided into small groups for their collaborative learning activities. The online students worked entirely online, also in small groups, apart from two face-to-face meetings: at the start of their seminar, when they received instruction on the function of the technologies used for online participation (mailing lists and Yahoo groups platform) and completed survey forms, and at the end to complete the post-seminar survey.

9. Measures

The following measures were administered before and after the seminar to all participants.

(1) To evaluate learning we used two specific questionnaires, validated in previous research (Francescato et al., 2006; Klobas, Renzi, Francescato, & Renzi, 2002):
   (a) Perceived Knowledge Questionnaire, measuring how much (on a scale of one *nothing* to seven *very much*) each student thought he or she knew about seven specific topics concerning the subject of the seminar. Perceived knowledge was the sum of responses. This technique has been found to provide a reliable pre–post measure of perceived knowledge (Klobas & Renzi, 2000). Cronbach alpha for this scale was 0.84.
   (b) A 30-item multiple-choice test (Actual Knowledge Questionnaire), measured how much students knew about the seven topics. To avoid pre–post test memory effects, we used a split-half technique giving 15 items in the pre -test and other 15 items in the post test. Each item had four possible answers, of which only one was correct. Maximum score was therefore 15.

(2) To evaluate competence acquisition students in small groups (four to five students) had to produce a final paper showing they had used the appropriate techniques learnt in the seminars in an environmental context of their choice. The 37 final papers were evaluated by two judges on the basis of seven criteria, found to be valid on a pilot research (Francescato et al., 2006). For each criterion evaluator could give a score from one (inadequate) to five (very good). The maximum score was then 35. Inter-judge agreement was 96%.
(3) To evaluate the convictions that students have about their capacities to study, to regulate their motivation, to organize their studies, to find support for their learning and to find study modalities that favor learning, we adapted Pastorelli and Picconi's (2001) Scale of Academic Self Efficacy (SASE) for the university environment. The original 19 item scale, based on Bandura's MSPSE (Bandura, 1989, 2001; Choi, Fuqua, & Griffin, 2001), has been used successfully in several Italian studies with school children,

but only 10 of the 19 items were suitable for administration to university students. Each item was measured on a five point scale from one (*not at all capable*) to five (*very capable*). Cronbach alpha for the reduced scale in this study was nonetheless satisfactory (0.80).

(4) To evaluate the convictions that students have about their capacity to cope with problems and solve them in creative and original ways we used the 14 item Perceived Self Efficacy for Problem Solving scale (PSEPS) (Pastorelli, Vecchio, & Boda, 2001). This scale was found reliable in a large sample of Italian students. Items were measured from one (*none at all capable*) to seven (*completely capable*). Cronbach's alpha in this study was 0.87.

(5) To evaluate the convictions that students have about their capacity to fit in, and to take a proactive role in social situations using a 15 item Scale of Perceived Social Efficacy (SPSE) (Caprara, Gerbino, & Delle Fratte, 2001) derived from the Smith and Betz (2000) scale and validated for a large sample of Italian adults. The items were measured on a five point ordinal scale where one represented *not at all capable*to five *completely capable*. In our study, Cronbach's alpha was 0.91.

(6) An Empowerment scale (Francescato, Mebane, Sorace, & Vecchione, 2007b), validated with a large sample of Italian adults, composed of three subscales: (1) Perceived capacity to define and reach objectives (10 items), (2) Perceived resilience in difficult situations and hopefulness (nine items), and (3) Sociopolitical Interest (five items). Items were measured on a seven point ordinal scale where one represents minimum and seven maximum. In our study Cronbach's alpha for the subscales were for 0.83 the first, 0.75 for the second and 0.83 for the third subscale.

The following measures were administered only before the seminars.

(7) To evaluate learning strategies we administer before the seminars the QSA (Pellerey, 1996) composed of 14 subscales, 7 assessing cognitive strategies and 7 affective emotions experienced in learning. Items were measured from one to four, according to the frequency of experienced behaviors or feelings. Cronbach's alphas for the subscales range from 0.77 to 0.80.

