Cooperative Learning: A Foundation for Project Work

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Abstract
This article has one theme and two parts. The theme is that we humans can do more and do it more enjoyably when we cooperate. The first part of the article explains eight principles from cooperative learning, a methodology that facilitates students learning in groups of two-four members, along with the learning they do with teachers and by studying on their own. The second part describes four cooperative learning techniques, as a way to bring to life the eight principles from the first part, and also to provide readers of the article with ready-made ideas for using cooperative learning in their own teaching. This article suggests that shorter cooperative learning activities can prepare students for doing projects, and that students can do shorter cooperative learning activities as part of the work they do on projects.

Introduction

Cooperation is all around us. In today's world, we could not survive without it. Here are just a few examples. The laptops the authors of this article used to write it, the food we ate while writing it, the badminton racquets we used to take a break from writing, all the works written by others in the reference list of this article, and all the learning we did while experiencing and observing cooperative learning in action. For all of that, we need to thank others. Plus, the examples above represent just a tiny drop in the sea of cooperation in which we swim on a daily basis.

In the third decade of the 21st century, is cooperation becoming more or less important in our lives? We can debate that question, but certainly cooperation takes new forms in this century. For example, so much cooperation now takes place virtually, and probably we cooperate more than we did before with machines, such as robots and examples of the Internet of Things (Gul et al., 2021). The problems we face, such as climate catastrophe, pandemics, and other matters represented in the United Nations Sustainable Development Goals (Silva, 2021) appear to be becoming more complex, demanding more

cooperation; yet, on some levels, people appear to be becoming more combative and less cooperative.

The main point here is that cooperation has always been important for us humans and remains vital today. Fortunately, education bureaucracies, such as Ministries of Education, from preschool level to adult education, and even including geragogy (Kern, 2018), recognize the value of engaging students in peer interaction along with teacher-fronted and individual learning. While the COVID-19 pandemic has made peer interaction more difficult, it has also forced students and teachers to learn new forms of cooperation (Van Heuvelen, 2020), forms which can be beneficial even when face-to-face returns to being the dominant learning mode.

This article has one central theme: we humans (including students) can do more and do it more enjoyably when we cooperate. We first explain eight principles from cooperative learning, a methodology that facilitates students learning in groups of two-four members, along with the learning they do with teachers and by studying on their own. We then describe four cooperative learning techniques as a way to bring to life the eight principles from the first part, and also to provide readers of the article with ready-made ideas for using cooperative learning in their own teaching that engages students in doing project work, such as producing a class magazine or a series of posters on how to take care of the environment.

Cooperative Learning Facilitates Cooperation

While cooperation provides great value on cognitive, affective, and social planes (Johnson & Johnson, 2009), cooperation can be difficult to achieve. Most often, just asking or assigning students to form groups for a project will not be enough to enable them to collaborate effectively with their groupmates. More needs to be done to provide an environment sufficient to facilitate student-student cooperation. Fortunately, an extensive literature exists from which teachers can draw for ideas on how to facilitate successful projects and other group activities. Cooperative learning techniques seek to embody four cooperative learning principles: positive interdependence, individual accountability, equal opportunity to participate, and maximum peer interactions. Hundreds of cooperative learning techniques exist, and each can be varied in multiple ways. Furthermore, students and teachers can create their own cooperative learning techniques and variations of their own techniques. All cooperative learning techniques are generic. That is, they can be used by students of different ages, in different countries, studying different subjects, including first and additional languages. In fact, communication plays a vital role in cooperation; thus, cooperative learning fits brilliantly with language learning.

The next subsections of the current article present a number of cooperative learning techniques. Some of these techniques can be done in as little as a few minutes; others might need an entire class period. Students and teachers may need time to become adept at using particular techniques. Therefore, it might be best to exercise patience and to use easy content the first-time students try out a new technique.

1. Giving Explanations - Everyone Can Explain

Everyone Can Explain is a fairly brief and easy to use cooperative learning technique that, as you might guess from the name of the technique, highlights giving explanations. The steps in Everyone Can Explain are as follows.

Step 1 – Students form themselves into groups of two, three, or four members. Everyone in each group has a number, e.g., in a group of three, one member is #1, another is #2, and the third member is #3.

