



A Historical Review of Collaborative Learning and Cooperative Learning

Xigui Yang¹

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Abstract

Collaborative learning and cooperative learning are two separate approaches developed independently by two groups of scholars around the same period of time in the 1960 and 1970 s. Due to their different origins and intertwined paths of development, they have their own distinct features while sharing many similarities. The relationship between collaborative learning and cooperative learning can be confusing. Therefore, this paper provides a brief historical review of collaborative learning and cooperative learning to identify the origins of each, where they diverge from each other, and where they are aligned. This paper examines the definitions of the two terms and compares their characteristics. This is followed by a discussion of their historical development in the last fifty years: early development between the 1960 and 1970 s; maturation in the 1980 and 1990 s; convergence in the mid-1990s; and the emergence of Computer-Supported Collaborative Learning (CSCL) in the late 1980s. Finally, this paper summarizes the four paradigms of mainstream research on collaborative and cooperative learning, namely, the “effect” paradigm, the “conditions” paradigm, the “interaction” paradigm, and the “design” paradigm.

Keywords Collaborative learning · Cooperative learning · CSCL · Historical review

Introduction

Collaborative learning is now used as an umbrella term for various instructional approaches to small group learning, including but not limited to cooperative learning, team-based learning, peer tutoring, study groups, project-based learning, problem-based learning, and learning communities (Koschmann, 1996; Smith & MacGregor, 1992; Udvari-Solner, 2012a). Notably, the relationship between collaborative learning and cooperative learning has been most confusing (Bruffee, 1999), “...more like an arbor of vines growing in parallel, crossing, or intertwining” (MacGregor, 1992, p. 37), given the fact that they were developed around the same period of time. Some scholars use the two terms as synonyms, some consider cooperative learning a subcategory of collaborative learning, others treat them as two ends of a continuum, with cooperative learning being most structured and collaborative learning being least structured, and still, others draw a clear line between the two (Barkley et al.,

2014). There is a theoretical rationale to discriminate the two terms, but in practice, it is difficult to separate them because collaboration and cooperation often co-exist in many group work processes (Jeong & Hmelo-Silver, 2016).

According to Bruffee (1999), collaborative and cooperative learning are complementary and supplementary, and their differences can be mainly attributed to their different origins:

Collaborative and cooperative learning were developed originally for educating people of different ages, experience, and levels of mastery of the craft of interdependence. So teachers devising methods in each case tended to make different assumptions about the nature of knowledge and the authority of knowledge. (p. 87)

Therefore, the purpose of this paper is to provide a brief historical review of collaborative learning and cooperative learning to identify their origins, where they diverge from each other, and where they are aligned.

This paper is organized into five parts. The first part examines the definitions of the two terms and compares their characteristics. The next three parts outline the historical development of collaborative learning and cooperative learning in the past five decades, which can be roughly divided into three phases: early development between the 1960 and

✉ Xigui Yang
xy65409@uga.edu

¹ College of Education, University of Georgia, River’s Crossing, 850 College Station Rd, Athens, GA 30605, USA

1970 s; maturation in the 1980 and 1990 s; convergence in the mid-1990s; and the emergence of Computer-Supported Collaborative Learning (CSCL) in the late 1980s. A timeline of their history can be found in the Appendix Table 2. The fifth part summarizes the four paradigms of research on collaborative and cooperative learning, namely, the “effect” paradigm, the “conditions” paradigm, the “interaction” paradigm (Dillenbourg et al., 1996), and the “design” paradigm.

Definitions and Characteristics

It is challenging to define collaborative learning or collaboration, and there is no universal definition (Dillenbourg, 1999; Koschmann, 1996; Whipple, 1987). To Bruffee (1999), the most prominent collaborative theorist, collaborative learning “creates conditions in which students can negotiate the boundaries between the knowledge communities they belong to and the one that the professor belongs to” (p. 144). In this philosophical view, the notions of power and authority are challenged, with the assumption that knowledge is not transmitted from the professors to the students but socially constructed among people of a community (Bruffee, 1984, 1999). Thus education can be viewed as a conversation among people and a process of reacculturation (Bruffee, 1984, 1999). In light of Bruffee’s conception, Panitz (1999) defined collaboration as “a philosophy of interaction and personal lifestyle where individuals are responsible for their actions, including learning and respecting the abilities and contributions of their peers (p. 3). Likewise, Oxford (1997) also acknowledged the philosophical orientation of collaborative learning. With a focus on the learning processes, Roschelle & Teasley (1995) defined collaboration as “the mutual engagement of participants in a coordinated effort to solve the problem together” (p. 70). Due to its philosophical orientation, collaborative learning tends not to impose too much structure on learning activities (Bruffee, 1995, 1999), and the students “work together in small groups that are typically self-selected, self-managed, and loosely structured” (Davidson, 2021a, p. 12).

