

# Group Work in a Classroom: An Analogy With Organisms in a Community

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## *Abstract*

There is a large number of relationships between organisms in communities, and these relationships comprise the following types: predation and parasitism, commensalism, proto-cooperation and mutualism, neutralism, amensalism, and competition. The possible effects of the relationship between two species are that one or the other can benefit (+), lose (-), or neither benefit nor lose (0). By analogy, I have classified the behavioural relationships between students during group work. Different groups of students require different treatments. As a result, I propose a mixed approach to the formation of groups, careful observation of individuals, and the division of the work into smaller sections. In this way, low achievement of a group as a result of the uncooperative behaviour of some students can be prevented.

## *Introduction*

Between teachers, at least on a declarative level, it is widely accepted that active methods with fully engaged students can lead to higher levels of student learning, and this is especially true in teaching science. Group and collaborative work is considered beneficial for students in many ways (Marentič-Požarnik, 2000; Peklaj, 2004). Through such work they can learn new facts and skills, reconstruct their knowledge, change attitudes, and best of all achieve all of this in a friendly environment, and it would be negligent for a teacher to ignore a method with such promise to elevate students to the highest peak of educational Olympus. However, in everyday reality, collaborative work does not suit all situations and some traps are hidden within, traps that include the grouping of students, fairness in grading, and absenteeism (Gupta, 2004).

In more than 20 years of teaching using group work, both in the classroom and in outdoor activities, I have observed that, under equal outer conditions, some groups work brilliantly but the outcomes of other groups performing the same task may not be so encouraging. In the same class, where work must follow a prescribed schedule, there are always groups that “work like a Swiss watch,” with all work completed on time and almost without any intervention by the teacher. On the other hand, there are groups that are always late and where a lot of school time is lost simply by having to push them to work. In practice, these are well-known problems and there is no unique solution to overcome them. Some suggest forming groups by chance, while others allow students to form groups based on their own preferences. Some will suggest that work must be done, in the same group, from start to finish, while others prefer to vary group membership (Bahar, 2003; Mitchell, Reilly, Bramwell, Lilly, & Solnosky, 2004). I have observed that group work was sometimes improved with just the absence of a single student, or the presence of a formerly absent student, in a group. Out of curiosity, a colleague and I started to observe patterns of behaviour in groups and, with time, recognised an analogy between the interrelationships of students in a group and those of community members in an ecological system (a biocoenosis).

In every biocoenosis, there is a large number of relationships between species, and these relationships comprise the following types: predation and parasitism, commensalism, proto-cooperation and mutualism, neutralism, amensalism, and competition (Odum, 1971; Tarman, 1992). The possible effects of the relationship between two species are that one or the other can

benefit (+), lose (-), or neither benefit nor lose (0), as shown in Table 1. Some species can experience one type of relationship with one species and a completely different relationship with another. For example, a sparrow can be commensal in a stork nest, a predator of seeds, the prey of a hawk, and neutralist with a hedgehog.

Table 1  
*Possible Types of Relationship Between, and Effects on, Two Species in an Ecological System*

Type of relationship	Effect	
	Species A	Species B
Predation and parasitism	Benefit (+)	Lose (-)
Commensalism	Benefit (+)	Neither (0)
Protocooperation and mutualism	Benefit (+)	Benefit (+)
Neutralism	Neither (0)	Neither (0)
Amensalism	Neither (0)	Lose (-)
Competition	Lose (-)	Lose (-)

### ***Methodology and Results***

For more than 20 years, I and a colleague observed students as they participated in group work. When students work in groups, their teacher should not interfere and disturb them but slowly walk between groups to observe and listen to the students and wait on their call for help. As a result of our observations, we learned that each group works in a completely different fashion, with the work of a group largely dependent on the behaviour of group members. Knowing about the relationships between species in an ecological community mentioned previously, we recognised almost similar patterns for the students in a group.

