Effective Engineering "Teaching" in Practice
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Lecture - 12b
Feedback and Reflection (Part - 2)

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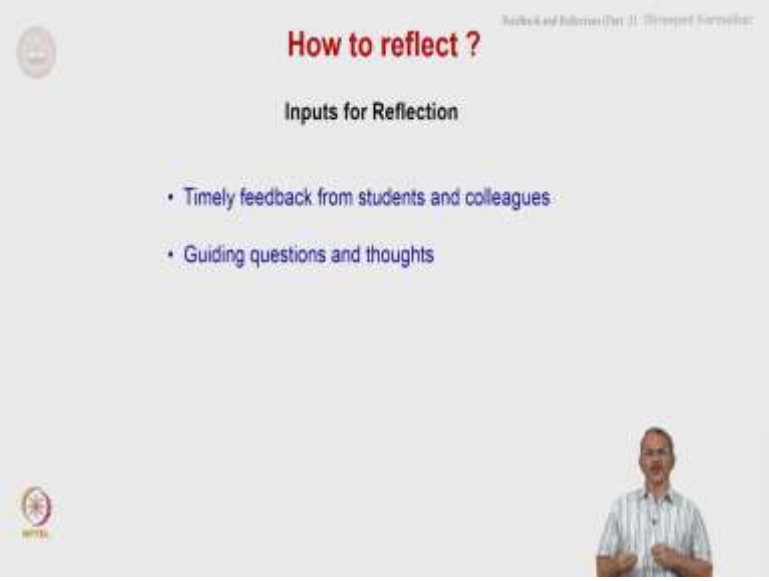

Now, how to reflec,t what are the inputs for reflection, timely feedback from students and colleagues, that is one of the inputs. The other input is some guiding questions and thoughts. These guiding questions and thoughts can be regarded as some sort of mantras for meditation right. So, all of those who are familiar with concept of meditation and so on know that to get into this state some prescriptions are given; for example, you must repeat some sound or some word.

So, this repetition of sound or word helps you to get into the meditative state. Similarly there are some guiding questions and thoughts for a teacher to get into the state of reflection and try to assess the impact of the teaching, right, during reflection. Now, let us look at each of these one by one.

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So, what are the various forms of feedback?

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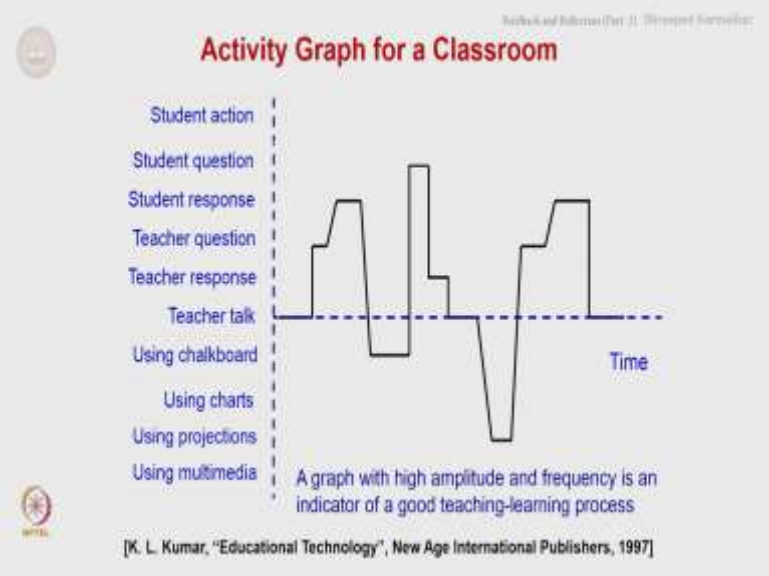

Here is a very simple, but effective approach to assess how the teaching and learning is happening in a class. Here, what we are doing is, we are plotting the various activities that go on in a classroom as a function of time. Now, it is very important to note how the activities are arranged on the y axis. So, whichever activity is most common, that is located closer to the time line.

For example, teacher talking and teacher using chalkboard. Now, there are most common activities that go on in a class. Therefore, they are located close to the time line. All the actions of teachers and students are listed in the positive y axis as you go up and all the teaching aides that the teacher uses like the chalkboard, projection, multimedia and all that will be listed in the downward direction from the timeline. Now, whichever activity is less common is located farther away from the timeline on this graph. For example, you can see the teacher questioning is less common than teacher talking. Therefore, teacher questioning is located farther away right.

Now, student actions are less common than teacher actions. For example, the number of times students ask questions in a class is much smaller than the number of times the teacher may be asking questions or the teacher may be talking. Therefore, student question is located much further away than let us say teacher question. Now, student action, means a student coming to the board and explaining derivation or carrying out a derivation. So, all these things are listed as student action here. So, the activities that go on in a class are listed here, let me go through them once more, teacher talking, teacher responding to the students, teacher asking question to the students, student responding to the teacher or teachers question, students asking question and finally students doing some action, coming to the board and working out things and so on.

