Cooperative Learning Principles Enhance Online Interaction
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Abstract

This paper describes eight principles that can be used to promote cooperative interactions among students working in online environments. The principles derive from a well-established approach to education, known variously as cooperative learning and collaborative learning. Each principle is explained as to what it means, why it is important and how it can be deployed. The eight principles are heterogeneous grouping, teaching collaborative skills, group autonomy, maximum peer interactions, equal opportunity to participate, individual accountability, positive interdependence and cooperation as a value. Research suggests that cooperative learning is associated with enhanced cognitive and affective outcomes.

Cooperative Learning Principles Enhance Online Interaction

When many people think about computers, tablets, smartphones and other IT devices, they picture individuals alone seemingly glued to the screens and keyboards of their devices. Similarly, when people think of students using those devices for learning, they imagine the students alone, perhaps at desks or tables in their homes, far from their classmates. However, such images of individualized involvement with electronic learning tools often fail to look below the surface. In reality, students are often using their devices to interact with others, and frequently those others are their fellow students.

The purpose of this paper is to share ideas for facilitating and enhancing those student-student online interactions. These ideas flow from a learning technology known variously as cooperative learning or collaborative learning. In this paper, the neutral abbreviation 'CL' will be used. The paper begins with background information on CL, including supporting learning theories and research, as well as a definition. The main section of the paper explains eight CL principles, including what each principle means, why it is important and how it can be applied in IT environments.

Background on Cooperative and Collaborative Learning (CL)

CL dates back to at least the 1970s and finds support in many theories of learning, including Sociocultural Theory (Vygotsky, 1978), Social Interdependence Theory (Johnson & Johnson, 2006), Humanist Psychology (Maslow, 1968), Social Constructivism (Palincsar, 1998) and Multiple Intelligences Theory (Gardner, 1993). Additionally, a great deal of research has been done on CL. This research covers a wide range of learners, subjects and modes of learning, including online learning. In general, the research suggests positive effects for CL on both cognitive and affective variables (Ibáñez, García Rueda, Maroto, & Kloos, 2013; Johnson, Johnson, & Stanne, 2000; Slavin, 1991). Indeed, a steady stream of research continues to investigate many areas of CL, including research on online learning, as can be seen from a search of online databases and in the 'From the Journals' listings in the enewsletter of the International Association for the Study of Cooperation in Education (IASCE) (IASCE, 2014).

CL can be defined as principles and techniques for helping students collaborate with peers and others. This paper will explain eight of these CL principles. Furthermore, hundreds of CL techniques have been developed. The key point about CL is that it is so much more than asking students to push their desks together in a classroom, or to connect to each in an online environment, and then hoping that they will collaborate successfully. Instead, CL provides teachers and students with a large and growing body of ideas for taking further steps towards making it more likely that student-student interaction will realize its potential. Additionally, the hope is that the collaborative skills and attitudes that students develop in the process of interacting with their peers will serve students well throughout their lives in whatever contexts they find themselves.

Eight CL Principles

This section of the paper explains eight CL principles, including what each principle means, why the principle is important and how to implement it in IT groups. Readers should be aware of two points. One, different books and websites on CL espouse different principles, but a great deal of overlap exists among the various principles espoused. Second, readers

should also note that a twosome or pair is considered a group. Indeed, in some ways, two members is the best size for groups, because in twosomes, students may have more opportunities to be active. Plus, students are less likely to be left out of the groups of two, and they can manage their groups more easily. Furthermore, after working in twos, students can pair with other twosomes to share ideas, thereby widening their resources and enjoying more interaction opportunities. The eight CL principles to be discussed in this paper are heterogeneous grouping, teaching collaborative skills, group autonomy, maximum peer interactions, equal opportunity to participate, individual accountability, positive interdependence and cooperation as a value.