In contrast, the definitions of cooperative learning or cooperation are much less abstract. The most renowned cooperative theorists, Johnson & Johnson (1999), defined cooperative learning as “the instructional use of small groups so that students work together to maximize their own and each other’s learning” (p. 5). They emphasized interdependence in group work: students “can reach their learning goals if and only if the other students in the learning group also reach their goals” (Johnson & Johnson, 1999, p. 5). Cooperation can be defined as “a structure of interaction designed to facilitate the accomplishment of a specific end product or goal through people working together in groups” (Panitz, 1999,

p. 3). Cooperation implies “the division of labour among participants, as an activity where each person is responsible for a portion of the problem solving” (Roschelle & Teasley, 1995, p. 70). Compared to collaborative learning, cooperative learning has a more practical orientation as “a set of instructional methods in which students work in small, mixed-ability learning groups” (Slavin, 1987, p. 3). Although with different goals and emphases, cooperative learning methods all tend to structure group interactions to ensure equal participation and individual accountability (Bruffee, 1995, 1999; Oxford, 1997; Sharan & Sharan, 2021). Most well-known small group learning techniques, such as Jigsaw, Think-Pair-Share, Three-Step Interview, Teams-Games-Tournaments, and Group Investigation, were invented by cooperative learning researchers; conversely, very limited specific procures can be attributed to collaborative learning (Davidson, 2021a).

Therefore, the key difference between the two approaches lies in that: “in nurturing educational rewards to be gained from self-governed student peer relations, [collaboration learning] sacrifices guaranteed accountability... in guaranteeing accountability, [cooperative learning] risks maintaining authority relations of traditional education both within each small working group and in the class as a whole” (Bruffee, 1999, p. 92). Many scholars attempted to differentiate collaborative and cooperative learning (Bruffee, 1995; Davidson, 2021c; Davidson & Major, 2014; Dillenbourg, 1999; Jacobs, 2015; Oxford, 1997; Panitz, 1999; Smith & MacGregor, 1992; Veldman & Kostons, 2019) (see Table 1). It is critical to note that these differences are generalizations of the two approaches, especially at their earlier stages. Both approaches can take varied forms, and many of the distinctions seem to be blurred after years of development.

To sum up, collaborative learning was founded by humanity educators in higher education, based on theories of constructivism (Piaget and Vygotsky) and critical pedagogy (Freire), with the goal of shifting the structure of authority in education. Collaborative learning research typically involves qualitative approaches, whereas the practice of collaborative learning is typically based on the design of open-ended tasks for students to work together to reach a consensus and typically does not intervene in group processes or teach team-building skills. In contrast, cooperative learning was established by social psychologists and STEM educators to improve K-12 education in a culture of competition and individualism, based on theories of social interdependence (Lewin and Deutsch), constructivism (Piaget and Vygotsky), and behaviorist learning theories (Skinner and Bandura). Cooperative learning researchers typically use quantitative approaches to test and validate their theories. The practice of cooperative learning has typically been based on many ready-to-use methods to promote positive interdependence among group members. How these distinctions come into being will be made more apparent as we review the historical development of collaborative and cooperative learning in the next section.

Table 1 Differences between collaborative learning and cooperative learning

Aspects	Collaborative Learning	Cooperative Learning
Origin	Group learning in British schools and universities (Abercrombie; Mason and colleagues)	American social psychological study on cooperation and competition (Lewin; Deutsch)
Education level	Started from higher education	Started from K-12, esp. primary schools
Premise	Learning is impeded by authority of knowledge.	Learning is impeded by competition and individualism.
Theoretical foundations	Social construction (Kuhn; Rorty) Constructivism (Piaget; Vygotsky) Critical pedagogy (Freire)	Social interdependence (Lewin; Deutsch) Cognitive development (Piaget; Vygotsky) Behaviorist learning (Skinner; Bandura)
Leading scholars	Humanist educators in literature and philosophy (Bruffee)	Social psychologists and STEM educators (Johnson & Johnson; Slavin)
Research methods	Qualitative	Quantitative
Research focus	Learning outcomes (achievement, social skills, etc.)	Learning processes (knowledge construction, argumentation, etc.)
Knowledge type	Nonfoundational knowledge (addressing questions with arguable or ambiguous answers)	Foundational knowledge (addressing questions with widely agreed-upon answers)
Task type	Open-ended tasks	Close-ended tasks (with correct answers)
Group processes	loosely structured	Highly structured
Division of Labor	No	Yes
Assessment	Group performance	Individual learning
Typical strategies / methods	Consensus groups (Bruffee) Peer tutoring (Bruffee) Collaborative writing (Bruffee) Reciprocal teaching (Palincsar & Brown) Learning communities (Smith & MacGregor) Team-based learning (Michaelson, Knight, & Fink)	Think-Pair-Share (Lyman) Jigsaw (Aronson) Group Investigation (Sharan & Sharan) Jigsaw II (Slavin) Student-Team-Achievement-Division (Slavin) Team-Games-Tournament (Slavin) Team-Accelerated Instruction (Slavin) Learning Together (Johnson & Johnson) Constructive Controversy (Johnson & Johnson) Three-Step Interview (Kagan) Inside Outside Circle (Kagan) Rally Robin (Kagan) Numbered Heads Together (Kagan) Co-op Co-op (Kagan)