Now, let us also list the teaching aids that are used in the class. So, these are listed in the downward direction. Again whichever is less commonly used in the class, that is listed further down. So, teacher using charts and projections is less common than teacher using chalkboard. Therefore, using projections is listed further down than chalkboard. And finally, multimedia, audio visual aids are used least commonly and therefore, they are listed at the bottom.

Now, all that I do is plot a graph of these activities. A graph may look something like this. Now, what is happening here is that, I mean let me explain the graph. Teacher is talking for sometime, let us start from the left end, then teacher has thrown a question, some student has responded and then teacher started explaining something on the board, so the graphs comes down. Then again it shoots up because some student has asked a question, then the teacher has responded to that question right, so we are somewhere here, teacher responded to the question. Then again teacher started talking.

So, we are here somewhere here. Then teacher started using some projection here, then teacher threw a question at the class. So, we go up and so on. So, this is your graph of the class.

Now, how can you use this graph to get an idea of the quality of teaching learning? A graph with high amplitude and frequency is an indicator of a good teaching learning process. So, that is a criterion. So, if your frequency and amplitude of this graph is high; that means the teaching and learning is happening better in a particular class. Now, it is not very difficult to appreciate why this should be so. For example, if in a class all that is happening is teacher is talking, then what you will have is just the horizontal line, we will just have this line, that is all right. This, just this line will be there. If teacher is just talking and using the chalkboard then you may get a graph like this, something like this. So, it will have a low amplitude, right your amplitude will be just this much.

Now, if some student has asked a question. So, he has got stimulated, right got interested in the topic that you are teaching and the student has got up, stimulated, then he or she will ask a question. It is important to note that the students do not ask a question every time they have a doubt. Please understand this point very carefully. You look into your own psychology. When have you asked questions? Whenever you are presented with a new material, you always have a lot of doubts, but that does not mean you ask those doubts. You ask a doubt only when you get sufficiently interested in a topic. So, please remember that a student question is an indicator of not only the presence of doubts, but it is an indicator of the level of interest in the class. Therefore, if the graph touch is high amplitude and students start becoming active, then it means that students have got interested; that means, your teaching has been effective. That is why higher amplitude means better learning.

Similarly, research has shown that if you use various teaching aids, right, not just the chalkboard; projections, multimedia and all that, then learning is better. That is why if your graph is going down deeper right, then it is an indicator of better teaching and learning in the class. So, you can actually use this graph very effectively. To compare let us say two classrooms. For example, let us say there is a first semester course on physics being taught to let us say about say 500 students, in about 5 classrooms with 100 students in each classroom in parallel, by several teachers. Assuming that the distribution of the students in every classroom is more or less identical, distribution in terms of their

performance and attitudes and so on, you can compare these various classrooms from the point of view of teaching and learning simply by plotting graph for each of them and then looking at the graphs after the class. So, whichever classroom has higher amplitude in frequency, the graph has higher amplitude and frequency, that classroom teaching and learning has gone on better.

You can use this graph also as an indicator of changes that you introduce in your teaching. Supposing you have made a change in your teaching and you want to see whether really it has been having some impact. Has it improved matters for the students? You can plot a graph of your class and check this graph before you introduce the change and after you introduce the change. Sometimes in a single class you may not see the impact, therefore, you can plot the graph over a longer period maybe 2 or 3 hours right. So, this is one way of sensing the impact of your teaching, one input for your reflection right, this is one from a feedback.

Let us look at another form of feedback. Here what we do is, we distribute slips among the students. The slips may be about one third the size of A4 size page. On one side of the slip, you ask the students what they liked most about this course or the teacher. Here it is important to note that if a teacher wants to improve, simply the teacher rating is not a sufficient feedback. It does not give you sufficient inputs for improvement.

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Suppose a teacher knows that I am getting a feedback that is 6 on 10 and I want to improve to let us say 9 on 10. Now, how do I improve. I know that I am 6 on 10, but how do I make myself 9 on 10. Simply the rating does not give you these inputs. So, therefore, it is very important to get descriptive feedback where students have to write what they felt. So, this is what is being done here. That is why you will see most of the space on the slip is reserved for descriptive feedback.

Now, at the bottom you are asking the students rating also. So, you have two ratings, they are being asked for course rating and teacher rating. Now, it is important distinguish between these two ratings. Sometime the students have some preconceived ideas about certain courses. For example, if I take electrical engineering, many students are very favorably disposed towards a topic such as digital signal processing. On the other hand they are not favorably disposed towards some other course such as say semi-conductor devices. So, this disposition of the students is captured in the course rating. So, you may have a teacher who is teaching well, but if the students have for some reason a positive disposition in one course than other course, the rating of the teacher in the two courses may be different even though the teacher may be equally good in both courses. So, to remove this effect of the course, we collect what is called course rating. And the teacher rating is about how the teacher is handling the course. So, that is really something of your interest. So, both the course rating and teacher rating should be collected.

