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Six Ways to Discourage Learning

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Intro

One way to improve your teaching is to become aware of very common things teachers often do which *don't* help the learning process, and avoid them! This usually takes some practice, and discussion with others who teach. Six of these behaviors you should note and avoid are:

- **Insufficient "Wait-Time"**
- **The Rapid-Reward**
- **The Programmed Answer**
- **Non-Specific Feedback Questions** ("Does anyone have any questions?)
- **Teacher's Ego-stroking and Classroom Climate**
- **Fixation at a low-level of Questioning**
- **Conclusion**

Insufficient "Wait-Time"

"Wait-time" is the amount of time after an initial question has been posed before the teacher answers it him or herself; repeats, rephrases, or adds further information to the question; or accepts an answer from a student. More than just a few seconds are a necessary prerequisite for mental information-processing (Rowe, 1974). When the teacher becomes a non-stop talker, students have no chance to think over what is being said, to formulate intelligent responses, or to ask for clarification?

Mental information-processing may be accompanied by verbal analyses or proceed in silence. It is essential to provide quiet-time for thinking as well as opportunities for verbal responses.

Students who note that the instructor answers a preponderance of his own questions without waiting for a response soon grow dependent upon the teacher to do their thinking for them. In like manner, an answer too rapidly accepted has the effect of cutting off further information-processing and analysis by the rest of the class. We may attest verbally to our aim of encouraging independent thinkers, but unless we consciously work to expand our wait-time, we will have rhetoric with little resultant change in behavior.

Rowe (1974) reported that when teachers were trained to increase their wait-time from **one** second to **3-5** seconds several changes occurred in students' behaviors: length and number of unsolicited but appropriate responses increased; failures to respond decreased; and the incidence of student-to student comparisons of data increased. Instructors who are interested in repeating this experiment in their own classrooms can measure their wait-times ("one, one-thousand, two, one-thousand," etc.) and then deliberately expand these periods of silence-for-thinking both after a question is posed and after an answer has been given. Sharing the concept of wait-time for thinking with the students often enables the teacher to maximize his efforts and gives the class an insight into learning skills.

The Rapid-Reward

What is the effect on students' processing of information and analysis of data when an instructor says to the first respondent to his question: "Right, good?" As if to assure that further thinking will be terminated, the teacher either proceeds to re-word, repeat, and exemplify the answer, or goes on to the next topic. Learning is a highly individual-istic process, and people learn at different rates and in varying ways (e.g. Gardiner, 1995). Rapid acceptance of a correct answer favors the faster thinker/speaker who has completed his thought processes; those in mid-thought are terminated prematurely.

A variation on this theme is the softly-voiced, hesitant answer of the student seated nearest the instructor. Because many students commonly respond softly to the teacher if he or she is within close proximity, an awareness

of the consequences of this behavior is crucial. Many a student seated out of earshot has become frustrated, bewildered, or lost interest when a softly-voiced, difficult-to-hear answer is rapidly rewarded. To ameliorate this situation, repeat softly-voiced answers, then encourage student-to-student dialogue, discussion, and peer critiquing of each other. This can be done with a questioning glance around at other students tacitly requesting comment and a direct question to other students, "What is your analysis of what was just said?" Physical movement of the teacher from place to place about the room in order that as many students as possible enjoy close proximity to the instructor at one time or another during the class helps as well. These are very effective strategies which can involve many more students. You will have a much easier time using them if you do so from the start of the term. If the students get used to the idea that you will answer your own questions if they remain silent long enough, they often will do so!

The Programmed Answer

The following are examples taken from classroom dialogues which exemplify this third pattern:

1. "Why doesn't the moon have an atmosphere? It has very weak gravity,doesn't it?
2. "What reasons do you have to use that formula? Was it suggested in the homework chapter? Had you ever used it before? Or seen it used in this context?"
3. "What happens when we add the sums of the rows? Do we get skewed results?"

The programmed answer not only deprives the respondent from expressing his own thoughts by steering him towards the answers that the questioner expects, but also conveys the message that there is really little interest in what he thinks or says. While the reasons offered by those who make a practice of this pattern are usually altruistic (i.e., "Silence after the posing of a question is embarrassing to the student;" "I feel impelled to help out by suggesting clues"), one needs to ask himself honestly: "Is it I or the student who is uncomfortable after a second or two of silence;" "Do I have confidence in the students' ability to think about the question and formulate a response?" and, more importantly, "Am I interested in what the student has to say or in determining which of *my* answers he prefers?" While programming can be an effective tool when one desires to guide students' thinking, suggest possibilities, or model logical thought processes, it is important to be aware of its limiting effect in opening up a wide variety of possible ideas. It is via the latter route by which an instructor can demonstrate his interest in the students' ideas and himself model inquisitive learning behavior. A willingness to listen helps to create in the classroom a community of learners.

Non-Specific Feedback Questions ("Does anyone have any questions?")

Many instructors feel justified in assuming that their students have no questions if no one responds when they ask, "Are there any questions? Do you all understand?" Purportedly designed to give the instructor information as to the clarity and comprehensibility of his presentation, these questions usually fail to solicit feedback. Why? We can isolate several possibilities, two of which are the nature of students and the nature of the questions.

