

Conceptualizing Collaboration in the Context of Computer-supported Collaborative Learning

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Abstract: “Collaborative learning” has become a common expression in a wide range of spheres. We often say that we learn collaboratively when we perform a task together. However, the term “collaborative learning” has more complex implications than only doing a task together with peers. Successful collaborative learning is characterized by meaningful and intense interactions among peers and shared understanding of the concepts. In computer-supported collaborative learning (CSCL) learners’ interactions are mediated by technological artifacts, therefore, the role of technologies becomes highly important from both cognitive and motivational perspectives. In this paper I discuss the essence of collaborative learning and CSCL as it is viewed in the field of learning sciences. I seek to demonstrate the complexity of CSCL and underline the idea that CSCL is a distinct form of learning mediated by technological artifacts, and only certain learning situations taking place online in groups can be termed as “CSCL”.

1 INTRODUCTION

Nowadays the terms “collaborative learning” and “CSCL” have become common. However, at times these words seem to be overused: various types of online forms of learning are being addressed as “collaborative”, and certain implications this concept has are thus being underemphasized.

The concept of CSCL is based on the notion of “collaborative learning”. It is possible to find various definitions of collaborative learning in the research literature. Thus, it may be challenging to try to agree upon a universal definition. The same relates to CSCL. The aim of this paper is not to arrive at a concrete definition. Instead, in this paper I seek to provide a grasp of key components and processes constituting CSCL which would demonstrate the essence of this complex phenomenon.

I support my argument by reviewing concepts discussed in the literature on collaborative learning and CSCL in the field of learning sciences. Later I suggest to approach some examples of how the concept of CSCL is viewed in related areas. Namely, I provide some examples from the research literature in the field of information systems (IS). Therefore, this paper has a purely conceptual character and is

aimed at positioning CSCL as a distinct form of learning mediated by technological artifacts. It is important to note that this paper focuses on CSCL where students are located in different physical environments.

2 CONCEPTUALIZING COLLABORATION

The concept of CSCL consists of two key “ingredients” – collaborative learning and technological support. The key aspect of collaborative learning is interactions among peers; in CSCL these interactions need to be promoted and enhanced by technological tools. Ensuring effective collaborative interactions in an online environment is a challenging task for facilitators; however, misconceptions about the nature of interactions as well as over-expectations towards technological tools are not uncommon.

The following sections address the issues introduced above. First, I discuss collaborative learning and interactions among peers as its core. This discussion is a basis for understanding CSCL and the role of technologies in supporting effective collaborative interactions, thus promoting successful

CSCL. Further, I summarize some of the misconceptions about CSCL, which helps emphasize the complexity of the phenomenon. Finally, I provide examples where CSCL is attributed a wider interpretation.

2.1 Collaborative Learning

The word “collaborative” has a deeper meaning than it may seem at first. As Dillenbourg (1999) discusses, when a word becomes fashionable, it often starts to be used to denote more than it originally was supposed to denote. When various kinds of learning situations are addressed as “collaborative” it becomes difficult to discuss the cognitive effects of collaborative learning. In addition, it becomes challenging to approach contributions of different authors who use the word “collaboration” differently (Dillenbourg, 1999).

In the most general sense collaborative learning is believed to be happening when more than one person is working on a task and attempting to learn together (Roschelle and Teasley, 1995; Dillenbourg 1999). Even this broadest definition of collaborative learning can be interpreted in multiple ways. Group size can vary greatly, as well as the length of the learning situation. Communication can be happening face-to-face or be computer-mediated (synchronous or asynchronous) (Dillenbourg, 1999).

There has been a long discussion concerning differences and similarities between collaborative and cooperative learning (Roschelle and Teasley, 1995; Dillenbourg, Baker, Blaye, and O'Malley, 1996; Dillenbourg, 1999; Kirschner, 2001; Kreijns, Kirschner, and Jochems, 2003; Stahl, Koschmann, and Suthers, 2006; Resta and Laferrière, 2007). For example, Roschelle and Teasley (1995) characterize cooperative work as an activity where labor is divided among participants, while collaboration is associated with mutual engagement of group members in an attempt to reach a solution together. Similarly, Dillenbourg (1999) argues that in cooperation work is split among the partners, and after individuals have solved sub-tasks, the results are assembled to the final outcome. However, it is also possible that partners split the work in collaborative learning situations. What is important is that the division of labor is different. In collaboration, tasks can be split in different layers but still be highly interwoven (partners are monitoring each other), while in cooperation sub-tasks are independent. Moreover, in collaboration this division of labor is not very stable – for example, roles may change quite often (Dillenbourg,

1999). As Resta and Laferrière (2007) note, there are no universally accepted definitions of “cooperative” versus “collaborative” learning. Although there are differences, these two concepts also share a number of common assumptions. For example, both in collaborative and cooperative learning students work in groups, teaching and learning go side by side, learning is active, the teacher becomes a facilitator, and students develop social and teamwork skills (Kirschner, 2001).