So, very simply said, one can say that it is difficult for a teacher to get a very high rating in a course which is not rated very highly by students. Same teacher, if he teaches a course which is rated highly by the students, then his own rating or her own rating in that course can be higher.

Now, on the other side of the slip you ask the students scope for improvement of this course or teacher. Now, here is an important point about any feedback. A feedback does not necessarily always mean negative feedback.

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So, feedback should include both components - positive as well as negative. Even when a teacher gives feedback to the students, the teacher should give both positive and negative. It is not correct to only scold the students for their weaknesses or their lapses you must also give positive feedback. In fact, if the negative feedback is accompanied by a positive feedback, then many times the negative feedback may be received much better. Now, this is what we are telling the students also, that students should be asked what they like about the course or teacher and also where the teacher or the course can be improved.

Now, at the bottom of this particular slip, you can see there are 2 entries there. One entry says B.Tech/ M.Tech and the other entry says the CGPA, that is the grade point average, cumulative grade point average of the student. But there are some attributes that we asked the students for. Let me spend a couple of minutes on these attributes, why they are important. If you want faithful reflection of the impact of your teaching, then the feedback should be collected anonymously; that is the person who is doing the feedback should not be identified because only then the person feels free to give his or her accurate feelings.

On the other hand there is another issue here. Supposing you have a class which is mixed for example, there are certain classes which are interdisciplinary where you have teachers from different disciplines. So, for instance you can have a course on basics of

electrical engineering given to all students of an engineering college where you have students from electrical engineering background or discipline as well as students from let us say, metallurgy and biotechnology, civil engineering and so on. Now, it can happen that an electrical engineering student may take more interest in a course related to electrical engineering than a student from say biotechnology or metallurgy. Also therefore, the problems faced by the different groups of students may be different. Therefore, unless you identify the group that is giving the feedback in a mix class, it may be difficult for you to interpret the feedback. For example suppose some students write that they are finding the course difficult in a mixed class.

Now, if you knew the attributes of the students. For example, you knew that they are from let us say, metallurgy department or civil engineering department. I am talking about a course in electrical engineering. I am not saying that metallurgy or you know biotechnology students will always have some problem, I am saying that considering a course related to electrical engineering, basics of electrical engineering being important to all of them, all the students. So, if you knew the attributes, then you can do something too is the situation, you can have some separate sessions for those students who are facing the difficulty. So, that is why in order to locate the cause of the problem correctly, we asked for some attributes.

So, here for example, in this slide, I have gave B.Tech, M.Tech because there are some courses we teach in IIT where both B.Tech students and M.Tech students are together. So, you have to see your own class composition and you can put the appropriate attributes below. Now, let me come to the CGPA, the grade point average, how this can be useful. Now, let me tell you my own experience about this. So, when I have been teaching large classes, I have got in the feedback some students saying that you are going very fast. So, let me give you some numbers in a class of 90 say I may get about 8 to 9 students saying that you know you are going very fast. On the other hand, I also get in the same class a feedback saying that, about another 10 students saying that you are going slow you can speed up.

Now, I used to feel that you know the students who are high ranking in the class right, whose CGPA is high may be finding that I should cover more portions and you know I am going slow and there may be some students you know whose CGPA is very low, who are repeaters, these are the students who may be feeling that I am going very fast. But I

was surprised when I actually collected this feedback wherein I asked the students to give their grade point average. I found there is no correlation between the grade point average and their saying that I am going fast or slow. In other words, I had very high ranking students saying that I am going fast and I had very low ranking student saying that I am going slow.

So, it removed my misconception that the perception of the student about the pace of the lectures depends on their performance, academic performance right, it is not. So, you cannot just conclude ad hoc fashion. In other words, this is really important that when you collect the feedback, we should collect it properly so that we get an accurate picture and we are not left with misconceptions about the impact of my lectures.

I am going back to the previous feedback on slips where I ask the students what they like on one side and scope for improvement on other side. What time of the course can we do this feedback session? So, I suggest that this distribution of the slips, collecting feedback on the slips can be done somewhere around 3 weeks into the course. And I encourage that this feedback be taken during the early parts of the course so that the students will you motivated to give you feedback because they feel that if they give you feedback and you make corrections in your teaching, then they will you benefited in the rest of the course. So, you can also collect it towards the end of the course, but then when you collect the feedback towards the end of the course, you can only implement it for the next set of students, not for the same students whom you have taught.

So, you can collect the feedback twice in the course. I encourage you to do that. First time into the 3 weeks, so after 3 weeks of starting of the course you collect this feedback from the students and then you can do it again at the end of the course and you can in fact, then compare the two feedbacks to see whether things have changed.