Effective Engineering "Teaching" in Practice
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Lecture-07
Coorperative Group Learning

Welcome back. Today's lecture is going to be on something called Cooperative Group Learning. In the previous lecture we saw what active learning was today we will see what Cooperative group learning is all about.

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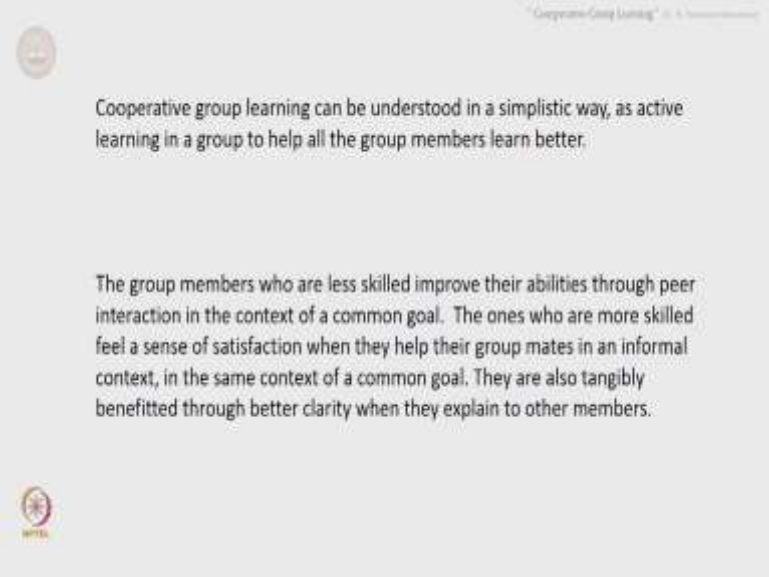

Cooperative group learning can be understood in a simplistic way, we will start out in a simplistic way, as nothing, but active learning in a group right. You have a group you have active learning in a group, so as you help all the group members learn better, that is essentially what cooperative group learning is. You will see that all these have a lot of interconnections and so on so forth, that is a very nature of it. Let us not try to define something very very finely and try to exclude the other things in so on so forth, that is not a very good approach to take. We will, there will be specifics for each and every term, that is why they are called by different terms; however, there will be an underlying connectivity between the various aspects. After all, the whole idea is that everybody learns much better.

So, there will be similarities, there will certainly be differences and so on so forth. Let us not worry too much about them, let us move forward. The group members who are less skilled, they improve their abilities through peer interaction in the context of a common goal. That is what happens, any group will have people of differing abilities, in fact, we will see this in great detail in the later part of the course.

These members when they interact with each other, the people who are not so skilled can improve their learning by interacting with peers. That is in fact, proven to be a very good way of improving one's learning and on the other side the ones who are more skilled, for whom things come easily feel a sense of satisfaction when they help out their group members. And in an informal setting, in an informal context, in the same context as that of the common goal. This way it all becomes smooth, there is no you and you versus I and so on so forth the learning is much better, the satisfaction is much better therefore, everybody gains.

If somebody is looking for a tangible benefit for people who are highly skilled, there are also tangible benefits, they are tangibly benefited through better clarity when they explain to other members. You and I know, then when you teach something to somebody, your own understanding improves significantly and that happens here all the time. So, everybody in the group is benefited and that is the beauty of cooperative group learning.

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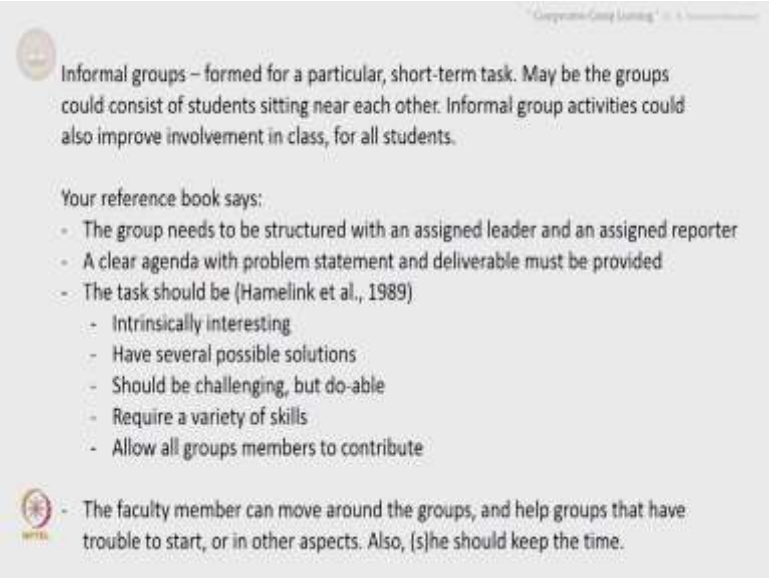

Now, let us see what are the various ways or some of the various ways in which this can be done. Again, there are so many ways in which the details of the cooperative group learning could be different. I am just going to present to you some of the ways based on whatever is there in the literature and my own experiences.

