

## DIMENSIONS OF EFFECTIVE TEACHING

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At the outset it may be stated that effective teaching is not solely dependent on teachers. Students also have responsibilities to learn. While the student's responsibilities are individual and personal, the teachers' responsibilities are collective and professional. The present discussion is subject to this proviso.

The three fundamental dimensions which form the reference axes for measuring teaching excellence were presented in an earlier paper<sup>1</sup>. These dimensions are analytically distinct and mutually exclusive, and they fix the co-ordinates of a teacher in a 3-D references frame. The values of the co-ordinates can be determined from performance appraisal of the teacher by students, by peers and by department heads. These dimensions are restated below :

1. Knowledge
2. Projection
3. Rapport.

While these dimensions were briefly dealt with earlier<sup>1</sup>, they are further amplified here with examples and research findings.

### 1. KNOWLEDGE :

A teacher who has critical insight into his subject knows the ramifications of all key assumptions leading to a

derivation.

Suppose the teacher says that here is a case of a 2- dimensional laminar flow of a Newtonian Fluid. When he says 2- dimensional, he knows the complexity brought in by the 3rd dimension, the end effects and the edge effects. When he says laminar flow, he knows the effects of turbulence and when he says Newtonian Fluid, he knows the engineering situations in which a pseudoplastic fluid will defy this theory.

Suppose the teacher says that hysteresis and backlash are neglected, he knows that hysteresis motors with a gear train need a different treatment.

When he teaches that hysteresis loss =  $n^B m^{1.6}$ , he not only knows that there were classical papers giving 1.6, 1.65, 1.7 etc. as empirical indices and that there is no particular sanctity for 1.6; but he may perhaps remember that Steinmetz landed at New York harbour as a penniless refugee and worked his way up until he became President of AIEE and that one of the landmarks in his career was the discovery of this formula =  $n^B m^{1.6}$  where is known as Steinmetz coefficient. He may also remember that the International Conference on SI units at Vienna debated a lot whether the unit of flux

density should be called one Tesla or one Steinmetz. Such was the importance of the man behind this formula.

So the upper reaches of the subject must be clear to a teacher, even if he is teaching only a first year class; even if he teaches only elementary theory. You may ask why? Why should a teacher know more than what he has to teach?

One cannot understand even the rudiments of an important subject without knowing its higher levels.

We teach the second or third semester students that a circular wire, infinitely thin, carrying 1 ampere produces a maximum field strength at the centre  $H = 1/2a$ . An extremely simple fundamental concept. But suppose a student wishes to know what is the field strength at the circumference? Is it zero? It may be interesting to know that  $H = \infty$  at the circumference and it requires a Hankle Transform to prove that. And then we suddenly face a paradox, that if  $H = \infty$  at the circumference, the total flux coming out of the circular wire is infinite, leading to infinite inductance. How do we resolve the paradox? The danger started when we assumed the wire to be infinitely thin. Such are the allegators lurking beneath the placid waters of an elementary theory. A teacher should therefore know much more than what he has to teach.

Hight<sup>2</sup> says that a teacher must enrich his knowledge to keep his teaching alive and exciting and to prevent his mind from falling into the disease of authority and age, which is paralysis. Ask anybody outside the profession what he thinks are the principal defects of teachers. He will

give you two. One is impractically, "being too academic". The second is 'teaching the same old stuff year after year'. This is a statistical finding, Many teachers do not even try to handle an interdisciplinary subject or for that matter a new subject. After the first few years, they rest on their oars, using the acquired momentum, apply no more energy and gradually slow down to a stop. They drift from month to month, from year to year, on the little breezes and ripples of daily routine without setting their course and pulling steadily at the oars. They become like oxen harnessed to the millstone, plodding round and round the same circle day after day. By middle age, they have a sense of lost opportunity, and they have earned it. Some of them become cynical, bored, burnt out. They are called 'burnt out' teachers. As Claxton<sup>3</sup> explains they are sarcastic to the students and disparaging about almost everything. They snipe at the players from the safety of the sidelines. If a new experiment fails, they will simply say 'I told you so'. If the experiment succeeds, they are implicitly reminded of the low standards for which they have settled. So young teachers are usually warned not to be influenced by burnt-out teachers.

A vigilant teacher will not allow his teaching to petrify by neglect. Even if he teaches elementary French, he will look up French art, French history and French civilization, see every available French film, learn to enjoy a Marseills accent, try to stage a Molliere play or translate Balzac into the local language or attend a summer programme at Alliance Francise. And

in the next semester he is brimming with enthusiasm and his enthusiasm becomes infectious. A good teacher is an interesting person with a wide range of interests.