Step 2 – Students have a task. First, they work alone. Next, they share answers and attempt to agree both on the answers and on explanations for the answers. It is okay if they cannot agree on answers and/or explanations (perhaps multiple reasonable answers and explanations exist).

Step 3 – Groups check that all group members can give and explain their group's answers. Perhaps, they can rehearse their responses, and groupmates can coach each other.

Step 4 – At the class level, a number is chosen at random, and the member in each group with that number may be requested to share their group's answers and explanations with the teacher and the class. Students and teachers give feedback; that feedback goes to the entire group not just to the randomly chosen person who spoke on behalf of the group.

Everyone Can Explain can be used in many contexts. For example, if a class already has a textbook, workbook, or worksheets, instead of students doing an exercise or activity from one of those materials alone, they can do it in groups via Everyone Can Explain. Pointers to keep in mind include:

a. Please remind students that explanations will be needed. The following story about the importance of explanations was told by Professor David W Johnson, a co-author of many, many publications on cooperative learning, at a workshop that one of the authors of this article attended.

> *A psychologist at a mental hospital had been working with three patients for about a year, and they had made a lot a progress. So, she was planning to release them from the hospital and allow them to return home to their families. However, she wanted to make one more check to be sure the patients were really ready to be released. So, she called the three of them into her office, and she asked them, "Please tell me - what is 3 times 3?" The first patient said, "Sure, I know. 3 times 3 is Thursday." The psychologist couldn't believe it. She'd worked so hard with this patient, and now this! What had gone wrong?*
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> *But, undaunted, she turned to the second patient and said, "You know what 3 times 3 is, don't you?" "Of course," the patient replied, "3 times 3 is mangoes." Well, the psychologist threw up her hands in frustration. She was ready to tear up her diplomas, quit her comfortable, well-paid job, and set up a stall selling mangoes and mango juice.*
>
> *In desperation, she faced the third patient. With a pleading voice, she asked, "Please, please, you know, I'm sure you do, what 3 times 3 is." The reply came without a moment's hesitation: "3 times 3 is 9." The psychologist let out a huge sigh of relief. At least she wasn't a total failure; one patient could be released.*
>
> *Then, the psychologist had an idea. She'd get the third patient to explain to the other two how 3 times 3 equals 9, they'd understand, they could all be released, she'd be a success. However, when she asked the third patient to explain his answer, he said, "3 times 3 = 9 because Thursday times mangoes = 9."*

b. Demonstrate how to give explanations for the types of questions the class will be doing. Note: Not everything in language can be explained, at least not easily. As Halliday stated in an interview (Thompson & Collins, 2001, n.p.) in regard to the theory of Systemic Functional Linguistics, of which he was the main developer, "I defend the complexity of the theory, because we are talking about a very complex phenomenon [language], and it doesn't help anyone if you pretend it's simple." Similarly, Krashen (cited in Srauss, 2012. n.p.), whose theory of Second Language Acquisition revolutionized the field, asserted, "Linguists have not even described the grammatical system of any language completely and many rules are forbiddingly complex, with numerous exceptions."

c. Remind students that a group member will be selected at random to present on behalf of their group. Thus, they may wish to help all group members to give and explain their group's answer.

d. Some students wrongly believe that giving explanations is a one-way street, with all the benefits going from the giver of the explanations to the receivers, with the givers just wasting their precious time. Students should know about the research by Webb and her colleagues (2009) about the many benefits enjoyed by those who give explanation. As Seneca, a philosopher from more that 2000 years ago, is believed to have said, "Those who teach learn twice." Teachers see the truth of Seneca's statement for themselves every day.

e. Project work thrives on explanations. For instance, when groups discuss how to go about their projects, these discussions can be more fruitful when group members provide reasons to support their suggestions.

2. Changing Roles - SUMMER

SUMMER (Hythecker et al., 1988) presents one cooperative learning technique in which students rotate roles. SUMMER focuses on students' reading and thinking skills. Students do this technique in dyads (groups of two), and each student has the same reading text which has been divided into sections. The steps are spelled out in the letters of SUMMER.