With these differences in mind, it is important to remember that collaborative and cooperative learning share more similarities than differences (Kreijns et al., 2003). They both harness “peer group influence to focus on intellectual and substantive concerns” (Bruffee, 1999, p. 92) and are both student-centered pedagogies compared to traditional teacher-centered lectures. Fundamentally, they have some shared theoretical assumptions, such as: Learning is an active, constructive process; learning depends on rich contexts; learners are diverse; learning is inherently social; learning has affective and subjective dimensions (Smith & MacGregor, 1992).

Early Development in the 1960 and 1970s

Small group learning approaches such as collaborative learning and cooperative learning can be traced back to ancient times (Johnson & Johnson, 1999, 2021). However, modern exploration of collaborative learning and cooperative learning

began in the 1960s and emerged as fields of study in the 1970s. Around this period of time, there were probably many other educators who were practicing small group pedagogies without knowing or using the labels of collaborative or cooperative learning (Gamson, 1994).

Collaborative Learning with British Origins

Research on collaborative learning originated in Britain in the 1960s (Bruffee, 1984). At the college level, Abercrombie experimented with teaching medical students to make better diagnoses through collaborative learning at the University of London (Bruffee, 1973, 1984, 1999). For secondary education, the Curriculum Laboratory at the University of London Goldsmiths’ College worked closely with local school teachers to promote collaborative learning with a strong political endeavor to establish democracy and humanity in education (Bruffee, 1984). Mason (1970) summarized the innovative work he and his colleagues in the Curriculum Laboratory

did in his book *Collaborative Learning*, which was the first time this term appeared in the literature. Mason (1970) proposed to design a new educational system that could foster “authenticity in knowledge and in relationships” and “dialogue between pupils and collaboration,” which he believed “can only happen if most work goes on in small groups, so conditions must also be sufficiently relaxed for teachers to allow groups to work much of the time without supervision” (p. 85). As a pioneer of collaborative learning, Mason (1970), however, deliberated not to give any definitions of collaborative learning, nor did he provide operational procedures for practicing collaborative learning.

In the early 1970s in the United States, a young American professor in English at Brooklyn College, Kenneth A. Bruffee, borrowed the term “collaborative learning” from Mason (1970), as he was trying to solve practical issues in his own teaching (Bruffee, 1984, 1999). Years later, Bruffee furthered the theorization of collaborative learning and became the leading collaborative theorist. Bruffee (1973) described his earlier attempts at collaborative learning in his literature and composition classes in the article “Collaborative Learning: Some Practical Models” published in *College English*, which became a major platform for many of the early discussions of collaborative learning.

As Bruffee (1973) observed, college students participated in a wide range of collaborative activities such as academic study groups, hobby groups, and political activist societies outside the classroom, whereas they were expected to work individually inside the classroom and collaboration was discouraged. At that time, the open admissions policy in his institution brought about dramatic changes in the campus demographics with more minority students and students of low achievement (Bruffee, 1999). There was a need to bridge the achievement gap and racial differences, forcing him to rethink the nature of knowledge, authority, and education. Drawing inspirations from Dewey, Vygotsky, and Freire’s *Pedagogy of the Oppressed*, Bruffee (1999) started to experiment with collaborative learning in his department around the idea of knowledge communities and reacclimation, but he had not yet fully uncovered the connections between these ideas and collaborative learning until the 1980s.

Cooperative Learning Without a Name

In the meantime, the pioneers of cooperative learning, including David W. Johnson and Roger T. Johnson, Elliot, Spencer Kagan, Richard Schmuck, Neil Davidson, Elizabeth G. Cohen, Robert E. Slavin, and Shlomo Sharan, started their research careers on cooperative learning in the 1960 and 1970 s (Davidson, 2021a). The term “cooperative learning,” however, did not appear in literature until around 1980; alternative terms such as “small group learning” were used before that (Davidson, 2021a). The recently published book *Pioneering Perspectives in Cooperative Learning*, edited by Davidson (2021b), invited

these leading scholars to share stories about how they developed their unique approaches to cooperative learning.