There are some necessary components of collaborative learning: there is always some physical setting, instructions to subjects, and institutional constraints. Therefore, collaborative learning can be described as a kind of social contract specifying some of the conditions under which certain interactions may occur. Thus, “the words “collaborative learning” describe a situation in which particular forms of interaction among people are expected to occur, which would trigger learning mechanisms, but there is no guarantee that the expected interactions will actually occur” (Dillenbourg, 1999, p. 5).

2.2 Interactions as the Key Aspect in Effective Collaborative Learning

In collaborative learning, interactions among peers represent the most important aspect (importantly, without excluding other factors such as interactions with teachers and learning materials) (Kreijns et al., 2003; Dillenbourg, Järvelä, and Fischer, 2009). In their interactions students manage social relations and perform cognitive and metacognitive aspects of the task (Dillenbourg et al., 1996). The extent to which learners engage in the collaborative process has a direct impact on the quality of collaboration; learners must make a continued effort to coordinate their learning (Roschelle and Teasley, 1995; Dillenbourg et al., 2009). There are three main categories of interactions that have been found to support learning: explanation, argumentation/negotiation, and mutual regulation (Dillenbourg et al., 2009). Negotiation is a process when students try to arrive at agreement on some aspects of the task. It can be also negotiation of meaning. Arriving at a shared understanding of meanings is a necessary component of collaborative learning, as it is not possible to collaborate if someone does not fully understand what they are collaborating on (Dillenbourg et al., 1996). The concept of shared understanding should not be treated simplistically; it depends a lot on students' efforts and intensity of interactions (Dillenbourg et al., 2009). Having a

shared understanding enables transactivity – one of the central challenges in collaborative learning – i.e., students' ability to relate to each other's statements, build upon them and modify them, as well as integrate them into their own line of reasoning (Weinberger, 2011). Weinberger, Stegmann and Fischer (2007) discuss collaborative learning in terms of knowledge convergence – a group-level phenomenon addressing the way how two or more individuals become similar with respect to their knowledge through social interactions.

2.3 Computer-supported Collaborative Learning

Knowledge about collaborative learning can help us better understand CSCL (Resta and Laferrière, 2007). The central focus of CSCL is on practices of joint meaning-making mediated through technological artifacts (Stahl et al., 2006), thus, it is emphasized that knowledge is an interactional achievement here as well (Stahl, 2006). CSCL is believed to be beneficial for educational practice due to both technological advancements in digital learning and better opportunities for students' active knowledge construction (Weinberger, 2011). Among emerging benefits of CSCL are better academic achievement, development of higher order thinking skills, student satisfaction with learning experience and enhanced productivity (Resta and Laferrière, 2007).

In CSCL learners are usually expected to work on complex phenomena with little interference from teachers (Weinberger, 2011). Stahl (2006) introduces the group cognition theory in the context of CSCL. It implies such a view of cognition where a small group collaborates so tightly that the process of building shared knowledge cannot be attributed to only one particular group member, and not even divided into a sequence of contributions from individual group members (Stahl, 2012).

In CSCL learners often have to communicate in text-based environments, where it is not always easy to see the quality of metacognitive processes (Hurme, Merenluoto, and Järvelä, 2009). Collaboration scripts have been a topical research area recently, looking into how it is possible to trigger productive interactions among peers (Dillenbourg et al., 2009) by, for example, describing a step-by-step procedure of performing a task and distributing roles of individual learners in a CSCL group (Weinberger, 2011).