So, one could form informal groups to improve learning. Informal groups is nothing, but they are formed for a particular short term task, a few minutes may be a part of the class and it could just be the students were sitting near each other could be asked to form a group. If there are about 60 students in class and you know and you want to form groups, maybe about 3 or 4 per group people were sitting together in the same bench or 2 benches next to each other could be asked to form a group, this turns out to be effective.

Informal group activities could improve, could immediately improve the involvement of the students in class for all the students and that is a very big benefit right there. Even if nothing else happens the involvement significantly improves and that itself is a good thing, to begin with. There are so many others.

Your reference book Wankat and Oreovicz says the group needs to be structured with an assigned leader and an assigned reporter. A leader is the one who ensures that the group works in an appropriate fashion, the reporter is the one who reports their achievements, findings and so on so forth, probably to the faculty member or to the others in the group.

So, this is considered as a good thing. There must be a clear agenda with problem statement and deliverables, these must be provided is what your book says. It makes sense, if they are left with their own wits, things could go in various different directions, which is desirable in certain scenarios, but in the context of most aspects of engineering, especially when you are not brainstorming you are trying to solve particular problems, making them understand particular concepts, it might be good to have a very clear agenda with clear problem statement and what needs to come out of their solution. what is expected, not the answer, but what is expected.

There are also guidelines for how the task should be designed; that is given the paper by Hamelink *et al.*, 1989. They say that the task should be intrinsically interesting. Makes sense; otherwise it would not catch the attention of students. It should have several possible solutions, it should be challenging, but doable. This is very important, find the balance between challenging which kind of extends the abilities of students at that level,

but it should be definitely doable. It should require a variety of skills ideally and also allow all group members to contribute. It should be made in such a way that all group members can contribute to the process.

And then the faculty member can move around the groups and help the groups that have sometimes had trouble to start, this happens quite a bit, or in any aspects that they need help. And most importantly the faculty member must keep the time, there must be somebody who says this many minutes left, this many seconds left and then very politely closes and then moves on to the next thing. So, this is for an informal group activity, informal groups are formed as I mentioned just at the spur of the moment. It could be people who are sitting next to each other and this group activity is known to significantly improve learning.

Now, let me give you 2 examples from my experience. These have been published, so, there is peer acceptance of this of how I do group activities. One for tutorial sessions in my course also called recitation sessions in some countries, tutorial sessions in my course where people practice numerical problems and so on so forth. To clarify the principles that we are taught, that is the original aim of tutorials. We do it differently in and so on so forth each class becomes a tutorial in a certain sense, but let us talk about tutorial sessions in particular.

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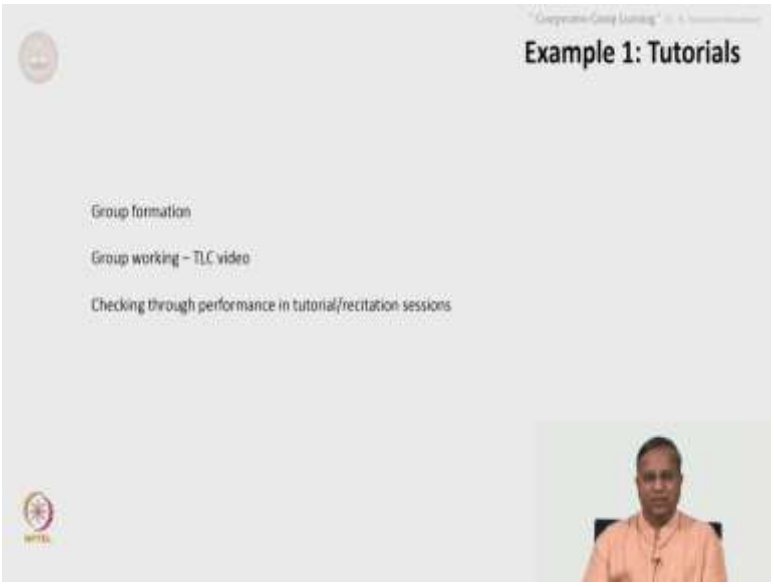

What I do is take care in the group formation phase itself, I ensure that every group has representation from people across the class. What I normally do is give a diagnostic test in the first week of the course and based on how they have done in the diagnostic test, I form sets. The diagnostic test itself tests something of the, probably an earlier course that is also being covered in this course in an advanced fashion and so on so forth, or it could be the material that was covered in the first few lectures extended slightly and so on so forth. A difficult exam and then of course, as expected there is a distribution in the performances of students. I typically divide this into 3 or 4 sets depending on their, the marked distribution and then jumble up the sets for example, I do not say that (a) is the set that contains the highest performance I probably call it set (c) that is what I mean.