Like Bruffee, Aronson (2021) invented the now famous jigsaw method in the early 1970s in response to critical issues caused by the socio-cultural contexts, i.e., the desegregation in public schools in Texas. Aronson (2021) implemented the jigsaw method among fifth-grade students. It was a success as students learned to appreciate each other’s differences, became friendly to each other, and developed a positive attitude towards the school.

David and Roger Johnson from the University of Minnesota started to train teachers on cooperative learning in the mid-1960s during a time of competition and individualism within American society. In 1975, they published their masterpiece *Learning Together and Alone* (5th edition in 1999) (Johnson & Johnson, 1999). They grounded their research practices on social interdependence theory, cognitive developmental theory, and behavioral learning theories (Johnson & Johnson, 1999, 2009). Social interdependence theory was developed by Morton Deutsch in the 1940s, which “grounds the entire field of cooperative learning” (Stevahn, 2021, p. 17). Deutsch’s social interdependence theory was expanded by his student David Johnson (Johnson & Johnson, 1999, 2009, 2021).

Social interdependence theory distinguishes three types of social interaction: promotive interaction (cooperation) from positive interdependence of individuals in a group; oppositional interaction (competition) from negative interdependence of group members; and no interaction (individualist efforts) from independence or no interdependence within a group. Although cooperative, competitive, and individualistic learning can all lead to constructive learning, the Johnsons argued that cooperative learning should be “the basic foundation of instruction, the underlying context on which all instruction rests” (Johnson & Johnson, 1999, p. 11). The cognitive-developmental perspective of cooperative learning is rooted in Piaget’s “conceptual conflicts” and Vygotsky’s “Zone of Proximal Development” (Johnson & Johnson, 1999). The behavioral learning theories by Skinner and Bandura support the use of extrinsic motivation as incentives for students to learn together “since it is assumed that students will not intrinsically help their classmates or work toward a common goal” (Johnson & Johnson, 1999, p. 186).

Further, Johnson and Johnson (1999; 2009; 2021) identified five core elements of productive cooperative learning: (1) positive interdependence (achieved by sharing goals, resources, roles, workload, and rewards); (2) individual accountability and personal responsibility; (3) promotive interaction; (4) appropriate use of social skills; and (5) group processing. Besides building a comprehensive theoretical framework and practical guidelines for cooperative learning, the Johnsons applied their cooperative learning methods in the classrooms and conducted empirical research to validate and refine their theory (Johnson & Johnson, 1999, 2009,

2021). Many other cooperative learning scholars also conduct quantitative research, as most of them are well-trained social psychologists (e.g., David Johnson, Slavin, Sharan, Aronson, Kagan, and Schmuck) or STEM educators (e.g., Roger Johnson and Davidson).

A community of cooperative learning scholars was formed in the late 1970s. Initiated by Shlomo Sharan, the First International Convention on Cooperation in Education took place in Israel in 1979, and the International Association for the Study of Cooperation in Education (IASCE) was founded. The IASCE was active for four decades until its closure amid the Covid-19 pandemic in 2020 (Davidson, 2021a).

Coming of Age in the 1980 and 1990s

In the 1980 and 1990s, both collaborative and cooperative learning witnessed substantive growth and gained wide recognition. However, they did not develop in the same fashion or at the same pace. Having established solid theoretical foundations in the 1970s, cooperative learning has flourished in research since then and was widely adopted at all educational levels by the 1990s. Theories of collaborative learning were not established until the early 1980s, and up to that point, research on collaborative learning was lacking (Bruffee, 1986; Smit, 1989). However, collaborative learning became “a conscious and well-developed set of practices carried out by a growing number of practitioners from many disciplines” in the 1990s (Gamson, 1994).

The paths of collaborative and cooperative learning started to cross around the mid-1990s as scholars attempted to differentiate the two approaches (Bruffee, 1995; Dillenbourg, 1999; Oxford, 1997; Panitz, 1999; Smith & MacGregor, 1992). In 1995, four scholars (two representing each approach) (Matthews et al., 1995) co-authored an article, “Building Bridges between Cooperative and Collaborative Learning,” published in *Change: The Magazine of Higher Learning*, emphasizing the similarities of the two approaches. This can be regarded as a critical moment for reconciling differences between the two approaches. Moreover, the field of instructional design and technology began to adopt collaborative learning as a research paradigm, using the term “collaborative learning” to broadly characterize all approaches (Koschmann, 1996).

Towards a Theory of Collaborative Learning

Bruffee first presented his theorization of collaborative learning in 1984 (Bruffee, 1984), with important extensions to the theory in 1986 (Bruffee, 1986), culminating in the publication of his book *Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge* (first published in 1993; second edition in 1999) (Bruffee, 1999).

