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Chapter VII

A Constructivist Framework for Online Collaborative Learning: Adult Learning and Collaborative Learning Theory

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Abstract

The purpose of this chapter is to review and discuss theoretical perspectives that help to frame collaborative learning online. The chapter investigates literature about the type of learning and behavior that are anticipated and researched among participants learning collaboratively and discusses how these attributes explain computer-supported collaborative learning. The literature about learning is influenced by perspectives from a number of fields, particularly philosophy, psychology, and sociology. This chapter describes some of these perspectives from the fields of cognitive psychology, adult learning, and collaborative group learning. Recent research into computer-supported collaborative learning that applies these theories will also be discussed.
Introduction

Computer-supported collaborative learning (CSCL) is an emerging paradigm gathering a research focus of discussion from a range of disciplines. Lipponen (2002), discussing the foundations of this new and emerging focus of research and its differing interpretations, traces its short history as an academic discourse and explains many of the differing concepts of collaboration that it represents. This chapter explores the theoretical background to collaborative learning, reviewed to frame and explain a research study into collaborative learning in a distributed computer-supported environment. The theoretical ideas explored here, also represented in the CSCL literature, are placed in a broader context of educational literature and discussed in detail. The chapter will focus on online collaborative learning from within an interpretive framework, from the perspective that knowledge is subjective and socially constructed. The constructivist and social constructivist viewpoints about learning and knowledge construction are presented here first through an investigation of relevant literature about constructivism.

The field of adult learning, particularly in higher education contexts, is also explored with examination of research into the nature of the facilitation of learning by group interaction and the theories that underpin this area of study. The significant contribution of the social nature of cognition as theorized by Vygotsky (1978) to the theory base underlying collaborative learning is reviewed, with the importance of dialogue within an online community of learners discussed.

Constructivist Perspectives about Learning

The literature about a constructivist approach to learning that is described here covers a diversity of ideas from cognitive developmental theory to research in adult learning, from collaborative and group learning to educational technology and instructional design. The theoretical perspectives of learning and knowledge through which these different disciplines and studies have been reviewed are the principles of constructivism and particularly social constructivism. Constructivism is perceived differently across the educational literature, ranging from being called a theory of epistemology or a theory of learning, to being described as a philosophy or approach underlying a range of theories of learning. Constructivism is considered here to be a set of beliefs about knowing that become a perspective for understanding learning.

Definitions of Constructivism

Within his discussion of autonomous and individualized adult learning, Candy (1991) described constructivism as "a broad and somewhat elusive concept" (p. 252) and wrote of the irony that the discussion about constructivism, with its multiple perspectives, has
emerged from the field of science, so long considered a positivist field of hard facts and laws. He quoted writers such as Feyerbrand (1975), Kuhn (1970) and Pope (1983), (cited in Candy, 1991) who wrote of science as people's multiple constructions of concepts based on a central principle, i.e., that knowledge cannot be taught but must be constructed by the learner. Many other disciplines such as anthropology, sociology, and psychology also reflected dramatic shifts in perspective about "how people invent, organize, and impose structures on their experiences, and have argued that essentially knowledge is a social artefact" (Candy, 1991, pp. 253-254).

Candy described constructivism as three interrelated domains: a constructivist view of people, a constructivist view of knowledge, and constructivism in teaching and learning. His constructivist view of people is that they are not shaped by circumstances beyond their control but continuously inquire and explore and are driven to interact with others to make sense of their experience and develop a schema for reality to guide their actions. The constructivist view of knowledge, unlike the positivist view of knowledge as "an accumulated body of empirically verifiable facts, derived directly from observation and experimentation" (Candy, 1991, p. 262), perceives its content as constructed by the learner who experienced it. This means that if knowledge is tentative and socially constructed, it cannot be taught but only learned (or constructed). Many of the constructivist ideas of learning originated from the work of cognitive psychologists such as Piaget, Bruner, and Vygotsky who shared a central notion of constructivism in which the learner had a representational model, a system of schema or personal constructs that provided an anticipatory scheme for the learner to make sense of any situation. Thus, constructivism in learning is concerned with "how learners construe (or interpret) events and ideas, and how they construct (build or assemble) structures of meaning. The constant dialectical interplay between construing and constructing is at the heart of a constructivist approach to education" (Candy, 1991, p. 272).

Another adult educator, from the field of teacher education, Fosnot (1988) developed a definition of constructivism from a Piagetian perspective, and she defined the term as having four main principles. Fosnot's first principle was that knowledge consists of past constructions; we can never know the world in a truly objective way, as if it is separate from ourselves and past experiences. Instead, we know it through our logical framework which transforms, organizes and interprets our experiences. This logic is constructed and evolves throughout our physical and cognitive development. Secondly, she described how constructions come through assimilation and accommodation, polar processes defined by Piaget (cited in Fosnot, 1988). Assimilation is our logical framework, and when it is insufficient we accommodate or develop a higher level theory or concept to encompass the new information. Thirdly, constructivism from this perspective assumes learning is an organic process of invention, not a mechanical process of accumulation. A learner-centred, active instructional model is one where the learner must construct knowledge. The teacher is a mediator, not a dispenser of knowledge. Finally, meaningful learning occurs through reflection and resolution of cognitive conflict and negates incomplete levels of understanding.