So, the highest performance could be set (c), the next highest performance could be actually (d), the lowest performance could be (a) and so on so forth. So, the students are not immediately aware as to where they fall in the spectrum. Then, I give the students these 4 sets and ask them to form groups themselves under the conditions or to satisfy the condition, that each group must have one from each set. I hope this is clear. Based on the performance in the diagnostic test, I form 4 sets and then ask the students to form groups to satisfy the condition that each group has one from each set. Students typically form groups. There is rarely any complaint, sometimes complaints come and they need to be handled and so on so forth but that is rather rare.

And then these groups are formed, these groups are formed right in the beginning. In the tutorial session they are asked to sit together and then address the questions. There are 2 ways in which this can be done. The yeah, we are talking about how the group works. The tutorial sheet consisting of problems can be distributed maybe a week or 10 days before the tutorial session, a week before the tutorial session or you could take a few problems at a time and give that to the class in the tutorial session or project that on the screen during the tutorial session. Both these could be done. In other words, the students could have seen the entire problem set earlier and worked it out and then come to class, you could insist the students work it out in their groups and then come to class or you could form the groups ask them to come here, project the problem so that they see the problem in class for the first time and then they work it out in groups.

So, the second one has the advantage that you get to see how the group works, the first one does not have that advantage because they going to work it out in groups in their

hostels, homes and so on so forth. So, you do not get to see how they work. So, this is the slight, the big advantage that you have with the second approach.

What I am going to show you now is an example of this group working in cooperative group learning in a course, a faculty development program that was organized recently by the teaching learning center of IIT Madras. So, that gives you some idea and then I will clarify that a little later too. So, as you can see, yeah I am back here, let me go back to this. This is the Faculty Development Program, let me go to a 10, yeah that is, yup from here you can see people discussing they have been given a task in this particular session, they are discussing.

See those circular tables are really helpful during this discussion. Even if you do not have circular tables, using the regular tables also this can be done. I think that should be fine. That gives you an idea of what happens during the process of working out in a group. I'll also give you a video which illustrates this sometime later, let us get back now.

So, this is the way a group works during the cooperative group learning session. That is fine, but you need to figure out how they have done, how they have performed. So, the checking through their performance in the tutorial recitation sessions is a must to see whether their learning has improved. For example, what I do is I tell them right in the beginning that you work it out and then I am going to call one person in a group. I am going to select the group by probably drawing lots and then I am going to call any person in the group that I like and the person needs to illustrate the solution on the board. When the person has gone through the problem, has learnt how to solve it hopefully, most of them do has learnt how to solve it and has understood that and then the person comes through the board and works it out for the entire class.

This would, this is fair I am not calling cold, the person has enough notice, the person very well knows that he or she could be called anytime and therefore, that itself could provide the motivation for them to learn in the group. And more importantly what I do is I tell them that the marks that this person gets would be the marks that is assigned to the entire group for this particular activity, and tutorials typically carry about 10 percent weight towards the final grade. That is a high incentive for students, 5 percent some sort of an incentive, but 10 percent is a good incentive. Therefore, the entire group ensures

that everybody in the group learns. That is the whole idea there and this needs to be checked, this needs to be taken seriously ,given the marks and then that is the only way by which you can ensure that everybody participates in the forthcoming sessions and therefore, they get engaged and therefore, they learn better. This works very well, the cooperative group learning works very well especially to improve the learning of people who are not so skilled

Let me give you a second example of cooperative group learning that I practice. In this case, in the laboratory course. Soon we will do an entire session on lab courses, but let me describe the cooperative group learning part of the lab course here. The group formation is done using the grades in my own previous course or the grades that my colleague would have given in his or her course, that is usually a good reflection you do not really need your own grades and so on so forth to form groups.

And then I form sets, give it to the students ask them to form groups making sure that each group has one from each set of students. This is what I do. Therefore, it is pretty much the same. Only thing is that the source of the basis is a little different, because it is a little difficult to give a diagnostic test right in the beginning in a lab course and so on so forth.