What type of student will (bravely) call attention to his own ignorance when the question is posed to a class: "Does everyone understand?" Interestingly enough, it was a student who suggested that those who do respond comprehend most of the concept, lesson, problem, etc. and need only a minor point made clear. Others, whose lack of understanding is more comprehensive, whose confusion is more widespread, may be too intimidated to call attention in such a public way to their situations. Often the latter are so confused that they cannot think of questions to ask. Undoubtedly many students look around, see no hands raised, and conclude that they are the only one who doesn't understand. How can we determine what it is that students do and do not understand?

Contrast the following pairs of questions:

1. "Does anybody have any questions?"
2. "Let's think of some other examples now of situations in which this principle is applicable."

1. "Does everybody see how I got this answer?"
2. "Why did I substitute the value of 0 in this part of the equation?

1. "Who wants me to go over this explanation again?"
2. "What conclusions can we generalize from this specific graph?"

The teacher needs to ask him or herself, "What is it important for the students to say or do in order that I be able to determine the extent of their understanding?" Then formulate and pose one or several *specific* questions which will give a more comprehensive sounding of the class' problems and questions. If you put yourself in a situation where silence indicates "no problems," you probably will not accurately discover the extent of your

students understanding.

The Teacher's Ego-stroking and Classroom Climate

Think of the effects on students' willingness to respond to teacher-posed questions when statements such as the following are made:

1. "Since I have explained this several times already, you all should know what is the effect of an increasing epsilon with other variables held constant.
2. It is trivial to show....
3. (After having listened to several students' answers) "The *real* answer is this: ....
4. "Does everybody understand the explanation I just gave? It should be clear by now."

Students need to feel that it is psychologically "safe" to participate, to try out ideas, to be wrong as well as right. *This is a very important concept.* If a student figures something out on their own, even with hints, it is much more likely that they will remember it than if you simply tell them. This does take more time and patience on your part, and part of becoming a good, experienced teacher is learning how much to "tell" and how much to let student's discover on their own. This also depends on what you think is most important to teach, which is something you should think carefully about before beginning to teach a class. This may depend whether the class is for majors or non-science students. In the latter case, you may decide that problem solving skills and understanding of the scientific method and appreciation of how astronomy is done are more important to teach than a long list of content items. In that case you will cover less, and encourage the students to be more active. In other cases you may need to hurry them along.

The teacher's behavior is a most important determinant in the establishment of a safe or comfortable climate. Learning, an active process, requires that the learner interact with ideas and materials. Constant teacher-talk, feeling compelled to comment on each student idea, deciding to be the final arbiter in decision-making processes, interrupting, controlling, intimidating either through expertise, or the threat of grades -- these are but some of the behaviors which prevent students from engaging in the active processes needed for significant (as distinguished from "rote") learning to take place. It is interesting to note the increased levels of student participation when instructors do not conceal the fact of their ignorance; when they sometimes hesitate about certain questions or information; when their responses are dictated more by an honest desire to assist the students than to demonstrate the extent of their own knowledge.

A few of the possible behaviors which can encourage the establishment of an environment conducive to participation are the teacher's remembering and referring to students' ideas, yielding to class members during a discussion, acknowledging his or her own fallibility, framing open-ended questions which provide for expressions of opinion and personal interpretations of data, accepting the students' right to wrong as well as right, encouraging joint determinations of goals and procedures when feasible (i.e., "How can I help you best to learn this material?"), sharing the responsibility for learning with the learners (i.e., permitting students to answer their peers' questions; freeing oneself from the burden of thinking that what isn't covered in class, the students cannot learn elsewhere; encouraging group presentations of the material to be covered, etc.) soliciting student participation in their own learning evaluation such as feed-in of test questions and joint correction of examinations.

Fixation at a low-level of Questioning

Bloom (1956) and successors have postulated that cognition operates on ascending levels of complexity. One begins with knowledge, or informational details, and moves upward through comprehension, analysis, and synthesis to evaluation. Questioning can be a central feature in promoting the development of conceptual abilities, analytical techniques, and the synthesis of ideas.

Skillful teachers use questions to guide thinking as well as test of comprehension. Too often, however, as illustrated by this sixth recurring pattern. teachers' questions become fixated at the informational level, requiring of students only that they recall bits and pieces of rote-memorized data: information-level questions. For example:

1. What is the formula for finding the force between two charges?
2. What is the definition of "Roche lobe?"

One word or short-phrase answers, those capable of being sung out in unison, constitute the preponderance of question-and-answer dialogues in many classrooms and necessitate little interrelating of material, sequencing of thoughts, analyzing of data. While a solid base of factual information in learning is clearly important, fixating students' thinking at this level discourages the development of the more complex intellectual skills. Questions such as given below encourage the students to

use informational knowledge in order to analyze concepts, synthesize complex relationships, and evaluate the new data: "What would happen if we inserted a metal conductor in between the moving charge and the current?"

Being conscious of the levels of questions one is asking and attempting to structure the questions towards analysis, synthesis, and evaluation can do much to combat a fixation at the informational-level of thinking.

Conclusion

If asked to formulate the goals of the educational process, most teachers would probably include the nourishment of intellectual curiosity, encouragement of independent learners, development of people able to engage in the more complex thinking processes, as well as knowledge of certain contents. Yet instructors "behaviors" such as the six described above work against the achievement of these goals. Now you know about them! Keep talking about these things and you'll continue to get better. Teaching can be improved like any other skill, and it was fascinating to me when I first learned how much research and data has been accumulated about what works and what doesn't in teaching. Being scientists, we ought to use the data which relates to our own teaching of science.

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