2.4 Role of Technologies in Computer-supported Collaborative Learning

While CSCL can be characterized by multiple opportunities which would not be available for students in a traditional classroom setting, many learners experience significant challenges when they are simply assigned to groups and left with devices. CSCL environments often turn out to be motivationally and cognitively much more demanding (Weinberger, 2011). Taking it for granted that interactions will occur simply because technology makes it possible can be said to be one of the major pitfalls happening in the context of CSCL (Kreijns et al., 2003). Students who do not have sufficient prior experiences with collaborative practices may not have adequate knowledge that would guide them in collaboration setting (Fischer, Kollar, Stegmann, and Wecker, 2013). It is crucial that online students are aware of the learning opportunities offered by collaborative technologies in order to engage in learning actively (Dabbagh, 2007). Moreover, it is extremely important to consider the psychological dimension in the social interaction, and the socio-emotional issues of group formation and dynamics, i.e., such processes as getting to know each other, developing trust and building the feeling of online community (Kreijns et al., 2003).

Technologies play a crucial role in CSCL: the design of a computer system which is mediating collaboration has a great impact on collaborative process (Dillenbourg et al., 1996). Since in CSCL focus is on learning through interactions with peers rather than directly from the teacher, the role of technological tools shifts from providing instructions to supporting collaboration by offering media for productive communication (Stahl et al., 2006). The aim of a CSCL environment is not only to make collaboration at distance possible, but to provide such conditions which would support and promote effective group interactions (Dillenbourg et al., 2009; Stahl, 2006). Computer-mediated communication can often be characterized as impersonal and task-oriented; therefore, it is important to design sociable CSCL environments. Such environments would provide students with non-task contexts and allow them to socialize also off-task (Kreijns et al., 2003).

CSCL environments can have a great impact on student motivation. When taking a CSCL course, a student is required to spend a lot of time in the online learning environment. Environmental

structuring has been identified as one of the motivational regulation strategies (Wolters, 2003). This strategy means that a learner should be able to organize his or her own work environment in such a way that it would ensure comfortable conditions for studying. A learner should be comfortable at the learning desk, have enough light, have books and notes organized in a suitable way, be in silence or listen to music. In the online environment it can work exactly the same way – an individual learner should have the opportunity to personalize his or her own environment and make it appealing. For that reason, learning management systems (LMSs) may not be that suitable as a platform for a CSCL course. Often such systems do not offer much opportunity for customization; instead, they are often impersonal and have a formal and standard interface. An LMS may serve as a resource of content for students, however, students' activities in an LMS are restricted (Dabbagh and Kitsantas, 2012).

2.5 Misconceptions about Computer-supported Collaborative Learning

CSCL is a complex phenomenon requiring a lot of planning, coordination and commitment. However, quite often it is associated with a belief that classroom content can be delivered in electronic form to large numbers of students without much teacher involvement, at the same time reducing other costs. This view has a number of critical points. First of all, providing students with content does not equal teaching or instruction. Second, online teaching usually increases the teacher effort. The teacher does not only prepare materials and distribute them by means of technologies. The teacher is also the one to motivate and guide each individual student. Third, interactions among students are a central aspect in CSCL, which means that students are expected to express questions, follow each other's learning and teach and regulate each other. Thus, careful planning is necessary to ensure the effectiveness of a CSCL environment which would stimulate productive collaborative interactions (Stahl et al., 2006).

There are also a number of misconceptions regarding technological artifacts and their role in CSCL. Thus, one common myth in CSCL is media effectiveness. When a new medium appears in the educational field, it often raises over-expectations regarding its effects on learning. Within CSCL various tools have demonstrated controversial results; however, this myth seems to never die and

occurs again along with the appearance of new technological artifacts (Dillenbourg et al., 2009).

2.6 Different Interpretations of “Collaborative”

In this section I suggest to have a look at the concept of CSCL from the point of view of related areas such as IS. The understanding of CSCL discussed above can be found to be reflected in the IS field. For example, in research works by Alavi (1994), Leidner and Fuller (1997), and Neufeld and Haggerty (2001) it is underlined that collaborative learning implies active knowledge construction where students are engaged in acquiring, generating and analyzing information through exchange of multiple ideas and feedback on them.