Curriculum planners would know that when several subjects are introduced in the same semester, certain subjects may help each other and create confusion. eg. COBOL and PASCAL introduced simultaneously is liable to create confusion, while English literature and English history tend to reinforce each other. Mills<sup>4</sup> gives the example of A. C. and D. C. machines being taught in alternate periods creating confusion, while Unix and Care reinforcing the proficiency of the student, as shown in Figs. 1 and 2.

## 2. Projection :

The word 'Lecture' is derived from the Latin 'lectare' meaning 'to read aloud'. Lectures consisted of an oral reading of a text followed by a commentary.

We can probably recollect some old teachers who used to read aloud from a note book or who used to simply write on the blackboard without speaking a word of explanation. Stimulation was conspicuous by its absence. But today, unless the teacher has a lot of salesmanship in the classroom, his survival as an effective teacher is uncertain. So, effective teaching involves some marketing management of his commodity which is his knowledge. Hence the lecture must be stimulating. When does the attention of students start attenuating? Attention fluctuates throughout an one-hour lecture. Research has shown that after the first 20 minutes there is a marked decline in attention, followed

by a peak of attention just before the lecture ends, as shown by Fig. 3. This decline after 20 minutes is less likely to occur if the lecture includes a short group discussion or a simple problem-solving to break the monotony of the lecture.

Further a lecture has to be well-structured. A lecture must be seen as a well-articulated structure of thought, as a geologist sees interlocking layers of clay, sand, water and igneous rocks beneath the landscape.

Research has also identified 4 levels of listening :

1. Skim listening
2. Survey listening
3. Search listening
4. Study listening

Teachers may find this concept worth examining further.

A classroom is a vivid kaleidoscope of multiple perceptions and multiple apperceptions. Lowman<sup>5</sup> states that the college classrooms are fundamentally dramatic arenas with teacher as the focal point just as an actor on the centre stage. The difference also was pointed out<sup>1</sup> that actors do not make eye-contact with the audience, while eye-contact is essential for a teacher. Without eye-contact there is very little communication. Arthur Conan Doyle introduces a speaker by name Prof. Murray chairing an important meeting. Conan Doyle says " Prof. Murray made several profound remarks to his black tie and to the paper-weight on the table, with a humourous aside to the window curtain." A teacher should not take Prof. Murray as his deal.

Moreover in a learning situation, there is always a proper sequence.

Suppose a teacher introduces the concept of hoop stress ( circumferential tension in a ring due to radial force). He may start by saying that hoop stress is the stress experienced by a man who loosens his belt after a heavy meal. So he first gives an example and then proceeds to the theory. He proceeds, from the known to the unknown from the concrete to the abstract from the particular to the general from the simple to the complex from observations to reasoning . Mills <sup>4</sup> says that this is the golden rule.

A teacher must also give a feedback to the students about their performance. Students work better if they know the results of their performance, even if the results are below their expectations. Fig. 4 shows, two groups of students set to do 10 mental multiplications. Group A was continuously informed of their results and each time they were encouraged to beat their previous score. Group B was not told of their results. After each group had 10 attempts, the conditions were reversed. Group B was informed of their results and Group A was not informed. The effect of feedback is conspicuous.

What are the factors which differentiate 'good explaining' from 'poor explaining' ? George Brown<sup>6</sup> summarises the investigation of Gage and his associates and gives the following factors :

"Emphatic gestures and movements;  
Relatively short simple sentences;  
Use of appropriate pauses;  
Employing the black board to indicate the essential points ;  
Varying the speed of delivery ;

Making some friendly personal references ;

Using task - orientation statements such as

'Now, let us closely look at...etc;

Contains high proportion of nouns rather

than pronouns such as it or 'they';

Does not use vague phrases such as '

'sort of 'not very ', ' pretty much'. and so on',

'Well - er- all this can ....etc.;

Contains sign posts such as ' there are 3 main areas,

First.... second.....third.....etc;

George Brown<sup>6</sup> also quotes from the work of Ryan, the three sets of characteristics valued by students :

1. Interest and enthusiasm
2. Warmth
3. Systematic and businesslike behaviour.

Interest and enthusiasm are conveyed through the face, the voice, the hands, movement and stillness, and silence. The face must be seen, the voice must be heard and silence must be observed. All these are part of the fascinating topic of bodily communications which Argyle<sup>7</sup> and his co- workers have promoted. If we analyse a boring lecture, we find, that the non- verbal cues were few, the lecture rarely changed his facial expression, there were no gestures and often a surfeit of ums, and ers; that he rarely moved and if he did, it was with resignation; and that he spoke in a chill, flat, monotonous voice.