Heterogeneous Grouping

Heterogeneous grouping involves students forming CL groups with fellow students who are different from themselves. The many variables on which students differ include past achievement, social class, nationality, ethnicity, religion, sex, diligence and personality. Many CL experts advocate heterogeneous groups, because when students learn in groups that are heterogeneous as to past achievement, they are more likely to engage in peers tutoring, as those higher in past achievement can help those who are, at least temporarily, lower achievers. Such interactions can benefit both parties (Webb, et al., 2009). Heterogeneous grouping on other social and personality variables encourages students to see different perspectives and to learn to work with people different from themselves, thereby setting the stage for building a more harmonious society (Aronson, 2014).

Often, if students choose their own groupmates, the resulting groups may tend towards homogeneity, as the tendency is for "birds of a feather to flock together", and students may, at least initially, prefer such groupings (Jacobs, Power, & Loh, 2002). The most straightforward way to encourage heterogeneous groups is for teachers to assign students to groups. In a more student centric mode, teachers can discuss with students the meaning of heterogeneous grouping and its potential benefits. From there, students can be encouraged to form their own groups. Even if students never meet face to face, they can post data about themselves. With those data and perhaps some discussion, students working in online environments can form their own heterogeneous groups.

Teaching Collaborative Skills

The CL principle of teaching collaborative skills means devoting class time for students to learn about and reflect on their use of collaborative skills. Many lists of collaborative skills exist (e.g., Underwood & Underwood, 1999). Skills important for CL include comparing understandings, asking for help, offering suggestions and feedback, responding productively to suggestions and feedback, asking for reasons, providing reasons, disagreeing politely, providing specific praise and thanks and attending to group functioning.

When students use collaborative skills, their groups are likely to function better (Soller, 2001), leading to more learning and more enjoyment of learning. Furthermore, these skills will advantage students in many areas of their present and future lives. However, not all students have these collaborative skills, and, perhaps more crucially, even if students have the skills, they may not use them routinely. As a result, instructional time devoted to learning these skills and practicing their use may be time well spent.

Johnson, Johnson and Holubec (2007) present a six step procedure for teaching collaborative skills. The procedure focuses on one skill at a time. First, students need to understand the importance of the collaborative skill and second, what the skill involves, as to verbal (the words used) and non-verbal (gestures, facial expressions, emoticons) elements. Third, students practice the skill apart from class content, i.e., they work just on the skill, e.g., via a game or role play, without paying attention to the topic the class is studying. Fourth, students then combine use of the skill with learning of class content. Fifth, students discuss how well they, individually and as a group, are using the skill and how they might improve. Sixth, because time on task is often needed for students to reach the level of natural use of a collaborative skill, students persevere in practicing the skill. Teaching of collaborative skills may be especially important in online environments, such as discussion boards, email and social networks, as these environments present new challenges, requiring variations from the skills appropriate in face to face environments.

Group Autonomy

Too often, students tend to depend too much on their teachers, overlooking their own and their peers' abilities. The CL principle of group autonomy encourages students to look first to their groupmates when they need help or want feedback. For students to become lifelong learners, they need to take on some of the roles formerly seen to be the exclusive domain of teachers, such as the roles of providing assistance and feedback. Performing these roles provides students with learning opportunities and promotes peer interactions. Also, when students are helping each other within their capability to do so, teachers are able to provide help that lies beyond students' current abilities.

The CL literature offers many ideas for promoting group autonomy. For instance, groups can utilize the slogan, 'Team Then Teacher, i.e., students ask their groupmates before asking their teachers. Taking that slogan one step further, groups can follow a policy of '3 + 1 B4 T', i.e., if no one in their groups (of two, three or four members) can help, students ask one other group for help before asking teachers. Teachers are still there to help, but not as first options. Group autonomy can be especially important in IT environments, even more so than in classrooms, as teachers are less likely to be immediately available to provide assistance. In online environments, when students face difficulties, instead of giving up or waiting several hours or more for assistance from teachers, students can turn to their peers.