So, I typically use the previous material. Many years ago, I usually use the CGPA of the students, the marks of the students that could be relevant if CGPA is not being followed in your institutions. The students were very forthcoming with their marks and I used to use their CGPAS to form groups, which was far more reflective of where they stand and therefore, the groups are more effective then, but we change with the times. Now people are not so forthcoming with personal information such as CGPA and therefore, we need to change to form our own groups, that is what I have done.

The group working the lab experiments are performed by the groups. Together they, there is a leader for each group, the leader decides through discussion who is good in what and then gives them tasks to do during the lab experiment and then they discuss it together and then come and talk back to me. We will cover the details in another lecture. So, the group working is also monitored when they come and discuss with me and so on so forth, the details of this we will cover in another lecture. And during the discussion I

said that they come and talk to me after appropriate lab sessions, during that time I take care to monitor what is happening.

So, discussion with group members with an unsaid focus on some of the members. There are no marks given for this discussion, so they are all free and this is the time when they learn the most because I ask them questions, some to check whether they understood and others to extend their understanding by appropriate questions. I usually direct my questions to the weaker members of the group or people who are not highly skilled and they pick up, their confidence level slowly improves as the course progresses. This I have seen in every single year, every single time I have offered the lab course.

So, group, cooperative group learning works very well in this case and then again everybody gets the same grade, therefore everybody should work towards the success of their group. There are elements for group success, you know which determine the success of a group. This is again from your reference book Wankat and Oreovicz. Let us go through some of the aspects that are found in the literature. There is positive interdependence, inter between people, dependence positive interdependence, the group members must realize that for one to succeed all should succeed and as I mentioned the grading criteria can reinforce this aspect.

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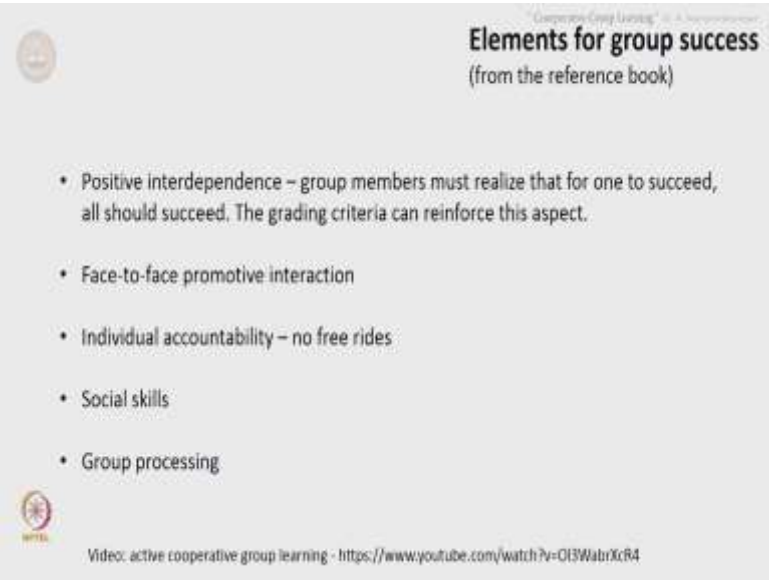

The way that I had mentioned that, the way the person performs or the marks that are given to the person are the marks that are given to the entire group. That is one way by

which you can implement this. Face-to-face promotive interaction is necessary for group success. If the group is not doing that, you might want to do some intervention, you might want to intervene to improve this aspect. Individual accountability is very important, nobody can have a free ride, nobody can be a you know hitchhiker as they are called and ride on the work of others.

The groups must make sure that everybody works and the faculty member can just say that if the group was not working well you can always come and talk to me let us see where the group is going wrong. Usually they come and talk to you because nobody wants to give a free ride to somebody else because they get the same grade as them and so on, this usually works out. Social skills are very important. How you politely get your point across buts be firm without offending other people, these are very important skills which engineers typically lack, which are essential for their work in the real world.

So, this is a nice way by which one can develop these social skills and group processing towards the common goal, whatever it may be, maybe somebody has fallen sick, maybe somebody needs to take over the rest of the group needs to take over that persons duty for that short at time, maybe the person can contribute in a bigger way sometime later. All these things come into play, but the main aspect is that the objective must not be lost, in this case the lab report or effective lab report and so on so forth must not be compromised is something that they get to learn as a part of the exercise, that needs to be internalized for the group success. At this stage let me suggest a video here on active cooperative group learning, I just called it active cooperative group learning, because cooperative group learning is typically active in nature as I mentioned earlier. You might want to watch the video to get an idea of how cooperative group learning can be done in different context.

I think that is all I have now. In this lecture we looked at some aspects of cooperative group learning which in principle is nothing but active learning applied to the improved learning of all the members in a group. Let us meet later to take forward the course. See you then.