Bruffee (1986) introduced social constructionist theories and how they shaped his understanding of collaborative learning. Based on Vygotsky’s idea that learning happens when social interactions are reflected and internalized by the learner, Bruffee (1984) argued that our thought or knowledge is not a given attribute but a social artifact constructed in the process of social interaction among communities of knowledgeable peers. Collaborative learning reflects the process of socially justifying our beliefs as we learn: “...by challenging each other’s biases and presuppositions; by negotiating collectively toward new paradigms of perception, thought, feeling, and expression; and by joining larger, more experienced communities of knowledgeable peers through assenting to those communities’ interests, values, language, and paradigms of perception and thought” (Bruffee, 1984, p. 646). In these knowledge communities, the teachers’ traditional role as the authority of knowledge was deconstructed, and a teacher’s responsibility was shifted to introduce the new members (students) to the community (Bruffee, 1984, 1986, 1999). In collaborative learning, authority is distributed among group members, fostering interdependence on each other (Bruffee, 1999). For the students, learning comes from joining a new community with a culture different from their own, which happens when they have conversations and negotiate the boundaries of different communities (Bruffee, 1999). Therefore, learning or education is a process of reacclimation, which is fundamentally collaborative (Bruffee, 1984, 1986, 1999).

Bruffee (1984) admitted that collaborative learning was challenging to implement and that there was no one approach or “recipe” to practicing it. But he believed collaboration was essential for students to engage in intellectual pursuit through social interaction (Bruffee, 1984, 1999). Although there was no single approach, Bruffee (1999) gave examples of collaborative learning, such as consensus groups, peer tutoring, and collaborative writing. Additionally, Wiener (1986) proposed a series of elements for practitioners to consider when evaluating collaborative learning, e.g., task design, student behavior, teacher’s behavior, group formation and management, and final product. However, there was a lack of evidence-based research on collaborative learning (Smit, 1989). Instead, collaborative learning scholars had to draw upon evidence from cooperative learning (Bruffee, 1986). Udvari-Solner (2012b) held a critical viewpoint that “[r]esearch regarding collaborative learning strategies is generally subsumed under broader investigations of collaborative learning. If collaborative learning strategies are held distinct from cooperative learning, it is difficult to find studies that have extensively investigated the use of one particular strategy.”

Cooperative Learning Flourishing with Research

Most prominent cooperative learning scholars are well-trained psychologists (e.g., David Johnson, Aronson, Kagan, Schmuck,

Slavin, and Sharan) or have a background in STEM education (e.g., Roger Johnson and Davidson). They conducted much quantitative research on the effect of cooperative learning in the 1980 and 1990 s. Johnson & Johnson (1999) asserted that “Cooperative learning can be used with some confidence at every grade level, in every subject area, and with any task. . . . The research on cooperative learning has a validity and a generalizability rarely found in the educational literature” (p. 192).

With a massive body of empirical research, meta-analytical studies were conducted to examine the overall effect of cooperative learning and identify conditions for successful cooperation (Johnson & Johnson, 1981, 1983; Slavin, 1983, 1999). According to Johnson & Johnson (1999), compared to competitive learning and individualist learning, cooperative learning can enhance student achievement, promote critical thinking, foster positive attitudes towards the subject area, increase interpersonal skills, decrease attrition rates, and improve students’ self-esteem. Slavin (1983) focused on incentive structure and task structure, and his review of the literature revealed that group rewards (instead of individual rewards) and individual accountability (achieved by task specialization and division of labor) are critical to improving students’ achievement. Although there are conflicting results in the research, Slavin (1990) summarized what was in agreement:

There is agreement that—at least in elementary and middle/junior high schools and with basic skill objectives—cooperative methods that incorporate group goals and individual accountability accelerate student learning considerably. Further, there is agreement that these methods have positive effects on a wide array of affective outcomes, such as intergroup relationships, acceptance of mainstreamed students, and self-esteem. (p. 544)

Technology and Collaborative/Cooperative Learning

With the development of personal computers and the Internet, interest in supporting collaborative and cooperative learning with technology has been growing since the 1980s. The Johnsons and colleagues conducted several studies on computer-assisted cooperative learning in the late 1980s (Johnson & Johnson, 1993) confirmed the media myth (i.e., technology is only a vehicle of delivery and what matters is the instruction strategy). They suggested that developers need to have a good understanding of the five elements of cooperative learning to create effective cooperative learning experiences. Likewise, Bruffee (1999) pointed out that software developers and educators should collaborate to design “genuinely interactive” software, which might be particularly useful for distance learning by offering online learners similar experiences to residential college students.