Maximum Peer Interactions

The CL principle, Maximum Peer Interactions, refers to maximizing two aspects of peer interactions. First, the *quantity* of peer interactions increases when group activities are used, particularly when the number of members in each group is kept small and when groups sometimes report to other groups instead of or in addition to the entire class. Second, the *quality* of peer interactions increases when students use higher order thinking skills (Chiang, et al., 2013). Indeed, the 'magic' of CL lies in the quality of peer interactions. These thinking interactions promote more learning, greater depth of processing and greater engagement (Järvelä, Hurme, & Järvenoja, 2011; Nussbaum, 2008). Thus, the greater the quantity of these quality peer interaction, the better.

IT provides many new and engaging tools for peer interactions. Unfortunately, too often, the use of IT in education merely results in teacher fronted instruction being delivered electronically rather than face to face. This situation can easily be changed. For instance,

when students listen to online lectures or read texts provided online, time and tasks for interactions should be included, and these tasks should include thinking tasks. Care, however, must be taken so that these thinking tasks are within students' current ability levels. Here, teachers have a vital role in providing the support students need so that these interactive thinking tasks are doable. This support might, for example, include annotated model responses. Furthermore, when groups are heterogeneous as to past achievement, lower achieving students can ask their groupmates for help, rather than going astray or giving up when faced with tasks that are too challenging.

Equal Opportunity to Participate

Sometimes one or more group members attempt to dominate the group, denying others the chance to interact with the task and with groupmates. Equal opportunity to participate is the CL principle that specifically addresses such situations. When some students are excluded from the group interactions, those students may learn less and enjoy less. At the same time, the rest of the group members lose the benefits of interacting with the excluded person(s). For instance, if excluded group members are less proficient at the task the group is undertaking, the other group members miss out on peer tutoring opportunities they would have had if everyone had been included.

CL techniques, along with various software, offer tools for providing all group members equal opportunity to participate. For example, in contrast to face to face discussions in which some group members may have difficulty being heard, asynchronous online communication allows students to share their ideas without having to compete for a spot in the conversation. Other ideas promoting equal opportunity to participate include colour coding to show each person's contribution to a graphic, table or text, or group members being chosen at random to share their group's ideas. Additionally, some software allows students and teachers to monitor the distribution and quality of turns in their groups.

Individual Accountability

While equal opportunity to participate is the CL principle which seeks to offer all group members chances to play important roles in their groups, the principle of individual accountability puts pressure on members to do their fair share in the groups. Thus, individual accountability can be seen as the flip side of equal opportunity to participate. Students need to use the opportunities provided to contribute what they can to their groups. Unless students feel individually accountable, if instead some students act as freeloaders, group morale may suffer, and students may lose faith in the use of groups for learning due to the presence of these freeloaders. Furthermore, freeloading makes assessment more difficult, as teachers may not be able to judge the members' contributions to their groups (Johnson & Johnson, 2003).

Fortunately, the CL literature and IT tools offer ideas for promoting individual accountability. For example, groups can roster who needs to do what and when, and monitor if it is done. Additionally, the same software that promotes equal opportunity to participate by monitoring each group member's participation can also let groupmates and teachers know who is not pulling their weight in the group. Two ways to address the difficulties that freeloaders pose for assessment are to involve peers in assessment, as peers are better placed to monitor each member's input, and for students to study together but be assessed alone, e.g., after students work together to solve a set of online mathematics problems, they do another set of similar problems on their own.

Positive Interdependence

Positive interdependence is the CL principle which most prominently encourages sharing among students. When students feel positively interdependent with their groupmates, the group feels that their outcomes are positively correlated, i.e., the feel that what helps one helps others, and what hurts one hurts others. In other words, groups adopt the spirit embodied by the Three Musketeers' slogan "All for one; one for all". Whereas individual accountability puts pressure on group members to contribute to the group, positive interdependence provides support; if students are having difficulties, their groupmates are there to help them. Positive interdependence can also promote motivation to learn, because students are learning not just for themselves but also for the benefit of their groups.