Hendry (1996) summarized a wide field of literature about constructivism, mainly from research studies in the field of math and science education, with the purpose of clarifying constructivism and identifying strategies for implementation in the classroom. Hendry drew on neo-Piagetian research to support the importance to the learners' construction
of meaning, of explaining their ideas and procedures to others in small groups, with the opportunity to agree and disagree. This social interaction led to children achieving higher levels of thinking than those not grouped (Kamil, 1990; Wheatley, 1991; as cited in Hendry, 1996, p. 29). Hendry quoted King’s (1992) work in which he suggested that the process of explaining something to someone else led students to reconceptualize their views. This might be because they are able “to remember more acceptable knowledge because they generate and revitalize a greater variety of acceptable ideas which they have already constructed” (Hendry, 1996, p. 30). The discussion and feedback their explanations inspire may make them reconstruct their ideas as well as clarify them. Hendry described a range of teaching strategies not unlike those used in online adult learning context, based in real-life contexts, with students’ questions and problems and a “problem-centred learning” process (Wheatley, 1991,) in which students were encouraged to collaborate in pairs and small groups to solve problems.

**Constructivist Debate in Instructional Design**

Teachers and course designers in the field of flexible and distance learning have adopted the constructivist approach to learning as an alternative to the more behavioristic model of learning that underpinned much of the earlier instructional design of distance learning materials. This paradigmatic change resulted in a debate that clearly defined the issues and understandings about the constructivist approach. The use of educational technologies, such as those used in CSCL, as a means of providing the interaction and feedback with teachers and fellow students that facilitate this way of learning means that the relationship between a constructivist approach, collaborative learning, and learning at a distance is a focus of this field.

Bednar, Cunningham, Duffy, and Perry (1992) described learning as an active process based on experience, with conceptual growth coming from sharing perspectives as well as from experience. They described the traditional objectivist view of teaching as that of transferring or communicating knowledge to the learner efficiently from a knowledge base. Such a perspective was incompatible with constructivism, which they defined as “a constructive process in which the learner builds an internal representation of knowledge, a personal interpretation of experience” (p. 21) that is constantly open to change as learners change their structures to add more structures of information and experience. A constructivist approach to instructional design means that content cannot be prespecified because the learner must construct his or her own understanding. Learning is not context-free but must be situated in a real-life context so the learner thinks as an expert in the field. Learners are not just efficiently processing information and remembering it to later retrieve it, but must learn to be reflexively aware of the process of their knowledge construction. They must be provided with authentic tasks and learn to think like the expert, not be given a version of information mediated by another viewpoint. The solution of Bednar et al. (1992) was to specify a core of central knowledge that could be defined, even though the boundaries of what may be relevant to the learner cannot be defined by the teacher.

This discussion of constructivism underlined the necessity for collaborative learning as a means of providing multiple perspectives to a concept. There was a need to see an issue
from different vantage points and to understand alternative views. Learners evaluated different viewpoints, identifying shortcomings and strengths through the creation of a collaborative learning environment. The goal of this process was not seen as coming to a consensus view but developing and sharing alternative perspectives on issues. The rigorous process of developing and evaluating the arguments in collaborative learning was seen as the goal. Such learning was not competitive but cooperative so students could understand multiple perspectives.

Strategies that the field of instructional design developed in response to the constructivist perspective include situated cognition (Brown, Collins & Duguid, 1989; Brown & Duguid, 2000). This strategy incorporates learning experiences that are situated in real-world experiences—not as isolated tasks but as part of a larger context—through projects and environments that are created to capture the larger context. Another strategy is the cognitive apprenticeship (Collins, Brown, & Newman, 1989), where the teacher models the process for students and coaches them to an expert performance. These are processes that can be achieved with CSCL, as it provides a tool for dialogue between teacher and learner. The teacher’s responses are not scripted, so the students must have a dialogue in which the process of solving a problem can be seen as well as the solution.

The application of educational technology within a constructivist perspective has also been discussed by Jonassen (1995), who suggested the use of situated learning, which emphasizes conversation and context as an effective strategy. Jonassen argued that educators should observe students in informal learning situations and teach four areas: “domain knowledge, heuristic knowledge, metacognitive strategies and learning strategies” (p. 60) in real-life useful contexts as cognitive apprenticeships. He assumed “the social constructivist perspective implied by communities of learners” (p. 60) and described several attributes of meaningful learning. He wrote of meaningful learning as having the qualities of being active, with learners responsible for the result; constructive, with learners accommodating new ideas into prior knowledge to make sense; and collaborative, with learners working in learning and knowledge-building communities “exploiting” each others’ skills while providing support and observing each others’ contributions.

Jonassen (1995) believes learning should be intentional, with learners trying to achieve a cognitive object. It is conversational, because learning is inherently a social, dialogical process, contextualized in real-life meaningful tasks, and reflective, with learners articulating their learning and the process they undergo. His list of attributes, as described above, are a combination of many of the attributes that frame the rationale for online collaborative learning, and his discussion of the way technology should be used as cognitive tools that facilitate thinking and knowledge construction is supportive of the aims of CSCL. It can be suggested that CSCL meets his criteria for filling the proper role of technology in learning—first, as a tool for accessing information, representing ideas, and communicating with others or generating products; then, as an intellectual partner for supporting the internal negotiation of meaning making, constructing personal representations of meaning. Finally, it can be viewed as a context for representing beliefs, perspectives, arguments, and stories of others, defining a space for student thinking, and supporting discourse among a knowledge-building community of learners. Jonassen has written of technologies amplifying learning by “engaging learners in cognitive opera-
tions while constructing knowledge that they would not otherwise have been capable of" (p. 62) as they are used as knowledge-representation tools.