(8) To measure personality we used the BIG FIVE QUESTIONNAIRE (Caprara, Barbaranelli, & Borgogni, 2000). The BFQ is composed of 132 items, for each of which respondents indicate the extent to which they agree or disagree on a five point scale, from one (very false for me) to five (very true for me). The BFQ has five main personality dimensions: energy, agreeableness, emotional stability, openness and conscientiousness. Cronbach's alpha ranged from 0.65 to 0.88.

(9) To measure another facet of personality we also used a Locus of Control Scale (Nigro, 1983) derived from Rotter (1966). It is composed of 29 couples of statements, of which respondents have to choose one. Items refer to how certain important social event impact directly on individuals (Alpha of Cronbach 0.80).

10. Data analysis

An analysis of variance for a mixed design was performed having as independent factors type of groups (face-to-face and online) and teachers' characteristics and repeated measures (pre–post) for two dependent variables (actual knowledge and perceived knowledge).

Multiple regressions were performed to assess the influence of teachers' characteristics on students learning and to identify which psychological characteristics of students better predict performance with face-to-face and online students.

11. Results

11.1. Professional knowledge and competence acquisition

ANOVA results for pre and post and online and face-to-face on each scale are shown in Table 1. Both face-to-face and online students increased their actual and their perceived knowledge. Online students, however, in their pre test scores had higher scores than face-to-face students, no significant differences emerged between groups at the end. Both seminars were effective in raising students' knowledge, however the incre-

Table 1
Anova (mixed design) considering actual knowledge and perceived knowledge in FtF and OL groups

	Time	Score	FtF	OL	df	Time			Treatment		Time × treatment		
						F	*p*	*Eta square*	*F*	*p*	*F*	*p*	*Eta square*
Actual knowledge	Pre	Mean	6.46	7.06	1.160	295.68	<.001	.649	.32	.57	6.06	<.05	.036
		s.e.	*.228*	*.236*									
	Post	Mean	10.18	9.84									
		s.e.	*.178*	*.184*									
Perceived knowledge	Pre	Mean	1.90	2.24	1.160	1344.54	<.001	.894	2.74	.10	6.12	<.05	.037
		s.e.	*.096*	*.099*									
	Post	Mean	4.89	4.86									
		s.e.	*.072*	*.075*									

FtF = face-to-face; OL = online.

ment was higher for face-to-face students who starter with a lower level of both perceived and actual knowledge.

Competence acquisition was measured through the evaluation of the 37 final group papers (18 face-to-face and 19 online). All of the small groups did at least an acceptable job, showing that the kind of professional competences promoted in the seminars could be learnt both online and in the face-to-face modalities. In fact, ranking the final 37 papers from highest performers to lowest, we find three online and three face-to-face papers among the top performers. Using Mann–Whitney's test we found no significant differences between online and face-to-face groups ($U = 129.5$; $p = .210$).

11.2. Teachers characteristics' influence on students' learning

Analysis of variance shows no significant effect of teacher's variable both on actual acquired knowledge ($F_{4.160} = .28$; $p = .89$), nor for perceived knowledge ($F_{4.160} = .32$; $p = .86$). As can be seen from Table 2 it seems that none of the diverse characteristics of teachers influenced students' learning both in the online and face-to-face settings.

To explore further the weight of the variable "teacher" we conducted several multiple regression analysis choosing as predictors the following teachers characteristics: (1) Ph.D., teaching assistant, doctoral student, (2) having shorter or longer formal training period in collaborative learning online, (3) years of experience in teaching collaborative learning online, (4) years of experience in teaching collaborative learning face-to-face. The same multiple regression design was applied separately for online and face-to-face students both for actual knowledge and perceived knowledge measures. None of the four regressions produced viable

Table 2
Anova (mixed design) considering the impact of different teachers on actual knowledge and perceived knowledge in FtF and OL groups