Set the mood: Students form dyads that are heterogeneous as to their current reading level. Instead of starting to read straight away, they first "set the mood" by establishing a relaxed, yet purposeful mood. To do this, perhaps they engage in a casual chat, for example, asking about what they ate at their most recent meal. Next, they check that each understands the steps in SUMMER, bearing in mind that it may take a couple times for students to become comfortable with the SUMMER process.

Understand by reading silently: The two students each have the same text that has been divided into sections. Students might have found this text or teachers might have found or written it, or it could be from a textbook. The dyad members each silently read the same section of the text.

Mention the main ideas: Without looking back at the text, a member of the pair mentions (i.e., states) the main points in the section. They do not look at the text because looking at the text might cause them to read from the text. Remember please – we want only the key points, not a repeat or a paraphrase; we want a summary. Summaries are much shorter than paraphrases.

Monitor the summary: As one partner is summarizing the section while not looking at it, their partner is looking and monitoring the summary for length and accuracy. Typically, students' summaries are too long.

Elaborate–In the **M** and **M** steps above, students identified the central points in the section; now, they take turns to elaborate on

these key points. Among the many means of elaborating are:

- connecting the ideas in the summary to what students studied previously
- associating the ideas with students' lives in and out of school
- suggesting additional information that is relevant to the main ideas
- stating agreement or disagreement with the main ideas
- reacting with happiness, sadness, surprise, and/or hope to the main ideas
- applying the main ideas
- reporting questions that came to mind, either questions about what was not clear or questions that go beyond the main ideas (e.g., hypothetical questions or questions about the future).It *should be noted that not every type of elaboration needs to be done for every section of the text.*

Next, the dyad does the U, M, M, and E steps for the remaining sections of the text. Here, roles rotate. The dyad member who did the first M for the first section does the second M for the second section, on and on, and they both take turns to do elaborations of various types for each section.

Review the entire text: After completing every section of the text using the U, M, M, and E steps, now, the dyad summarizes the central ideas in the entire text. Again, they take turns to contribute to this overall summary. Thus, yet again, everyone has an equal opportunity to participate.

Pointers when doing cooperative learning

a. "Equal *opportunity* to participate" does not always mean "equal participation." For example, maybe the member of the dyad with higher past achievement will speak a bit more in order to explain vocabulary, background information, how to summarize, and how to elaborate. No worries.

b. Teachers can prepare students to succeed by scaffolding (Wood, Bruner, & Ross, 1976) for them. Scaffolding means providing help, but gradually removing that help as students become more and more capable of performing tasks on their own. Ways to scaffold in SUMMER include teaching summarizing and elaborating, demonstrating how to do the SUMMER script, and making the text easier, perhaps by pre-teaching vocabulary and/or concepts.

c. Students do a little chit chat in the **S** (set the mood) step in SUMMER. This chat might seem to be off-task behavior, but teachers should consider whether we too engage in some casual conversation before beginning to work with our own peers, our fellow teachers. Perhaps, chatting can be a kind of team building activity.

d. Research on SUMMER brought out an important point about how cooperative learning can work (Hythecker et al., 1988). In this research, when students read using the SUMMER script, their recall of the text, both immediately after reading as well as three weeks later, was better than that of students who had read the text alone. That was no surprise, but what was especially pleasantly surprising was what happened next. Students who had learned with a partner to use SUMMER continued to have high scores even when they read alone, as long as they continued to read via the script. This suggests that skills learned in a group can be applied when performing alone. Thus, not only can teachers scaffold for students; peers can scaffold for each other. This refutes one criticism of cooperative learning: "Why should students study together for exams, when they have to take those exams alone? Studying together will make students dependent on others. Instead, students should always study alone so that they can be strong enough to succeed on their own."

e. When reading in preparation for their projects, students may wish to use the

SUMMER script both when reading alone as well as when reading with groupmates.

3. Benefiting from Heterogeneous Groups

Another cooperative learning principle is heterogeneous grouping, the idea that group membership should reflect the diversity that exists in the class overall. Students differ in so many ways including sex, social class, personality, race, religion, nationality, and multiple intelligence profile. Let us briefly discuss multiple intelligence profile (Christisen & Kennedy, 1999; Gardner, 1993). The idea is that humans have many intelligences, not just the intelligence measured on an IQ test, and that we can improve in all those intelligences. Unfortunately, many education institutions focus on only two forms of intelligence; this narrowness deprives students of opportunities to excel, develop, and teach others.