Another commentator in the field of instructional design and its use of technology to enable a constructivist perspective is Lebow (1993). In a comprehensive overview of the field of instructional systems design and its response to the principles and perspectives of constructivism, he argued that the philosophy of constructivism integrates the affective and cognitive domains of learning and offers another set of values to the field. He addressed the perceived incompatibility of the objectivist and constructivist aspects of instructional models, which he said was due to the perception that constructivism is a method, when it is a philosophy that supports the values of "collaboration, personal autonomy, generativity, reflectivity, active engagement, personal relevance, and pluralism" (Lebow, 1993, p. 5).

He maintained that instructional designers should attend more to the affective components of learning. His argument underlies an important assumption of online learning, "the process of acquiring new knowledge and understanding is firmly embedded in the social and emotional context in which learning takes place" (Lebow, 1993, p. 6). He incorporated these ideas into his principles of constructivism and wrote that "the feelings, intuitions, attitudes, values, interests, significant relationships and commitment of learners cannot be separated from the learning process" (p. 10).

His discussion of the principle that constructivism provides a context for learning that supports autonomy and relatedness is an important rationale for collaborative learning online. It encompasses the social constructivist perspective of valuing personal autonomy in learning as well as relatedness, through the use of methods of collaboration and interdependence that "emphasize personal responsibility and individual accountability" (Lebow, 1993, p. 8). These values underlie the strategies of learning and assessment that can be achieved in small-group learning online. Lebow provided a rationale for why collaboration is integral to a social constructivist approach when he wrote: "Since constructivists believe that motivation cannot be separated from the social context in which it is embedded, they seek to structure student relations to promote collaboration" (p. 8). The social constructivist view of learning has developed an importance that requires examination and explanation.

Social Constructivism

The importance of the social perspective of constructivism is being increasingly considered in the field of group collaborative learning. Prawat and Floden (1994) wrote that, in the range of views about constructivism and how it can best facilitate the knowledge-construction process, the social constructivists' approaches were becoming more important than other approaches to constructivism. They defined social constructivists as "distinctive in their insistence that knowledge creation is a shared rather than an individual experience," with learners developing their knowledge by the interaction of their combined perspectives. The social constructivist approach is based on the assumptions that "knowledge evolves through a process of negotiation within discourse communities" (p. 48).
Jonassen, Mayes, and McAleese (1993) reiterated the idea that cognitive activity occurs in a social context before being integrated into the individual's construction of meaning. They concluded that the learner must participate in "cooperative learning in which the learner is exposed to alternative viewpoints that challenge initial understanding" (p. 234). Jonassen's (1999) model of Constructivist Learning Environments (CLEs), explains how technology can enable collaboration and social construction of knowledge. CLEs engage students in investigation of a problem, critique related cases, and review information resources. Learners develop needed skills and collaborate with others, using the social support of the group to learn effectively. Jonassen and Remidez (2002) describe an environment, such as that established to support CSCL through a web-based environment, that supports collaborative groups and facilitates a scaffolded discourse about problem solving.

From the constructivist perspective described so far, the need to provide adult learners with a social context for negotiation and construction of knowledge becomes more apparent. The literature of adult and group learning provides a context for this discussion.

**Adult Learning: Major Perspectives**

The conditions in which adults learn most effectively need to be understood before the process of adults learning collaboratively can be clearly defined. Viewing the field of adult learning historically must include the work of Knowles (1990) among the most influential early writers in the field. His theory of androgogy has had a wide influence on research and practice in training and higher education. His emphasis on contextualizing learning within the adult learners' experience and developing their motivated independence enables the development of the more constructivist approach described in the work of Candy (1991) and Foley (1995). Laurillard's (2002) more teacher-centered perspective provides another focus on adult learning.

Knowles (1990) long maintained that adult learners have different characteristics than young, developing, and school-age learners, and that the practice of adapting theories about children to adult learners was not satisfactory. From pioneering work in the area of adult learning by Lindeman (1926) and research by Houle (1984) and Tough (1979) that focused on adults, Knowles developed a data bank of characteristics of adult learners. He incorporated these into his principles of androgogy (adult learning), which he defined as different from pedagogy (children's learning), particularly in the motivation and independence of adult learners. He described adults as motivated less by their teachers and more by their own need to learn, being more independent and self-directed in their learning than children.

Knowles' (1990) key assumptions included ideas about motivation for learning: that adults are motivated to learn as they experience needs that learning will satisfy; that adults are oriented to life situations so this is the appropriate basis for an adult curriculum; that the core methodology for teaching adults should be an analysis of their experience; and that there be provision for differences in "style, time, place, and pace of
learning” (p.31). Knowles also used the findings of Tough’s (1979) Canadian research that showed that adult learners preferred to have independent choice in details of their learning, including the content and style of teaching, and liked to learn collaboratively rather than independently.