To be listened to, one has to be heard, Audibility is often lost by slurring, swallowing or chipping words. Speakers in English usually drop their voices at the end of the sentences and a crucial

No.	Value	Explanation	Finding
1.	Economic	Business- minded, practical utilitarian, oriented towards useful and pragamatic things,	Engineering and Law students score high. The humanities student is least practical and least business minded.
2.	Aesthetic	Evaluates in terms of symmetry fitness and grace; values, form and harmony, individualistic and appreciative of beauty.	All are more or less equal at the young age.
3.	Social	Kind, sympathetic, unselfish humanitarian, philanthropic altruistic.	Law and engineering students score equally low.
4.	Political	Interested in personal power, leadership, influence and renown, competetive	Law student has highest score.
5.	Religious	Mystical, seeks to understand cosmos as a whole, values unity, seeks the highest psychic experience.	Engineering students score lowest.

point may go unheard. Beginners tend to speak much too quickly. Silence is an important device for gaining attention. If you suddenly stop at the middle of a sentence, people look up to see what has happend. New lecturers tend to be afraid of pauses and silences and rush to fill them with extra statements or questions. More experienced lecturers use silence to gain and hold attention.

### 3. Rapport :

When we discuss teachers' rapport and empathy with the students, we may

as well bear in mind that engineering students are quite friendly and it is therefore easier to establish rapport with them than with say, students of humanities. George Mathew's<sup>8</sup> research on the values and temperaments of college students gives several findings. He conducted a survey of the following values among others and obtained the corresponding findings as shown in Fig. 5.

Out of the temperament survey conducted by George Mathew, only

two temperaments are shown in Fig. 6; viz., objective and friendly. The figure is self-explanatory. The medical and engineering students are the most friendly and hence establishing rapport with them is not a difficult task for a good teacher.

Every profession has its atmosphere, its setting, its milieu and those who practice it, must feel at home there. If we enter into journalism, we must like the din and bustle of a large noisy office, we must be prepared to travel, and expect the unexpected, for the rest of our life. If we are obstetricians, we must be prepared to attend to a delivery and perform a Caesarian any hour of the day throughout our career. If we are to be good teachers, we must welcome the prospect, of facing the young in large groups as Highet<sup>2</sup> rightly puts it. We must know the name and faces of our students. Some teachers find it easy, some find it difficult; but it is a must. We may recall James Hilton's famous Novel "Goodbye Mr. Chips." Several years after retirement, good old Chips still repeats the roll call of his students in alphabetical order.

But as Highet<sup>2</sup> says it is not necessary to know the minute details of the individual students. It is enough to recognise the particular type or traits or combination of types in each individual. If a doctor examines a sick man, he does not itemise the details of his individuality. The facts that the patient is a rotarian, who enjoys chess and bird watching do not interest him. He sees a case of lobar pneumonia in a man of fifty with normal B. P. and a history of respiratory infections, but poor metabolism. The combination of these factors is his problem. Of course, if the

patient also has individual attributes which are relevant e.g. if he is a Pentecost and believes that lobar Pneumonia is only mental delusion, the doctor takes that also into account. But the success depends on the penetration with which you generalise the frame of mind of the individual student.

A further quality of the teacher which effects his attitude and rapport is kindness. It is very difficult to teach without kindness. And the kindness must be genuine. Students of all ages from nursery school children to graduate students can easily and quickly detect the teacher who dislikes them. There is a Reciprocity theorem here. Research has shown that personal attitudes produce reciprocal attitudes in others. If a teacher dislikes his students, in due course the students will become less friendly towards him.

If I may quote from 'Goodbye, Mr. Chips', once again, as Mr. Chips lay dying at the ripe old age 85, somebody said, "It is a pity that he never had any children". Chips opened his eyes and said, "I heard somebody say it is a pity I never had children. But I have, you know, I have. Thousands of them. And all boys." The poignancy of the feeling behind those words need not be explained.

Still a teacher may dislike some students, it is difficult not to do so. There are arrogant boys so cocksure of themselves and planted agents of outside agencies and even antisocial elements. But many of them are victims of colliding forces and like sick people they do not understand the fevers burning in them and the conflicts tearing them apart. Similarly, social differences and class distinction can

increase their resentment. In a slum school, students hate teacher who looks middle class. All over the world, this is a central problem of education. A teacher may feel that he is projecting warmth towards the students while the students may feel that it is patronising behaviour by a person from a different social class, with whom they cannot identify. So in spite of all the best teaching and all the kindness and warmth, there will still be a few wrecks and renegades in the end product. History says that Nero was taught by the best philosopher of the day, Seneca, the most accomplished teacher of the times; Nero got the best education in moral philosophy. But in due course he executed his wife and his mother indulged in debauchery and ruined the Roman empire.