	Time	Score	Teacher no. 1		Teacher no. 2		Teacher no. 3		Teacher no. 4		Teacher no. 5		df	Time × treatment × teacher	
			FtF	OL	FtF	OL	FtF	OL	FtF	OL	FtF	OL		*F*	*p*
Actual knowledge	Pre	Mean	6.66	7.40	6.00	6.87	6.18	6.12	6.42	7.33	7.05	7.55	4.160	.28	.89
		s.e.	*.505*	*.553*	*.519*	*.553*	*.519*	*.535*	*.491*	*.505*	*.519*	*.505*			
	Post	Mean	10.22	9.80	9.18	9.40	10.35	9.69	10.05	10.33	11.12	10.00			
		s.e.	*.384*	*.421*	*.396*	*.421*	*.396*	*.408*	*.374*	*.384*	*.396*	*.384*			
Perceived knowledge	Pre	Mean	1.99	2.13	1.71	2.45	1.77	2.00	1.98	2.29	2.02	2.35	4.160	.32	.86
		s.e.	*.214*	*.235*	*.220*	*.235*	*.220*	*.227*	*.208*	*.214*	*.220*	*.214*			
	Post	Mean	4.88	4.90	4.54	4.73	5.03	4.86	5.05	5.10	4.97	4.71			
		s.e.	*.158*	*.174*	*.163*	*.174*	*.163*	*.168*	*.154*	*.158*	*.163*	*.158*			

FtF = face-to-face; OL = online.

models. This confirms, as the analysis of variance already had shown, that the teachers' characteristics considered in this study do not influence students performances.

11.3. Psychological characteristics of students who perform better in online or face-to-face learning settings

Before conducting multiple regression analysis to examine the impact of students' characteristics on learning, we performed several Manova analyses to ascertain the homogeneity of online and face-to-face groups for each the psychological variables considered (personality traits, learning strategies, social efficacy, problem solving efficacy, academic efficacy, locus of control and empowerment). The results showed no significant differences between online and face to face groups on all psychological variables measured.

11.3.1. Face-to-face students

We first did multiple regression analysis considering the scores on Actual Knowledge as the dependent variable, and we used as predictors the five factors of personality (BIG FIVE). The model that emerged from the stepwise analysis explains 4% of the total variance (Adjusted R-square = 0.039; $F_{1.86} = 4.58$; $p < 0.05$). As shown in Table 3, Emotional stability is the best negative predictor ($\beta = -0.22$; $p < 0.05$), that is those with lower scores of emotional stability perform better in a F2F settings.

We then did a second regression analysis using as predictors students scores on other psychological variables such as locus of control, empowerment, social, academic and problem solving self-efficacy. No significant model emerged.

Finally in a third regression model we used as predictors scores obtained on the seven scales measuring different cognitive aspects of learning strategies (QSA). The model that emerged from the stepwise analysis explains 3% of the total variance (Adjusted R-square = 0.031; $F_{1.86} = 3.84$; $p = .053$). The willingness to study and collaborate with other was the significant negative predictor (QSA_C4) ($\beta = -.21$; $p = .053$). Students less willing to collaborate with each other seem to perform better in face-to-face settings.

In a fourth regression model, scores on the seven affective and motivational learning strategies scales were used as predictors. From this analysis no significant model emerged.

A further series of analysis was conducted using as dependent variables scores of perceived knowledge.

In the first model, the five factors of personality were used as predictors.

The model that emerged from the stepwise analysis explains 7% of the total variance (Adjusted R-square = 0.067; $F_{3.84} = 3.11$; $p < .05$). As indicated in Table 3, Conscientiousness ($\beta = .25$; $p < .05$) and Agreeableness ($\beta = -.21$; $p = .054$). Students with high levels of conscientiousness and lower levels of agreeableness or friendliness seem to benefit more by participating in a face-to-face.

In a second model, we used as predictors students' scores on empowerment and the various efficacy scales. No significant model emerged.

In a third regression we used as predictors the seven cognitive scales. The model that emerged .from the stepwise analysis explained 4% of the total variance. The capacity to auto-regulate the learning and study processes was the significant predictor (QSA_C2) ($\beta = .25$; $p < .05$). Students with higher capacity to regulate autonomously their learning activities seem to fare better in F2F settings.