Another commentator on adult learning, Foley (1995), also traced the sequence of learning theorists who influenced the concepts of adult learning, and his more recently written perspective described the change in educational research and practice that moved from focusing on effective teachers to studying what made effective learners. Foley’s perspective also provided a framework for critique of the field as well as providing a critical theorist’s perspective on adult learning. In describing the contribution to the interpretive understanding of learning and teaching that was made by cognitive psychology, he includes early Gestalt psychologists who described learners actively organizing knowledge into their own cognitive framework. These ideas he described as buried by behaviorist psychology—with its emphasis on scientifically observable responses and skills (including the work of Thorndike, Skinner, and Watson)—that dominated education until the 1950s. The exceptions to this were John Dewey’s progressive education and Vygotsky’s research and theory into child development in Russia (though this was not published in the West until the late 1960s), which were influential in representing a different approach.

Foley (1995) also stressed the importance to the field of adult learning of the work done with cognitive and learning styles, particularly the work of Kolb (1984). Kolb’s theory of experiential learning underlying these styles integrated ideas from cognitive psychology, educational theory, social psychology, and psychoanalysis. His propositions incorporated ideas already informing this field, particularly Vygotsky’s ideas about learning. Kolb emphasized that learning is social and that experiences influence the learning style a person prefers, while education and employment particularly affect the way a person learns. He described learning as an interactive activity between “individuals with their biological potentialities and the society with its symbols, tools, and other cultural artefacts” (Kolb cited in Foley, 1995, p. 39), and as a dialectical process involving people interacting with their environment. Foley, like Knowles, saw the understanding of such a variety of learning styles and epistemological positions as essential to helping adult educators understand the differences among their students.

Both Knowles and Foley described the significance of Rogers’ (1969) influence on adult education in the late 1960s and early 1970s with his ideas of student-centered, self-initiated learning, which critiqued the didactic type of teaching prevalent at the time and encouraged the teacher into the mode of facilitator. This role is important in the type of adult learning possible and suited to the computer-mediated environment. Rogers maintained that we cannot teach a person but can only facilitate his or her learning, and that individuals will only learn things they perceive as being an enhancement of their structure of self. He supported an accepting and supportive climate for learning, with student responsibility for learning rather than predetermined outcomes devised by the teacher. The concept of facilitation “has been a dominant influence in adult education for the past 30 years” (Foley, 1995, p. 43) and has changed the didactic approach of many teachers. Foley described its importance in two main developments in recent adult education, self-directed learning and adult learning principles.
The work of Candy (1991), already discussed in defining the attributes of the constructivist approach to learning, has significantly contributed to the field of adult learning through his research on the adult self-directed learner. Candy critiqued Knowles' assumption that all adults are self-directing and found that the literature suggested that many adults do not feel self-directing. He, too, quoted Carl Rogers, who, as one of the strongest advocates for a student-centered approach, observed that "only a third or a quarter of learners are self-directing individuals, the majority being people who do what they are supposed to do" (quoted in Candy, 1991, p. 61). He suggested that students may lack the necessary knowledge of the subject to begin autonomous learning, and that a solution may be for the teacher to be specific and direct initially and then look to more student collaborative modes of learning as a way of helping the learner to more self-direction, a situation that can be addressed through the formation of collaborative groups.

Candy (1991) claimed that developing personal autonomy need not isolate the learner who is still part of a social learning environment, a fact often obscured in the discussion of self-directed learning. "Adult education is distinguished by its emphasis on socially relevant learning within contexts of mutual interdependence" (p. 123). He described how adult education literature emphasizes the social contexts and pressures of learning, and he argued that no matter how self-directed, most learning requires membership of social groups and takes place in group settings. The need for other people "against whom to measure their progress and with whom to share the experience" (p. 301) and to validate their ideas is basic to most effective adult learning.

Candy (1991) alluded to Brown, Collins and Duguid's (1989) work on cognitive apprenticeship, where the learner is introduced to this language and concepts by other practitioners and learners in his or her knowledge community. The teachers or experts in the field of study begin by providing a model and a scaffold and "as the learners gain more self-confidence and control, they move into a more autonomous phase of collaborative learning, where they begin to participate consciously in the culture" (Brown et al., p. 39). Brookfield (1986) has also defined the self-directed adult learner comprehensively.

Laurillard (2002), in her analysis of academic teaching and learning in higher education, acknowledged a lack of research and professional training at this level and an attitude that academic staff only required expertise and knowledge of their discipline. She described the early elitist view of university teaching: students should take responsibility for their own learning, and academic teachers were simply experts in their field of knowledge who imparted that knowledge, particularly at the undergraduate level. Academic teaching was imparting knowledge, and failure was seen as the student's responsibility. This perspective is gradually changing—"The aim of teaching is simple: it is to make student learning possible" (Ramsden, 1992, p. 5, cited in Laurillard, p. 13). Universities are becoming less elite and are catering to a wider range and larger number of students, and there is a greater responsibility on the teacher to mediate learning, particularly through the medium of the online environment.

Laurillard (2002) wrote that the tradition of pedagogy, from Dewey's rejection of the classical tradition of passing on knowledge in the form of unchangeable ideas, has always argued for active engagement of the learner in the formation of his or her ideas. Vygotsky, Piaget, and Bruner all describe active engagement, not passive reception of
knowledge. However, while these psychologists have influenced approaches to learning in schools, and primary schooling has now changed, many universities still relied on lectures and textbooks. Laurillard proposed that to have a rich understanding of a concept, knowledge must be used in authentic activity. She discussed the scope of what is authentic, the degree of embeddedness in the social or physical world. Students have to be taught to stand back and reflect on learning, but it cannot be assumed that students will transfer that knowledge and apply it to new situations. She argued that if formal education provided more naturally embedded activities, students could do their own sense-making, as knowledge is taken out of its context by teaching abstractions. Abstractions must be grounded in multiple contexts to transfer well, and academic learning should be an activity that develops abstractions from multiple contexts.