For the analysis of possible relationships, we took each student to represent a member of a different species, and student behaviours were categorised. In an earlier attempt, we analysed a similar relationship pattern between teachers in team work (Şorgo & Logar, 2006), and we believe similar patterns can be recognised in almost every group which stays intact long enough and has some work to do. In the following, I commentate on the behaviours of different types of students during group work.

*Predators and parasites.* In both cases, one partner benefits and the other loses. Predation is a short-term process where the prey instantly dies. In contrast, parasitism is a long-term process and can even last a lifetime. Examples from nature are well known, and include foxes and owls as predators and mice as prey, and a cat that hosts fleas or tapeworm, both of which digest the cat's body fluids.

Typically, we recognise only parasitism in a student group, so there is no need to clean the bloody remains of a feast after a lesson! We can observe that some students constantly live at the cost of others. We can easily recognise them because they are constantly asking others for help before they have even tried to solve a problem. They consistently do not take notes, so they can be easily recognised via photocopies or scans of their peer's work. They rarely complete homework

voluntarily, so the other group members must do more. Sometimes we can observe the bullying of peers. We can further divide parasitism into two subgroups. In the first, one of the students can be a parasite on several members of a group, just like a mosquito “sucking” blood in a herd of animals. Damage for every single animal is minor, unless there are too many parasites. A smart student can be a parasite for years and nobody would even recognise him as a parasite, because the loss for a single host student is small. We must not confuse parasitism with cooperation, when students help each other with the exchange of notes or other materials. The other kind of parasitism is one-on-one, like a tapeworm in a small intestine. In this case, one student parasitizes on a single student. In some cases, the relationship can last for their entire school career.

As a teacher, you need to have an eye on them all the time. They need strict control, and their work must be checked several times during a lesson. Sometimes it is good to give them some work which can be performed only individually, so they cannot escape or push others to do the rest. Because they are not immune to plagiarism, it is a good idea to check their homework and compare it with internet resources.

*Competitors.* In nature, competition is one of the most common relationships. We can observe competition within and between species. Organisms from different species can compete for food, nesting grounds, and so on. Within species, they can compete for everything, just like the situation between species, as well as for mating partners. In the long term, a species can benefit through evolution, but usually both partners lose because they must share a resource. In the absence of others, the whole resource will belong to just one species.

Competitors would prefer to work alone, and would gladly escape group work if that was possible. They are always first to take additional material after it is delivered, and will rarely bring it back to the others at the right time. You will recognise them as lords of a mouse or keyboard, and they are in the first row when there is a demonstration. They will rarely share their findings with others and, in the worst case, will try to produce everything on their own, not allowing others to participate in a session. To prevent competition within a group, it sometimes pays to ignite competition between groups. Under this circumstance, some competitors can be very co-operative just to taste the winner’s glory. They like to be honoured at least every few minutes.

*Amensals.* In this case, one of the partners experiences neither a benefit nor loss, but the other partner loses. In nature, we can observe that some blue-green bacteria excrete poisons into the water. The result is dead fish, without any observable benefit for the bacteria. Another example is moulds that secrete antibiotics which stop reproduction in bacteria. It is unclear if moulds benefit, but bacteria definitely lose.

The best known situation in a school is vandalism. Students sometimes damage things, or sabotage the work of others, without any sane reason. More commonly, some students can destroy the working atmosphere in a group by making remarks about other members of the group.

Because of their destructive nature, amensals are the hardest people to work with. Because one eye is spared for parasites, the other eye belongs to them. Sometimes it is a good idea to give them some responsibility and remove them from a group for some time. If they are in a group with a student who is in one way or another different, then troubles can be expected.

*Neutralists.* Here, there is no direct relationship between species. This does not mean that they are not connected in some indirect way, though, or through some other species or ecological factor. In

the jungle, for example, there is no direct connection between elephants and apes, but they do breathe the same air and can be hosts for the same blood-sucking insects.