Given below are two common problems which teachers have to deal with occasionally.

#### Case I : The Silent Student

For the past four weeks, you have had a student in your tutorial group who has never spoken. Even when you have asked her a simple, direct question you have received only a monosyllabic answer, a grunt or silence.

Today you tried again. You asked a question, the student answered your question at length. Unfortunately the answer was wrong.

What do you do next ?

#### Case II : The Aggressive Student

You have just begun an important session with a relatively new group of students. Suddenly one of them leans forward and says angrily : 'I am sick of these bloody sessions. In fact I am disgusted with the whole course. When are we going to get down to something useful ?'

What do you do and say in the next few minutes ?

Dealing with case I, it may be stated that students who are mostly in need of special attention are usually shy or bashful. They take time to draw near and feel comfortable. Now the silent student has finally spoken. But unfortunately the answer was foolish. Will you snub him/ her ? Fig. 7 shows the effect of praising and snubbing given by Mills<sup>4</sup>.

Group A was praised for all satisfactory work and were not given any reproof or snubbing or scolding.

Group B was always snubbed or reproofed.

Group C was ignored and isolated. Neither praise nor reproof.

Group B showed that scolding had some initial effect, but soon it became ineffective. Scolding had the worst effect (the most deleterious effect) on the best students.

Case II deals with the aggressive student. He is disgusted with the whole course. He asks why don't you teach me something useful ?

That takes us to the important question of relevance. The teacher must add a sense of purpose. What is the relevance of this knowledge ? If the students have a destination in their minds, they will work better and more intelligently. It is just like in advertising. An advertiser's chief difficulty is to show the relevance of his product. e.g. How on earth can he persuade millions of people that their lives depend on the use of a particular brand of tooth paste ? He solves it partially by association. He says "..... contains the new magic ingredient of cinnamon which brings the boy and girl together". That makes

the product relevant, to life.

Even when we teach an age- old subject like Electrical Machinery, we may refer to levitation and modern high speed transportation systems, the microsuns, torquers and stepper motors in avionics, rocketry and satellites; the subject becomes relevant to the future of the students.

Hight<sup>2</sup> describes an old Professor in the Yale University (in 1883) who used to teach Greek Poetry especially Book I of Iliad, 3 hours a week for a whole year. He never said who Homer was, when and where Homer lived, what was the culture of Greece in those days, what was the general plan of the epic. He just started from line 1 on the first day and went on in a monotonous tone, period after period, throughout the year and in the last class he came to line 611 and said without any emphasis, "The poems of Homer are the greatest ever written by man : class is dismissed". It was just like Alice in Wonderland. When the White Rabbit was presenting evidence in the Knave's trial, he asked the King for directions. Gravely the King replied, " Begin at the beginning and go on till you come to the end and then stop ". So the Professor began at the beginning, covered the syllabus and went out into the sunshine. The relevance of a great epic like Iliad was forgotten.

So it is quite natural that a student wonders about the relevance of a subject. After the Vietnam war, some of the young conscripts who returned to classrooms in the U. S. A. used to ask " Will this subject help me to get a cup of

coffee ?" So relevance is necessary for motivation as well as for rapport.

#### CONCLUSION

The three fundamental dimensions of teaching excellence which fix the coordinates of a teacher in a 3-D reference frame and which were defined and detailed in an earlier paper<sup>1</sup>, are further amplified here with examples and research findings.

#### REFERENCES :

1. Pillai, K.P.P. 'Diagnostics of Teaching Excellence', The Indian Journal of Technical Education, Jan- June 1990, Vol. 13, No.1 PP. 7-12 and The Journal of Engineering Education April 1994 Vol. 7, No. 4.
2. Gilbert Hight, 'The Art of Teaching' (book), Methuen and Co. London, 1974.
3. Guy Claxton, 'Being a Teacher' (book), Cassell Educational Ltd., London, 1989.
4. Mills, H.R. (Teaching and Training' ( book), The Mac Millan Press Ltd., London, 1977
5. Joseph, Lowman, 'Mastering the Techniques of Teaching' (book), Jossey- Bass Publications, London, 1985.
6. George Brown, ' Lecturing and Explaining', (Book) Methuen and Co. Ltd., London, 1978.
7. Argyle, ' Bodily Communication' (book) , Methuen and Co. Ltd. London, 1975.
8. George. V. Mathew, ' Personality Patterns of College Students Specialising in Different Fields', Ph. D. Thesis, University of Kerala, 1971.