Table 3
Results of multiple regressions for FtF group

Actual knowledge						Perceived knowledge								
Big Five Questionnaire			QSA (cognitive scales)			Big Five Questionnaire			QSA (cognitive scales)			QSA (affective and motivational scales)		
	Beta	p-level		Beta	p-level		Beta	p-level		Beta	p-level		Beta	p-level
Emotional stability	−.22	.03	QSA_C4	−.21	.053	Conscientiousness	.25	.02	QSA_C2	.25	.02	QSA_A1	−.25	.01
						Agreeableness	−.21	.054						

Finally, in a fourth model of regression, we inserted as predictors, the seven scales that measure motivational and affective components of learning strategies. The model that emerged from the stepwise analysis explained 7% of the total variance (Adjusted R-square = 0.07; $F_{2,85} = 4.31$; $p < .05$). The significant predictor was called basic anxiety and difficulties controlling emotional reactions (QSA_A1) ($\beta = -.25$; $p < .05$). Students with lower scores on this scale benefited more from face-to-face seminars.

11.3.2. Online students

We conducted for online students the same series of multiple regression analysis that we had performed for face-to-face students, using first actual knowledge scores as dependent variable.

No significant model emerged for the personality traits.

When we used the other psychological variables (efficacy scores, locus of control and empowerment), the model that emerged from the stepwise analysis explained 5% of the total variance (Adjusted R-square = 0.054; $F_{2,79} = 3.35$; $p < .05$). Problem solving efficacy (PSEPS) was the only significant predictor ($\beta = .25$; $p < .05$). Students who perceive themselves as able problem solvers benefit more from online learning.

Using as predictors the seven cognitive learning strategies scales no significant model emerged.

Using as predictors the seven affective learning strategies scales, the model that emerged from the stepwise analysis explained 5% of the total variance (Adjusted R-square = .053; $F_{4,77} = 2.15$; $p = .082$). Two were the significant predictors, basic anxiety and difficulty in controlling emotional reactions (QSA_A1) ($\beta = -.32$; $p = .063$) and lack of perseverance in carrying task to completion (QSA_A5) ($\beta = .24$; $p = .069$). Students with low anxiety and low perseverance seem to benefit more from online settings.

We then repeated a series of multiple regression analysis using perceived knowledge as the dependent variable.

No significant model emerged for personality traits as measured by BIG FIVE. In the multiple regression analysis using the other psychological variables as predictors (locus of control, empowerment, and the three efficacy scales) the model that emerged from the stepwise analysis explained 5% of the total variance (Adjusted R-square = 0.045; $F_{2,79} = 2.93$; p = .059). Two were the significant predictors: the subscale Socio-political interest of the empowerment scale (SSPI) ($\beta = -.21$; $p = .057$) and external Locus of Control ($\beta = .21$; $p = .062$). It appears that students with less interest in social political questions and high external locus of control benefit more from online settings.

No significant model emerged using the seven cognitive learning strategies scales as predictors.

Instead using as predictors the seven affective scales of the QSA the model that emerged from the stepwise analysis explained 8% of the total variance (Adjusted R-square = .077; $F_{1,80} = 7.78$; $p < .01$). The significant predictor was lack of perseverance (QSA_A5) ($\beta = .29$; $p < .01$). It seems that students with low levels of perseverance, who experienced difficulties in carrying learning tasks to completion, benefit more from online settings (Table 4).

12. Discussion

Our results show that collaborative learning methodologies are effective in increasing academic knowledge and professional psychological skills both when used in a traditional F2F university seminar and in an asynchronous CSCL. Our findings confirm previous data coming from two other studies, which had proven that CSCL was at least as effective as F2F seminars in increasing students' professional competen-

Table 4
Results of multiple regression for OL group

Actual knowledge						Perceived knowledge					
Empowerment, autoefficacy and locus of control scales			QSA (affective e motivational scales)			Empowerment, autoefficacy and locus of control scales			QSA (affective e motivational scales)		
	Beta	*p*-level		Beta	*p*-level		Beta	*p*-level		Beta	*p*-level
PSEPS	.25	.02	QSA_A1	−.32	.063	SSPI	−.21	.057	QSA_A5	.29	.006
			QSA_A5	.24	.069	Locus Esterno	.21	.062			

cies (Francescato et al., 2006, 2007a). We want to underline that we chose to teach professional (constructing and conducting in-depth interviews, facilitating focus groups) and psychological skills which could benefit from the physical presence of the teacher. In fact, opponents of online teaching point out that the teacher's physical presence represents a "modeling asset" when transferring not only basic knowledge, but professional competencies which are also based on nonverbal behaviors, such as posture, tone of voice, facial expressions, and body movements. As Rudestam (2004) theorizes asynchronous CSCL has several characteristics that probably compensate for the lack of nonverbal cues, present instead in F2F settings. Asynchronous learning permits confrontation of more viewpoints than can emerge in a traditional class discussion: time constraints of synchronous oral communication usually allow only a few students to voice their opinions, often people may have problems remembering accurately what was said by a colleague. Asynchronous learning allows time to read other people comments with calm before writing, promoting critical thinking.