Furthermore, when students learn in groups, status hierarchies often form (Cohen & Lotan, 2014). For example, in a language class, group members best at the language being studied in that class are likely to be the stars of the group, the ones helping others. In contrast, the lower achievers are likely to be the ones receiving help. Such an unbalanced situation may lead to an unpleasant dynamic within the group. Fortunately, using tasks requiring a range of intelligences, not just what Gardner called verbal/linguistic intelligence, gives more group members opportunities to shine in the group interactions. Projects often involve a range of intelligences, such as doing calculations to provide statistics support for the group's views, creating visuals, doing skits to dramatize the group's ideas, and encouraging introspection in order that classmates connect the issues embodied in the project to their own lives and beliefs.

One example of a cooperative learning technique that goes beyond using language skills to include visual skills is MindMap–Pair–Switch. MindMaps (Buzan, 2003) provide visual representations of ideas, with a central idea in the middle of the MindMap and connected drawings, showing related ideas. Here are the steps in the cooperative learning technique.

Step 1 – Students work alone to create a MindMap on a topic. Each member of the foursome has a number: #1, #2, #3, or #4.

Step 2 – Members of the foursome form pairs to show and discuss their MindMaps and can amend their maps based on those discussions.

Step 3 – Students switch partners. For example, if students #1 and #2 collaborated in Step 2, in Step 3, #1 and #3 can now be partners, with #2 and #4 partnering. The new dyads share about their own and their previous partner's MindMaps.

Pointers when doing MindMap–Pair-Switch

One more step can be added to MindMap-Pair-Switch, and many other cooperative learning techniques, in which the pairs switch back and discuss with their original partner. Indeed, cooperative learning techniques can be very flexible. Please remember the cooperative learning principle of maximum peer interactions. The goal lies in having many peer interactions (maximum quantity of peer interactions), and a great deal of thinking (maximum quality of peer interactions).

Among the many other possible variations to MindMap–Pair–Switch could be changing the first step. For instance, instead of doing a mindmap, students could write, think, or dramatize. The last step also offers opportunities for variation. Instead of Switch, students could Square (i.e., the two pairs could combine into a foursome), or Share (i.e., a student could be selected at random to share with class about their discussion in the pair step), remembering that this

sharing should include their partner's ideas and the ideas explored, developed, and agreed and disagreed about with their partner. The sharing should not focus exclusively on the thoughts of the student who is speaking.

The story behind how we learned about the Switch component reminds teachers to look to their students for ideas and to look for the value in what at first might seem to be a mistake. One of the authors was teaching cooperative learning to teachers in a class that met once a week for ten weeks. After Weeks 1-9, teachers were encouraged to try out ideas from class and report back the next week. At one class, we used Write-Pair-Square, and the next week, a teacher recounted that a group of her students had done the technique "wrongly." The pairs did not join together to form a foursome, rather they switched partners inside the foursome (i.e., they switched partners). Fortunately, this open-minded teacher did not criticize the students for not paying strict attention to her directions. She instead saw the good in the students' actions. The rest of the class of teachers agreed, and we named this creation "Write-Pair-Switch." That teacher's mistake-to-good-idea process perhaps resembles what occurred in Fleming's serendipitous discovery of penicillin (Letek, 2020) and saved untold numbers of lives. To be honest, it would not be surprising at all if other students and teachers had previously invented something just like Write-Pair-Switch, although probably not with the same name, or maybe even with no name at all. The point is: we do not have to wait to see an idea in a book or journal article before trying it.

Returning to the theme of this section of the article, heterogeneous grouping can benefit projects in many ways. Heterogeneity brings different perspectives, different experiences to groups' work on their projects. Also, heterogeneity brings different talents, not just language skills. Just as we hope students with language skills will scaffold in order to boost their peers' language abilities, so too do we hope students with, for example, drawing skills will scaffold in order to boost their peers' drawing skills, so that they can do mindmaps and other visuals that make their groups' projects more appealing, persuasive, and memorable.