Neutralists prefer to work alone. Even if they alone cannot produce great projects, they do not like to work with others. Unlike the competitors, they do not like attention. They prefer to take their patch of work, finish it, and present it to the others without a lot of argument. When they know what to do, you can leave them alone.

*Commensals.* While one of the partners benefits, the other neither benefits nor loses. So a bird can nest in a tree (i.e., benefits) without visible damage or surplus for a tree. Our houses and apartments are full of tiny animals eating our dandruff or scraps of food.

Commensals are easily recognised by their invisibility as quiet people who say something only if they are asked to, or do something when they are forced to. If you want something from them, you have to tell them directly. They do not take the initiative and do not disturb group work. If there is some physical work, they are normally in the second row; and on computers, they are peeking at the screen from the back. They will do exactly what they have to and nothing more. It is easy to miss them and they are only one step away from parasitism.

*Protocooperates and mutualists.* In this relationship, both partners benefit. The difference is that mutualism is obligatory for both partners and protocooperation is not. The textbook example for mutualism is cooperation between ruminants and microbes in their intestine. The great African herds are an example of protocooperation. In such a herd, there are animals with good sight, the others with excellent noses or ears. A panic run is the signal to every other animal that something is wrong.

It is easy to recognise the students who can, and are willing to, co-operate. They will sit around a table, listen to each other, and everyone will have a chance to talk. The work is divided into fair amounts. In a group with many co-operative students, commensals and parasites can mimic themselves for a long time. Ideally, all partners in a group recognise that through co-operation all of them can benefit. It is too optimistic, though, to say that the benefits must be totally equal, which would be an ideal situation. Rather, the benefit must correlate with the amount of work invested in the project.

Cooperators enjoy group work and prefer peers with similar attitudes. When working, they sometimes take a teacher as a partner. This is a potential trap, because you can spend all your time with such a group and forget the others. They can be very intolerant to uncooperative partners in a group. It is good to check their work because they often have long debates and they lose track of time.

### ***Conclusions***

After years of group and collaborative work with students, we recognised through careful observation that we can identify different types of students with different behaviours during group work, and knowing that students are different can make group work easier from a teachers point of view. Students' behaviours are in many ways analogous to those between different species in a living community. As a result, work in some groups is better than in others, and different groups need different teacher assistance to reach the same goals.

There exists no such thing as a recipe to counteract all of the interactions that interfere with student learning and enhance the interactions that enable student learning. Even more, there is always the possibility that a teacher's intervention in group work would produce unwanted side effects. But as far as is possible, we have reduced long-lasting, unwanted relationships between students with a mixed approach to the formation of groups. Work in a classroom, or in a group, has to be split into smaller parts, with varying criteria for group selection. The criteria include random selection, student choice, and either completely or partially teacher-directed selection. In this way, almost every student will work with others and can take different roles in different groups. The group work must be organised in such a way that every student depends on every other student, and they have to have full responsibility for the work. Some students need to be constantly observed and, if they are harmful to the group, neutralised. In the worst cases they must sometimes be removed from a group for a period of time, set an individual task, and then returned to the same or another group after their part of the work is done. If this procedure is performed carefully, and is not recognised as punishment, even so called problematic students can become valuable partners in a group.

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## Ideas in Brief

Summaries of ideas from key articles in reviewed publications

### ***Towards a Theoretical Framework for Teaching Controversial Socio-Scientific Issues***

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Open any newspaper and you will find an increasing number of articles, many on the front page, dealing with public policy issues that have a strong basis in science. Glancing through the March 28, 2007 edition of our local, free newspaper, the *Free Metro*, one finds articles on the future of nanoscience, carbon emissions from power stations, a car that runs on air, cars converted to run on cooking fat, the effect of climate change on bird migration, CCTV cameras, beef as a possible cause of infertility, melting ice killing off baby seals, Toadzilla--a gargantuan cane toad--in Australia, near-identical twins, legislation on smoking and effect on cancer rates, and a couple of