We also found that collaborative learning works just as well both online and F2F, with teachers with more or less experience, more or less formal academic credentials. Further studies are needed to confirm or invalidate our findings. Partly our results could be due to the fact, that our teachers used a highly structured collaborative methodology, utilizing the same small group learning activities that had been especially devised and tested in previous studies (Francescato et al., 2006, 2007a) so they could be completed both F2F and online in the same week.

These modules required a fairly high degree of collaborative work among students. In both settings, students had access to the same theoretical materials on community psychology and performed the same practice exercise. They were given individual grades in the knowledge assessments but part of their individual assessment in the competence task was tied to those of their group members. Teachers acted both as content experts and process facilitators in both types of seminars. A less structured teaching situation could perhaps make the differences among the teachers more evident.

A limit of this study could also be in the variables we investigated (length of teaching experience online and F2F, formal academic credentials), while these did not have an impact on students, other teachers differences may have an influence on students learning. Further well controlled studies are needed, but our results seem to stress that a highly structured collaborative methodology that fosters interaction with peer students could be the key factor in promoting learning. Recent research has shown that this social interaction has to be facilitated, one cannot take for granted participants will socially interact, simply because the environment makes it possible (Kreijnsa, Kirschner, & Jochems, 2003).

Students who fared better online and F2F differed somewhat in their personality traits, in other psychological variables and in their learning strategies, but their differences did not account for much of the variance in learning. Further studies are also needed to confirm or invalidate our present findings. Future research should explore if, as in our study, online learning seems to be particularly beneficial to those students who lack perseverance, are not very anxious, can control their emotional reactions and have external locus of control and high problem solving efficacy. Our results are similar to those found in other studies (Liu, Papathanasiou, & Hao, 2001; Perkins, 1995; Reed & Overbaugh, 1993; Shermis & Lombard, 1998), which underline that students can learn well online only if they have low levels of anxiety and high control of their emotional reactions.

We found it very interesting that particularly students who use learning strategies characterized by lack of perseverance and have difficulties in handling their study time and finishing tasks punctually, benefited more from online settings. Possibly, asynchronous, highly structured collaborative learning courses, such as the one we tested in this study, which provide weekly deadlines and feedbacks, help students feel more responsible for their learning and also promote mutual aid. Moreover platforms, which make available at any time all the messages and materials online, have the advantage of creating a permanent written record of the entire classroom experience as an ongoing source of reflection and evaluation which could be very helpful with this group of students, who may be less able or willing to study independently.

F2F collaborative contexts were found to promote learning more in students who are less friendly, who do not want to study or collaborate with others, but are very conscientious and able to regulate their study schedules independently. These students are probably satisfied with doing cooperative tasks with others only in the short periods in which they attend classes, and not as it happens in asynchronous CSCL where they have the

opportunity but also the obligation to interact with their peers less intensely but for a potentially longer period in time. Typically graduate seminars meet for three hours every week, while the same task can be done online in a week.

Overall our data support those authors (Sherman, 1998; Smith & Senior, 2001) who advocate using more Internet based courses also for graduate training. Above all they confirm Rudestam' hypothesis on the potential of asynchronous collaborative learning environment for graduate training in the social sciences and in psychology in particular, fields in which very little e-learning has been implemented (Belar, 1998; Piotrowski & Vodanovich, 2004; Vodanovich & Piotrowski, 1999).

We hope our results will diminish the misgivings many professors still hold about distance education and show that distance education of the third generation, when integrated with collaborative pedagogical models as in CSCL, is indeed able to provide high quality education, contrary to the position stated by Barbera (2004).

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