Laurillard (2002), in analyzing current theories and research findings, concluded that there are different ways of conceptualizing the topics we want to teach, and teachers and students must have a continuing dialogue that reveals all their conceptions and that the teacher continually analyzes to determine further teaching. She described the learning process as a dialogue between teacher and student and as discursive, adaptive, interactive, and reflective: discursive with teachers and students agreeing on learning goals and task goals, with an environment for acting on these goals and receiving appropriate feedback; adaptive with the teacher responding to the students' conceptions in determining the dialogue; interactive between students acting to achieve the task goal with feedback from the teacher; and reflective by students linking this feedback with each task goal. Laurillard described this as a conversational framework.

Though her conversational framework provided an important perspective on the learning researched in this study, Laurillard's approach demands a very active teacher-directive role that to some extent undermines the type of student group collaboration and interaction that this chapter describes. However, her framework provides a sound basis for computer-supported adult learning, with principles of a reflective and responsive curriculum negotiated through online discussion.

**Adults Learning in Groups**

As an overview to several decades of research and theorizing into group processes and their application for adult learners, Jacques (2000) comprehensively summarized and described group processes, particularly in higher education. He reviewed the findings of research and the development of theory about group interaction that contribute to the theory of learning groups found in CSCL. He defined a group very simply, as two or more people who interact for more than a few minutes, and described the classic group attributes developed from a range of research. These included the notion of collective perception, when members of a group are collectively conscious of their existence as a group, as well as group needs, when members join a group to satisfy a need or give them some rewards. To be a group, the members must have shared aims, which are common aims that bind them together with the goal of achieving these aims as their reward (in tertiary learning, these are often assessment requirements and learning support).
Groups become interdependent and are affected by, and respond to, events that affect the rest of the group. They devise social organization, with a group seen as a social unit with norms, roles, statuses, power, and emotional relationships. To be a group, members must interact, and this can be applied to the context of computer-mediated communication space as Jacques (2000) described—“the sense of group exists even when members are not collected in the same place” (p. 13). Their interaction requires some authentic purpose and will not take place without some need to “influence, share and be responded to” (p. 13), which gives them a reason to communicate. A group must be together long enough for a rudimentary pattern of interaction to occur, and cohesiveness develops when members want to remain in the group and contribute to its well-being.

Jacques (2000) wrote that the need to address the socio-affective side of learners is supported in group research and should be seen for its importance in educating students for the types of relationships they will deal with in the workforce. Such emotional needs that group work serve will also help learning, and these principles are also evident in the online environment, though mediated and without the influence of physical presence of the group members. However, even in this mediated form, social presence is an important factor in establishing effective grouping. The atmosphere or social climate of a group can affect the spontaneity of the behavior of individuals in a group and the group norms established within a group—their code of ethics about proper and acceptable behavior such as responsibility and courtesy determine the type of socio-affective group support the group will provide. The sociometric pattern of the group—who interacts with whom, who likes who, who annoys who—provides a picture of the nature of the group support system, and has been investigated through studies of social presence among electronically observed groups (Rourke, Anderson, Garrison, & Archer, 1999; Stacey, 2002).

Jacques’ (2000) review of research showed that though groups are dynamic, there are predictable phases in their development, and he has summarized many classic pieces of research describing phases of dependence and interdependence (Bennis & Shepherd, 1956), flight, fight, and unite phases in group interaction (Bion, 1961), and the forming, storming, norming, performing, and adjourning phases of Tuckman and Jensen’s (1977) work that have been widely integrated into studies of organizational behavior. Jacques’ review of the body of research into group leadership concluded that it showed that “in normal situations, groups thrive best when the leadership functions are democratically shared among the members of the group” (p. 37).

**Cooperative Learning**

An influential strategy for group learning that has been implemented widely in the educational sector is cooperative learning. Researchers such as Slavin (1994) and Johnson and Johnson (1994) have developed strategies for teaching and learning in groups this way; e.g., Johnson and Johnson’s social interdependence learning through which group members share common goals but rely on the actions of the other group members to achieve outcomes (Johnson, Johnson, & Holubec, 1998). Although the researchers mentioned above have been among the most active and influential in the field, Davidson and Worsham (1992) claimed that there is no one model of cooperative learning or one “guru” in the field. They found critical attributes that were required in
all methods, including the need for suitable tasks for group learning, for small groups structured for student-to-student interaction, and for individual responsibility and accountability. However, whereas cooperative learning encouraged cooperation through structured interdependence of group members having teacher-defined differing roles, the collaborative learning movement allowed a more autonomous attitude to group roles with less teacher direction or intervention.

**Collaborative Learning Models**

Collaborative learning has many similarities to cooperative learning principles and though in many cases the term is used interchangeably, it generally reflects a different philosophy to that of cooperative learning. Panitz (1996), in an Internet discussion about the difference in these terms, called collaboration a "philosophy of interaction and personal lifestyle" not just a classroom technique where cooperation is "a structure of interaction designed to facilitate the accomplishment of an end product or goal." Collaborative learning:

- respects and highlights individual group members' abilities and contributions
- shares authority and responsibility for group outcomes amongst the group
- has an underlying premise of consensus building through cooperation rather than competition.