At the same time, it is also possible to come across different interpretations of collaborative learning in the IS research literature. For example, Gupta and Bostrom (2004) discuss the shift of interest from individual e-learning to group-oriented e-learning; and that is where the word “collaborative” comes in. In their study they describe technologies supporting four types of tasks where students work in groups. The four types are based on four fundamental schools of thought (behaviorist, instructivist, cognitive, and constructivist). Although the framework provides a clear outline for identifying environments supporting different types of tasks, it seems to approach the notion of collaborative learning from a broader perspective. Thus, when describing technologies corresponding to the tasks designed with behaviorist strategy aimed at achieving a certain skill, Gupta and Bostrom (2004, p. 3036) write: “all the participants of the group need is being able to access and communicate this solution scheme, requiring minimal communication support”. This seems to be controversial to the essence of collaborative learning discussed above. Drill exercises and factual learning tasks do not seem to be a sufficient ground for collaborative activity; moreover, interaction and communication is the core of collaborative learning. Effective CSCL environments are supposed to always provide enough opportunities for communication and promote interactions among peers. Therefore, the concept of collaborative learning acquires a different and more general meaning in the context of this work; various types of online learning in groups are being addressed as “collaborative”.

Another example is a paper by Arancibia and Rusu (2014) focusing on u-Learning, where “u”

stands for “ubiquitous”. A ubiquitous learning environment is such an environment which allows students to access learning materials from any location and at any point of time. The u-CSCL model is proposed, where CSCL is approached as a part of learning sciences focusing on people learning together with the help of computers. This model seeks to integrate collaborative learning and ubiquitous systems, and includes five main components: (1) teachers, (2) study materials, (3) technology platform, (4) access services, and (5) students. From the following elaboration on the components it can be read that collaborative learning techniques are defined as such where students “work together to solve the assigned tasks” (Arancibia and Rusu, 2014, p. 596). However, it is not explicit whether these processes imply tight and transactive communication, thus making it possible to interpret “collaborative learning” differently and in a broader sense as well.

3 DISCUSSION

Discussion of the concept of collaborative learning in the field of learning sciences suggests that successful collaboration among two or more people includes the following key aspects:

- Such types of interactions as explanation, argumentation/negotiation, and mutual regulation;
- Engagement of the members of the group and continuous effort to coordinate learning;
- Shared understanding;
- Transactivity.

In CSCL, technologies play a highly significant role as interactions among peers are happening in an online environment. Therefore, from the point of view of technological tools for collaboration, it is important to take into account the following:

- The main function of technologies is not to provide instructions, but to support productive collaborative interactions;
- CSCL environments should be sociable, allowing students to communicate also off-task;
- CSCL environments should be adaptive for different learners.

The role of a collaborative task and teacher support should not be underestimated either. Problem-solving and inquiry-based tasks can be a good basis for collaborative activities, as they ensure space for negotiation (Dillenbourg 1999). Learners

should be active in searching for meaning; the learning (not teaching) process should be constructive (Kirschner, 2001). The teacher does not simply provide students with learning materials, but monitors and coordinates learners in the online environment.

Thus, CSCL is a distinct form of educational practice. Only particular forms of learning activities carried out in groups by means of technological tools can be addressed as truly collaborative. However, there is some evidence that the concept of collaborative learning and CSCL can be interpreted differently in related areas. Thus, I provided some illustration from the IS field where various types of online learning situations are being addressed as “CSCL”, while some of the implications of the concept of collaboration seem to be underemphasized.

4 CONCLUSIONS

Learning by means of collaboration does not happen whenever learners come together. Learners must be committed to continuous negotiation, monitoring of progress and construction of shared understanding. This is a demanding task from both cognitive and motivational aspects (Dillenbourg et al., 2009).

In this paper I have attempted to summarize the key aspects of collaborative learning from the point of view of research in learning sciences, emphasizing the importance of interactions among peers. I have also discussed the role of technologies in promoting effective collaborative interactions in CSCL. Through this discussion I have sought to underline that CSCL is a complex phenomenon, and not every form of learning in groups mediated by technological artifacts can be addressed as “CSCL”.

I have provided examples where the term “collaborative” in the context of online forms of learning may have been interpreted differently. I do not seek to undermine the contributions of the authors. Learning happening at distance by means of technologies does not necessarily have to be CSCL; and other forms of online learning definitely deserve equal attention. However, I intend to draw attention to the essence of collaborative learning and careful use of this term to communicate research findings. I believe that in some cases a different term could be more suitable, such as “technology-mediated learning”, where learners’ interactions with learning materials, peers and facilitators are mediated through information technologies (Alavi and Leidner, 2001). CSCL then could be regarded as one of the types of

technology-mediated learning methods, emphasizing the idea of co-discovery resulting in deeper-level thinking (Alavi and Leidner, 2001). In addition, I believe researchers should be more explicit about what is meant by “collaborative learning” in the context of their work when they do use this particular term, as only this way other researchers can be sure that they have shared understanding of the phenomenon.

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