Collaborative learning/cooperative learning was neglected by instructional technology for over two decades

until the emergence of Computer-Supported Collaborative Learning (CSCL) (Dillenbourg et al., 1996). In 1989, the first workshop on CSCL, sponsored by NATO, took place in Italy, marking the beginning of CSCL as a field of research in instructional design and technology (Koschmann, 1996). It is self-evident from its name that the underlining model of CSCL is collaborative learning, but the term is used as a global description for various small group approaches (Koschmann, 1996). Furthermore, CSCL researchers learned to incorporate the strength of cooperative learning because they recognized the importance of structure (scripting) in the complex interplay of technology and collaboration and tried to strike a balance between scripting and over-scripting (Dillenbourg et al., 2009). In this sense, I argue, CSCL is where collaborative learning and cooperative become reconciled.

The first International Conference on CSCL was held at the University of Indiana in 1995 (Koschmann, 1996) and has been held biannually ever since. One of the earliest technological tools developed for collaborative learning is the Computer-Supported Intentional Learning Environments (CSILE) or Knowledge Forum (Scardamalia & Bereiter, 2006, 2010). CSILE was created for a university course in 1983, then implemented at all levels of education. It later evolved to become Knowledge Forum, a widely used web-based tool to support asynchronous discussion using multiple representations of understanding such as texts and graphical notes (Scardamalia & Bereiter, 2006, 2010).

The Evolution of CSCL in the 21st Century

In 2006, the International Society of the Learning Sciences (ISLS) founded the International Journal of Computer-Supported Collaborative Learning (ijCSCL), which has become a significant forum for the research community of CSCL and contributed to the establishment of CSCL’s “centrality to education for the future” (Stahl, 2015, p. 339). After over 30 years of development, CSCL “reached its adolescence” (Wise & Schwarz, 2017, p. 424) but has not become a mature research field because the CSCL community has not agreed upon a theory or framework to guide the research in CSCL (Wise & Schwarz, 2017). CSCL scholars (Dillenbourg et al., 2009; Stahl, 2015; Wise & Schwarz, 2017) have discussed trends in CSCL research as the field has evolved. Among these trends, there is one prominent continuing thread of CSCL research, namely collaboration scripts, which are structured scaffolding strategies or mechanisms to engage students in productive interactions (Fischer et al., 2007). Research has shown that collaboration scripts can promote knowledge gain and acquisition of collaboration skills (Radkowsch et al., 2020; Vogel et al., 2017). A possible explanation was that “collaboration scripts or prompts facilitated elaboration, elicitation, and knowledge externalization, and

sustained in-depth discussion, which in turn promoted high-level thinking and knowledge acquisition” (Chen et al., 2018, p. 831).

As a relatively newly-established area, the CSCL community has endeavored to demonstrate the effectiveness of CSCL. Numerous studies have been devoted to this end, but results have not always been positive, perhaps due to all of the complexities of CSCL. In response, some scholars have conducted meta-analyses to examine the overall effectiveness of CSCL in different dimensions (Jeong et al., 2019; Radkowsch et al., 2020; Sung et al., 2017; Vogel et al., 2017). For example, Chen et al. (2018) conducted a comprehensive meta-analysis, covering 356 peer-reviewed CSCL articles published between 2000 and 2016. They examined the effectiveness of three features of CSCL (collaboration, computer use, and supporting tools and strategies) on five types of learning outcomes: domain-specific knowledge, higher-order thinking skills, students’ perceived satisfaction, group task performance, and social interaction. Their meta-analysis (Chen et al., 2018) showed an overall positive effect of CSCL on all types of learning outcomes. Group awareness tools stood out as the most valuable in all learning outcomes and collaboration scripts were frequently used as an instruction and guidance strategy. Despite the overall encouraging findings, Chen et al. (2018) warned that CSCL was not a “panacea” and that the design of CSCL environments should be aligned with learning objectives, learning needs, and learning activities. Careful design of CSCL environments is needed to support positive interactions (Roschelle & Teasley, 1995), for example, by scaffolding students to construct shared knowledge and by structuring collaborative learning activities (Dillenbourg et al., 2009).

Four Research Paradigms

In the past five decades, there has been a proliferation of research on collaborative learning and cooperative learning. Dillenbourg et al. (1996) outlined the evolution of research on collaborative learning, which was used as an umbrella term, and proposed three paradigms to categorize different research orientations: the “effect” paradigm, the “conditions” paradigm, and the “interaction paradigm.” Each has roots from different theoretical perspectives of collaborative learning. Building upon their taxonomy, I introduce another term—the “design” paradigm to describe the design-based research in Computer-Supported Collaborative Learning (CSCL) that has emerged in the last twenty years. Thus, together there are four paradigms of research on collaborative/cooperative learning. To follow suit with Dillenbourg et al. (1996), the term “collaborative learning” is used to cover both collaborative and cooperative learning in this section. Dillenbourg et al. (1996) cautioned that this classification does not mean one paradigm is better than the other because all research paradigms are needed. However, it is important to note that there

is not a clear line distinguishing one paradigm from another, given their shared theoretical underpinnings.