Dillenbourg (1999), in analyzing the differences between cooperative and collaborative learning, focused on the difference in the division of labor, with cooperative learning often defined as splitting the work and then assembling it into its final output. In collaborative learning, partners do the work together and though some division of labor may well occur, the outcome is negotiated by the group. Collaborative learning is premised on a social constructivist approach with the understanding that knowledge is attained through the learner's construction of knowledge in the social context that the group process facilitates. Dillenbourg described computer-supported collaborative learning as a means of examining collaborative learning closely, and this has indeed become an intensive field of research (Koschmann, Hall & Miyake, 2001) which is explored in more detail in other chapters.

Bosworth and Hamilton (1994), though writing about face-to-face campus learning, claimed that "collaborative learning may well be the most significant pedagogical shift of the century for teaching and learning in higher education" (p. 2), because it can potentially change teachers' and learners' views of learning. Gerlach (1994) also described the college-based movement towards collaborative learning as being based on the idea that learning is a social activity in which participants talk together and, through that talk, learning occurs. He discussed Britton's (1970) ideas about conversation as the means of developing, exploring, and clarifying ideas and explored Vygotsky's (1978) ideas that "learners need to be active organizers who use language in continual interaction with the social world in order to change both the world and themselves" (p.

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3) The social interaction meant students “talk to learn,” and the affective and subjective aspects of learning are brought into play as students must articulate their viewpoints and listen to the views of other group members. This allowed them to work with other students to create knowledge and meaning and not rely on the one-way delivery of the teacher or their printed text. Gerlach saw well-managed grouping and a shift from a teacher-centered classroom to a learner-centered one as the main changes to traditional classrooms that would contribute to successful collaborative learning in higher education.

This movement towards a collaborative model of learning gathered momentum at a time when CSCL was being investigated as a means of distributed group learning. The models described adapt well to the online environment where teacher and students are able to use the flexibility of the medium to continuously negotiate the curriculum and online tasks towards the most relevant and authentic purpose for each group of learners. From Kaye’s (1992) classic edited collection of studies into collaborative learning using computer conferencing to Salmon’s (2000) guide to the teacher’s role as e-moderator, the application of collaborative strategies into the online environment has been developed and discussed in the last decade (Harasim, Hiltz, Teles, & Turoff, 1995), though only slowly supported by a developing body of research. Paloff and Pratt (2001, 2003) have detailed such collaborative environments, and their discussion assumes an acceptance of the evolution of a learner-centered classroom when they write: “The virtual student needs to see the instructor as a guide who creates the structure and container for the course, allowing the students to co-create knowledge and meaning within that structure” (Paloff & Pratt, 2001, p.69).

Bruffee (1993), in his discussion of collaborative learning (though initially directed at changing the model of traditional face-to-face college learning), of on-campus teaching and learning that is particularly typical of undergraduate courses, has theorized and provided explanation for the possibilities of collaborative learning that can occur online, and his writing has become seminal to the CSCL discussion (Koschmann, 1999). He wrote of collaboration as a typical professional behavior where colleagues often ask colleagues to read a manuscript or draft a document together—reading and writing and discussing ideas together. He described this as reacculturation by collaboration, changing the models of teaching and learning education, particularly in higher education. He believed that if students are given experience in collaboration, they can develop an interest in interpreting tasks on their own, inventing and adapting language to negotiate consensus with other group members, and joining a community of peers in their construction of knowledge.

Bruffee’s (1993) concept of collaborative groups is of groups that are “nonfoundational,” i.e., not based on traditional positivist ideas of “giving” education from a knowledge base but on ideas of education as acculturation to a group process of learning. Teachers do not take over and tightly direct the group process but have a goal of productive collaboration among peers. This means that the teacher organizes students into groups, gives them their group tasks, and then backs off, not hovering over them or sitting in on their interaction, as this tends to encourage students to focus on the teacher’s authority and interests. Finally, after analyzing and discussing the group consensus, the teacher compares it to the current consensus in the knowledge community that the teacher represents.
Bruffee’s (1993) model included several criteria:

- An optimum number of five members for decision-making groups, as groups of nine, ten or more would “dilute the experience” (p. 32). Fewer than five would affect group dynamics in more obvious ways, as four will subdivide into two pairs, three would subdivide into one pair and one other, and groups of two (dyads) would sustain stress higher than other group sizes.

- Groups should not be too homogeneous (from the same place, or friends, or teammates), as there will not be the dissent necessary to provoke discussion, the conversation necessary to reach consensus that stimulates thought and learning if agreement comes too soon. Too much heterogeneity however may give no basis for consensus.

- Tasks have to be open-ended and require discussion and a seeking of consensus. The purpose is to generate discussion to reach consensus to help students organize collaboratively to work towards “membership in the discourse community that the teacher represents” (p. 38) without the teacher’s help.

Bruffee conceptualized the effectiveness of collaborative learning as the fact that at the end of the sequence of consensus groups—first, the small group, then, the whole class, and finally, the knowledge community—the students have knowledge that is not “given” by the teacher but rather has been constructed by them in the course of doing the task set by the teacher. The authority of this knowledge increases with the size of the group consensus, from small group to the whole class group to comparing the consensus knowledge with the discipline-based community. Bruffee (1993) wrote that collaborative learning “models the conversation by which communities of knowledgeable peers construct knowledge” (p. 52) and that writing is fundamental to collaborative learning. As online learning requires a written conversation through the use of computer-mediated communication, Bruffee’s points about social constructivism and writing are particularly relevant and important to the interpretation of this context.