Many ideas have been developed to encourage students to feel positively interdependent with their groupmates. For instance, students are more likely to feel that all group members' outcomes are positively correlated if they have group goals. These goals are not about the group, but about the strengthening of each individual member. An example in a writing class of such a group goal would be for all group members to do better on the second writing task of the term (except in the case of group members with perfect scores on the term's initial writing task). To help groupmates improve, students could use the Track Changes and Comments functions in MS Word to offer each other feedback on their drafts. If everyone in the group succeeds in improving on the second writing task, a celebration or other rewards could recognize this accomplishment. Yet another means of promoting positive interdependence is for each student to have different resources. For example, each group member could go online to research a different subtopic of the larger group topic and then share what they learned with their groupmates (Aronson, 2014).

Cooperation as a Value

An eighth CL principle, cooperation as a value, builds on positive interdependence and seeks to spread the feeling of "One for all; all for one" beyond the small group to the entire class, the entire educational institution, the entire city, the nation and the world, expanding to also include other species. While students need to know how to compete and how to work alone, the hope embodied in the principle of cooperation as a value is that students will come to view cooperation as their preferred option. A look at the news headlines on almost any day finds many areas in which the world needs more of this cooperation, yet many factors in society foster competition and individualism.

Many means exist for promoting cooperation as a value. For example, in service learning projects (Kinsley & McPherson, 1995), students work together to provide a service while at the same time engaging in learning linked to their curriculum, e.g., IT students might develop websites and other online tools for non-profit organizations. Another means of promoting cooperation as a value would be for students to appreciate the many benefits of cooperation, e.g., they can learn about IT inventions, IT companies and IT networks that required large scale cooperation to bring to fruition and to grow. Students can also reflect on how their own cooperation in small groups (2-4 people) lays a foundation for their later participation in larger scale cooperation.

An Example of Some of the Principles at Work with Technology

The availability of Web 2.0 and cloud-based tools, such as Google Docs, Popplet and Prezi, allows multiple users to create, write, edit, annotate and comment on shared documents, thereby providing a platform for individuals to collaborate. The eight CL principles described in this paper can be applied to the use of such tools to foster collaboration. An example is sharing a Google Doc among a group of students to collectively write a research report. At the start of the assignment, each student chooses to be individually accountable to the group by choosing to write the first draft of a particular section of the report. After they finish their individual research, students contribute their draft to the shared Google Doc. As every student shares and views the same document, they each have an equal opportunity to comment, annotate or edit to improve their peers' initial contributions to the report. This collective endeavor to clarify, correct and elaborate can improve the report. As students work together on the report, maximum peer interactions are promoted in many ways, e.g., when groups in the class are invited to critically review every other groups' report, thereby stimulating higher order thinking skills. Through the process of collective writing, students will recognize the value of cooperation, being aware that the quality and success of their report is dependent on the contributions and feedback of individual students. Technology allows the collaboration to happen in real time where students' feedback and comments can be instantly viewed. Moreover, with the cloud computing, collaboration between students takes place seamlessly across different devices, such as tablets, smartphones and computers, and students can collaborate wherever they are and just-in-time.

Conclusion

The goal of this paper has been to offer principles and other ideas to heighten the value of student interactions conducted via electronic devices. The foundation of the ideas in this paper lies in a learning technology which some call cooperative learning and others call collaborative learning, both which all can abbreviate as CL. The first section of the paper provided brief background on CL including related theories, relevant studies, and a simple definition. The paper's longest section described eight CL principles in terms of the definitions of the principles, the principles' importance and ideas for applying the principles to learning contexts involving IT.

Perhaps the key idea to take away from this paper is that fostering successful groups is no easy matter. The initial step of students forming groups is only a very initial step. Much more needs to be done to increase the chances that the group members will strive to foster each other's learning. The theory and research cited early in this paper speak of the great potential of student-student interaction, and the eight principles described in this paper help students and teachers take many more steps towards successful groups not just among themselves as students but also in the wider world generally.

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