The “Effect” Paradigm

This paradigm seeks to answer whether collaborative learning is more efficient than learning alone Dillenbourg et al. (1996). Researchers usually conduct experiments with control groups (working alone) and condition groups (working collaboratively) in the classrooms or laboratories to test their hypotheses. The dependent variables are usually individual learning outcomes, such as achievement, critical thinking, attitudes towards subject area, social support, self-esteem, and social skills (Johnson & Johnson, 1999, 2009). While there are mixed results in this type of research, meta-analytic studies have demonstrated an overall positive effect of collaborative learning (Johnson et al., 2000; Slavin, 1980). However, Dillenbourg et al. (1996) argued that negative results or even results showing no differences should not be neglected entirely because “[s]ome negative effects are stable and well documented, for instance, the fact that low achievers progressively become passive when collaborating with high achievers” (p. 8). Furthermore, collaborative learning should not be treated as a “black box” because collaboration does not happen just by putting students into small groups (Dillenbourg et al., 1996). Collaborative learning per se does not enhance or inhibit learning achievement (Slavin, 1983). The better question to ask is perhaps what conditions make collaborative learning more efficient than working alone, which is the focus of the next paradigm.

The “Conditions” Paradigm

This research paradigm looks into the specific conditions that might promote collaborative learning. The research methods are similar to the first paradigm; however, researchers systematically investigate a wide range of variables, including group formation, type of tasks, communication medium, and collaboration contexts (Dillenbourg et al., 1996). For example, heterogeneous groups with varied expertise levels are generally more productive than homogeneous groups, but they have different effects on high- and low-achievers Dillenbourg et al. (1996). A meta-analysis by Slavin (1983) focused on incentive structure and task structure. Results showed that in K-12 settings, group rewards (instead of individual rewards) and individual accountability (achieved by task specialization and division of labor) are critical to improving students’ achievement (Slavin, 1983). The “conditions” paradigm helps researchers and educators better understand the mechanism of collaborative learning compared to the first paradigm. Nonetheless, in natural classroom learning environments, the condition variables inevitably interact with other variables to impact the

dependent variable, resulting in contradicting research findings (Dillenbourg et al., 2009). Some researchers explained the inconsistencies in terms of different researchers using different cooperative learning techniques, learning settings, experimental designs, learner attributes, and subject matter. However, interaction among these attributes was seldom considered (Webb, 1982). Effective collaborative learning comes from productive group interactions, and thus research should focus more on “the more microgenetic features of the interaction” (Dillenbourg et al., 1996, p. 12). Hence the third paradigm is the “interaction” paradigm.

The “Interaction” Paradigm

This paradigm divides research questions stemming from the “conditions” paradigm into two sub-questions: what conditions trigger what interactions and what effects do these interactions entail (Dillenbourg et al., 1996). The key to these questions is to identify “variables that describe the interactions and that can be empirically and theoretically related to the conditions of learning and to learning outcomes” (Dillenbourg et al., 1996, p. 12). Consequently, research becomes more process-oriented, and as a result, many researchers turn to qualitative methods such as discourse analysis and conversation analysis to identify moments of collaboration with the group as the unit of analysis (Stahl, 2006). The most studied interaction variables are explanation, argumentation or negotiation, and regulation (Dillenbourg et al., 2009). For example, Webb (1982) revealed that giving and receiving elaborate explanations (instead of simply the correct answers) were positively correlated with individual learning gains and that off-task and passive behaviors had a negative correlation with learning outcomes. On the other hand, many process-oriented studies in the “interaction” paradigm seem to answer only one of the two sub-questions (Dillenbourg et al., 1996). In other words, the relationship between conditions of learning and learning outcomes is not always made clear by researchers. One of the challenges of the interaction paradigm is the difficulty in data analysis and interpretation because there is a lack of theoretical frameworks to analyze interactions “due to the fact that the Piagetian and Vygotskian perspectives ... are simply too global to allow proper explanation” (Dillenbourg et al., 1996, p. 17).