Bruffee’s philosophy about collaborative learning is premised on the assumption that knowledge is a consensus, something people construct interdependently by talking together. He also described education as initiating conversation which then initiates thought; therefore, people can think because they can talk with one another, and we all have membership of a knowledge community. The need for externalizing this conversation is not simple problem solving but people working within their “zones of proximal development” striving to “understand the world at the very frontier of their ability to understand it” (Bruffee, 1993, p. 123). They use a transitional language from whatever community they come, and eventually this leads to an agreed upon language of the knowledge community they are entering, the new community of knowledgeable peers. They internalize this conversation so they can continue it alone, but they need that step into conversation to make that conceptual change occur. Bruffee’s ideas drew strongly from Vygotskian theory, which will be described in more detail later in the chapter. Bruffee’s ideas were used to frame and theorize the model of online collaborative learning that emerged from a study of computer-supported collaborative learners described in detail below by Stacey (1999).
Cognitive Psychology, Constructivism and the Social Nature of Learning

The findings from cognitive psychology about the social nature of learning, particularly the work of Vygotsky, provide us with a theoretical understanding and a researched critique of the foundations of the learning through group processes that have been discussed so far.

Cognitive psychologists such as Piaget, Vygotsky, and Bruner emphasized the social nature of learning, particularly when learners are confronted with problems that they cannot solve on their own without the resources of a group. More important, the process of discussion—listening to other group members and receiving feedback on ideas—provides the cognitive scaffolding these constructivists see as essential to higher order thinking (Slavin, 1994).

Vygotsky studied children's development as a way of understanding complex human processes, and his research has been replicated and extended to include the study of learning that occurs in the social setting of a group of either children or adults. These ideas from cognitive psychology provide a basis for learning requiring social interaction because Vygotsky viewed learning as a particularly social process with language and dialogue essential to cognitive development.

Vygotsky's notion of a zone of proximal development has gained acceptance since his work was translated into English in the late 1960s. This is a zone in which a learner cannot achieve an understanding of a new concept alone and requires help from a teacher or a peer: "It is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86).

Such a concept requires a learner to interact with other learners who will extend their understanding. Group interaction in the learning process is an important requirement for this condition and the exploration of Vygotsky's ideas can be used as rationale and explanation for the effectiveness of collaborative learning. Social interaction with its creation of a zone of proximal development enables learning that develops an internal process of cognitive thought that the learner can then construct independently. It also enables Vygotsky's notion of scaffolding, in which learners are given a great deal of support initially and then encouraged to become more independent and responsible for their learning as soon as possible. Vygotsky did not see learning as a developmental process but, properly organized, learning can result in mental development and can start other developmental processes that require learning. He refuted the traditional view that learning shows development but said that learning was the beginning of further development.

Vygotsky's concept of expert assistance has been influenced by the idea that this assistance has a vested interest in seeing that particular knowledge is acquired. The concept of the learner being active-a participant in the process-is emphasized in the post-Vygotskian research compared to the role of the adult in the learning process in the Vygotskian research. The motives of the learners are also to be considered as they are
not always enthusiastic receivers of expert assistance. A final challenge discussed by Goodnow (1993) was that of analyzing and describing interaction between peers and between the expert and the novice. The approach emerging from the literature is that of development being more than acquisition by one individual but acquisition of shared meanings. In the recent research on the social, affective, and cognitive benefits of cooperative and collaborative learning, Vygotsky is cited as one of the primary theoretical sources for the developmental approach to peer collaboration. However, according to Forman and McPhail (1993) who have reviewed collaborative problem-solving in comparison to other theoretical perspectives, researchers have interpreted Vygotsky’s approach to peer collaboration as a peer-tutoring process that they considered incorrect. By describing Vygotsky’s perspective as going beyond the process of transmission from expert to novice, they broadened the Vygotskian approach to peer collaboration.

**Post-Vygotskian Research**

Goodnow (1993), writing about the research inspired by Vygotsky, summarized the direction of post-Vygotskian research and reflected on the differing approaches and findings of theorists and researchers in this field from the 1960s to the 1990s. In the field of psychology in the 1960s, researchers found that the prevailing behaviorist views would not always fit their observations and that the effect of culture and context was important in cognitive development. Around 1970, as many developmental psychologists turned to other disciplines (social psychology, sociology, anthropology), other researchers focused more on social factors and looked to the works of Vygotsky and the Soviet psychologists. As context and culture were being researched and retheorized, so was cognition. There was recognition that when two people worked on a task, whether by talking to one another or solving the same problem, the critical point was not so much either individual’s understanding as the presence of shared meanings or “intersubjectivity” (Goodnow, 1993, p. 374). The debate over whether cognition is general and transferable from one task to another or specific to the task reached a point of agreement through followers of Vygotsky’s work: “Specificity now seems to be taken for granted by scholars working from a Vygotskian base” (p. 375). His work has meant that situations must be considered where learners work together as well as those that are individual.