4. Promoting Group Autonomy

Another cooperative learning principle is group autonomy. The principle calls on students to look to their peers as the first option when they need help, saving teachers as the last resort. This principle presents a challenge for many students who have become accustomed to teacher centered instruction and who have little confidence in their peers' ability to provide useful assistance. Such a perspective hampers students' development into lifelong learners. After all, teachers cannot follow students around for the rest of students' lives, and a key objective of projects is to prepare students to learn and do with peers during their careers and in other aspects of their lives.

What can teachers do to change the mentality that leads students to be so dependent on teachers? First, teachers should reject the temptation to intervene when groups show any little sign of trouble. Instead, the slogan "Three before me" might be useful: that is, students should first ask assistance from their three groupmates before turning to teachers. Second, teachers need to scaffold for students so that they really do become capable of providing each other with valuable help. For example, if presentations constitute part of projects, teachers can demonstrate how to do effective presentations and provide a checklist for the characteristics that make a presentation successful. Students can then

use this checklist to provide peer and self-feedback.

Friendly Spy is a cooperative learning technique that provides students with opportunities to give each other feedback and to learn from the good and not-so-good in other groups' developing projects. Spies try to find out what others are doing and then use that information to defeat those others. However, friendly spies are cooperative, not competitive. The steps in Friendly Spy go like this.

Step 1 – After students have been working for a while on their projects, one member from each group is chosen randomly to become that group's Friendly Spy. The Spy's task is twofold: one, to visit one or more other groups to find out what that group is doing for their project and how they are doing it.

Step 2 – The second part of the Spy's task involves offering advice on how the other group might do their project better. This is one place where the teacher's scaffolding (e.g., checklist) could be useful.

Step 3 – The Spy returns to their home group and shares any useful ideas learned from the group they visited.

Pointers when doing Friendly Spy

a. Students often spend a great deal of time with the same groupmates, and that time together has many potential benefits, including forming deeper ties, coming to know each other's strengths and weaknesses as well as likes and dislikes, plus working out problems that stand in the way of more effective interactions (Deitrick, 2019). At the same time, it can be refreshing to interact with other classmates from time to time. Friendly Spy provides opportunities to do that.

b. 7S (Jacobs & Zainal Abiden, 2017) is another cooperative learning technique that gives students chances to interact with people from other groups. The steps in 7S go as follows.

S1 – Stand – Students stand up. Green (et al., 2021) reported that too much sitting may not be conducive to learning.

S2 – Slide - Students slide their chair under their table in order to provide more space for the later steps in 7S. Of course, some students do not have the furniture for sliding. No worries.

S3 – Stretch – Students have probably been sitting for a while; thus, they might benefit from some stretching.

S4 - Sip – Students drink from their water bottles. Hecht (et al., 2017) found that increased water consumption can aid learning.

S5 – Stir – Students walk around the room alone, not with their group members. In this way, group membership is "stirred up."

S6 – Stop – When someone gives the signal, everyone stops walking.

S7 – Speak – Students form a twosome with a nearby student from a different group and has a discussion. Time limits can be used to encourage equal opportunity to participate (e.g., one person has the floor for the first two minutes) and then, their new partner is the main speaker for the next two minutes. Afterwards, students can return to their original groups, or they can stir again.

Conclusion

A project as a noun in the education context is usually a piece of multifaceted work done by a group of students over a period of time. Project as a verb can mean to look into the future. The point of this article has been to project (verb) how projects (noun) can become more effective and satisfying for students, teachers, and others by the use of principles from the cooperative learning literature. Eight such principles were explained, and four cooperative learning techniques

were described, along with suggestions for variations on these techniques.

One projection that can be made with great certainty is that students and all the other approximately eight billion human inhabitants of our decreasingly habitable planet will increasingly need to bring our talents and energies together on a wide range of projects so as to better cooperate for a better future. Scientists have called our current geological age the Anthropocene (Wolff, 2020), because humans (*anthro*) now are the main force shaping our planet, and as Spiderman's Uncle Ben told him (Cronin, 2015, n.p.), "With great power comes great responsibility." Learning how to do projects cooperatively allows students to project their great and developing responsibility for the ecological community, including our fellow animals and future generations.

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