The “Design” Paradigm

I offered “design” as a fourth paradigm to describe a unique strand of CSCL research that focuses on the design and development of “conditions in which effective group interactions are expected to occur (Dillenbourg et al., 2009, p. 6). It is easy to identify the three previous paradigms within CSCL literature (Chen et al., 2018; Radkowsch et al., 2020). However, the CSCL community has a tradition of conducting design-based research (DBR). Researchers and

practitioners collaborate to study educational phenomena in authentic educational contexts by testing and refining design principles through iterative design (Stahl & Hakkarainen, 2020). DBR is theory-driven and practice-oriented because it aims to bridge the gap between theory, research, and practice (Wang & Hannafin, 2005). A successful DBR project is the already mentioned Computer-Supported Intentional Learning Environments (CSILE) (later known as Knowledge Forum) (Scardamalia & Bereiter, 2006, 2010). Through the iterative design efforts to innovate means to support collaborative construction of community knowledge, they refined the technology, pedagogy, and theory of “Knowledge Building” (Scardamalia & Bereiter, 2006, 2010). The Knowledge Forum project and related research demonstrate the huge potential of the “design” research paradigm in CSCL. However, DBR is not free of challenges. First and foremost, there is still a lack of agreement in the field of DBR in terms of its definition, terminologies, features, and procedures (Christensen & West, 2018). This inconsistency makes it a challenge to conceptualize and implement DBR (Christensen & West, 2018). DBR projects are usually situated in specific educational contexts and it might be difficult to expand the interventions to larger contexts (Anderson & Shattuck, 2012). On the other hand, some scholars caution that focusing on scalability and generalizability might sabotage “the designerly nature of DBR” (Svihla, 2014, p. 35). It seems to be challenging to strike a balance. On the practical level, multiple iterations of a DBR project might present challenges of time constraints (Anderson & Shattuck, 2012).

Conclusion

This paper provides a historical review of collaborative and cooperative learning, beginning with their definitions and characteristics. The practice of group-based learning can be traced back to ancient times (Johnson & Johnson, 1999, 2021). However, modern practices of collaborative learning and cooperative learning simultaneously and independently emerged in the 1960s, launched in the 1970s, and thrived in the 1980 and 1990 s as two separate methodologies. Not until the mid-1990s did the two camps start acknowledging each other’s work and bridging their differences. In the context of instructional design and technology, the two seem to be less differentiated. CSCL emerged in 1989 and witnessed rapid advancement in the last two decades. The knowledge of the historical development of collaborative learning and cooperative learning can help us understand the similarities and differences between the two and help practitioners make informed decisions about which term most applies to a given learning situation and what pedagogical strategies are best to apply. Research on collaborative learning can be described

within four paradigms: the “effects” paradigm, the “conditions” paradigm, the “interaction” paradigm (Dillenbourg et al., 1996), and the “design” paradigm. While all research paradigms are important and necessary (Dillenbourg et al.,

1996), some researchers have called for more research on the “interaction” paradigm (Dillenbourg et al., 1996, 2009) and the “design” paradigm in the future (Stahl, 2015; Wise & Schwarz, 2017).

Appendix 1

Table 2

Table 2 History of Collaborative Learning, Cooperative Learning, and CSCL (Inspired by the table in Johnson & Johnson (1999, pp. 185–186))

Timeline of Collocative learning	
1964	Abercrombie book <i>Anatomy of Judgment</i>
1970	Mason Book <i>Collaborative Learning</i> (First time the term “collaborative learning” appeared in literature)
1973	Bruffee “Collaborative Learning: Some Practical Models”, <i>College English</i>
1980s	(American Association of Higher Education) AAHE’s Action Community on Collaborative Learning
1984	Bruffee “Collaborative Learning and Conversation of Mankind”, <i>College English</i>
1986	Bruffee “Social construction, language, and the authority of knowledge: A bibliographical essay”, <i>College English</i>
1992	<i>Collaborative Learning: A Sourcebook for Higher Education</i> , edited by Goodsell et al.
1993	Bruffee book <i>Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge</i>
Timeline of Cooperative learning	
1966	David Johnson began training teachers on cooperative learning
1970	David Johnson book <i>Social Psychology of Education</i>
1976	Sharan & Sharan book <i>Small Group Teaching</i> (Group Investigation)
1978	Aronson “Jigsaw Classroom”, <i>Journal of Research and Development in Education</i>
1979	First IASCE (International Association for the Study of Cooperation in Education) conference in Israel
1980	The term “cooperative learning” first appeared in literature (<i>Review of Educational Research</i>)
1985	<i>AERA SIG Cooperative Learning</i>
1995	Johnson & Johnson research review on competition and cooperation: <i>Learning Together and Alone</i>
Timeline of CSCL	
1989	First CSCL workshop held in Italy by the NATO Special Program on Advanced Educational Technology. Follow-up workshops held in 1991 and 1992.
1995	First International Conference on CSCL held at the University of Indiana. Since then, the conference has been held biannually.
1996	1996 <i>CSCL: Theory and Practice of an Emerging Paradigm</i> edited by Koschmann.
2002	<i>CSCL 2: Carrying forward the Conversation</i> edited by Koschmann, Hall, & Miyake.
2006	<i>The International Journal of Computer-Supported Collaborative Learning</i> (ijCSCL) founded by the International Society of the Learning Sciences (ISLS).

Declarations

Conflict of Interest The author declares that they have no conflict of interest.

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