Forman and McPhail (1993) critiqued psychologists who researched problem solving as an individual activity and who usually carried out this research in laboratory conditions, an approach they found less relevant than naturalistic settings. The research of those psychologists, educators, and anthropologists who have studied adults in naturalistic group problem-solving tasks showed a context in which “supports for, constraints on, and challenges to an individual’s thinking occur.” (Forman & McPhail, 1993, p. 213). They carried out a case study with adolescent girls that demonstrated that they could “establish, modify, reflect on, and refine their initial task goals and definitions so as to collaborate with their peers” (p. 224). They also provided a zone of proximal development for each other that facilitated higher mental functioning. They concluded that Vygotskian theory “supports and extends current debates on the benefits of collaborative problem solving” (p. 225) and supported research that tried to establish the most effective social context and interactional processes for motivation for problem-solving collaboratively.
Vygotskian theory views cognitive growth as occurring when children are given an opportunity to set up their own goals and organize their own activities. This implies that teachers must give up some of their control of the learning situation for collaborative learning to be most beneficial. A shared means of communication is also essential so that learners are able to argue or share ideas and work collaboratively together and make collaborative learning a meaningful learning process. Learners should be interested in the task and share the goal of solving it, and they should receive immediate feedback. These last two factors are typical of the context of online collaborative learning. Students can have online access to question the teacher when needed and if motivated by interest in goal solving. If members of the group do not have this shared interest, their credibility could be questioned by the group who will check the accuracy of their statements. The electronic conferencing environment enables this questioning, and adult learners are usually confident in expressing their thoughts.

Collaborative Learning and Technology

This chapter has so far drawn together a theoretical basis for explaining the type of learning that is now possible through computer-supported collaborative learning. The last part of the chapter will briefly illustrate these principles through discussion of some recent research and will explore some of the current research discussions about online collaborative learning. Research into online groups has now become a meaningful field of inquiry intent on developing pedagogical models that take advantage of the possibilities of CSCL. Institutions worldwide are concerned with the value of this medium and the most effective ways of using its potential in teaching and learning.

Stacey's (1999) study investigated the experiences of 30 students over a year of their Master of Business Administration (MBA) course, focusing particularly on their use of group communication online as they studied Economics in small groups. Though initially meeting at a study school, their main communication was through the use of CSCL, which was researched as an ethnographic study with the context of the group formation and development and the process of their collaboration described through multiple research perspectives. The groups' ongoing processes of communication and interaction were researched by observation, recording, and analysis of the text of the electronic communication and analysis of the usage pattern of the participants. The learning processes the students experienced using this medium were described through their reflections during interview and through analysis of electronic observation of their communication. The students' process of learning was achieved through collaboration, and the attributes of the social construction of knowledge that emerged through collaborative learning via CSCL were through:

- the sharing of the diverse perspectives of the group members;
- their clarification of ideas via group communication;
- the feedback to a learner's ideas provided by other group members;

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• the process of seeking group solutions for problems;
• their practicing the new language of the knowledge community in discussion with other group members before using this language in the whole group or in the new knowledge community;
• the power of the process of group discussion either mediated by communications media or by through face-to-face contact; and
• the sharing of resources within the group.

The collaborative behaviors through the CSCL also provided socio-affective support that motivated learners. Learning online provided the students with a means of comparing their progress with other students, and the use of computer conferencing set up an environment that required collaboration in order for the group to function effectively. Group members helped each other become competent online users and supported the students who had no electronic access. Technical collaboration—working together to support each other while learning the skills of online access—provided a means of developing group cohesion, and the cohesive groups enabled a democratic system of group management, responsibility, and roles.

The groups in the study that used the group conferences to manage the work and administration of the group interaction had a central point of communication that could be read by all group members, and this meant that their interactive communication could flow smoothly and expectations of contributions could be clearly flagged, thus avoiding any difficulties. The group conferences were also used to ask for assignment and administrative help. The friendly social conversation appeared to provide a group cohesiveness in the face of shared concerns. Collaborating together motivated students to study effectively and to seek to continue the group collaboration over the continuing program. The study found that an effective online environment such as this provided the students with the benefits of reduced isolation and convenience through asynchronous communication, though it raised issues and challenges with the changes and technical hurdles of the electronic environment.

The notion of an online community has been identified by many writers and theorists in the field and has become a focus for recent research. Bernard, Rojo de Rubalcava, and St-Pierre (2000), in summarizing collaborative online learning developments, identified the need for the learner to feel part of a learning community where social interaction fostered community spirit. Garrison and Anderson’s (2003) Community of Inquiry model, developed through their extensive research, identified factors of cognitive, social, and teaching presence as key attributes in analyzing online group interaction and learning. They challenge the rhetoric about online communities and see self-directed learning and critical thinking as essential attributes for participants to bring to a community of inquiry. The work of Wenger (Wenger et al., 2002) also provides a conceptual approach for understanding and investigating communities of practice, which he defines as those “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (p. 4). Wenger’s conceptual explanations of communities of practice, though developed in studies of situated learning in workplaces, have translated easily into the
online learning environment as both workplaces and education and training have drawn people into communities whose participants are distributed geographically and dependent on communication technologies. In describing CSCL communities, Woodruff (2002) has identified four cohesion factors holding such communities together: the function or goal of the community, the identity or membership, the discursive participation or shared discourse online, and the shared values of the community.

Smith and Stacey (2003) mapped research into computer-supported collaborative learning and identified gaps and opportunities that have yet to be explored. Research into such CSCL communities can draw explanation for the learning that occurs from the theoretical discussion undertaken in this chapter. The chapter has reviewed literature about adult learning and collaborative group learning through a framework of a constructivist perspective to provide an understanding of computer-supported collaborative learning.

References


A Constructivist Framework for Online Collaborative Learning


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