IDEAS FOR CREATING AND OVERCOMING STUDENT SILENCES

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Fifty minutes of teacher talk with passive student listening is relatively ineffective in developing student learning. By creating silences, teachers can encourage productive, active, student learning. Likewise, by overcoming silences, students can change from passive listeners to active talkers/discussers of their learning.

In this paper we consider creating and overcoming silences. Ideas are given for creating silences for individual active activities and creating silences, via wait times, to provoke facilitated class discussion. Then suggestions are given on how to overcome student silence via peer discussion and on overcoming the silence between teacher and students. But first consider the research upon which these ideas are based.

1. RESEARCH BASIS FOR CREATING AND OVERCOMING SILENCES

The fundamental research for creating and overcoming silences is extensive and is related to Chickering and Gamson's[1] summary of seven features to improve learning, Ramsden's[2] research on developing deep learning, and the concept of 20-minute student attention spans.[4-7, 9-12]

Chickering and Gamson[1] suggest that the seven ideas to improve student learning are: 1) prefer active to passive; 2) prefer cooperation to competition; 3) use clear time-on-task; 4) expect success; 5) have good teacher-student interaction; 6) provide prompt feedback; and 7) account for individual student-learning preferences. Ramsden's[2] research suggests that deep learning is promoted by good teaching, clear goals and standards of assessment, an emphasis on student independence, a social climate fostering good relationships among the students, openness to students, and vocational relevance, while negative impact results from a heavy workload and a large amount of formal lecturing without freedom for individual or group study. Hake's[3] research—comparing the performance on standardized, validated tests of 6,000 first-

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year physics students, some of whom received interactive engagement activities in class vs. some that received traditional lecture—showed that students who received interactive-engagement learned twice as much as those receiving traditional lectures.

After 20 minutes of teacher talk, boredom sets in, and student recall of information presented after 20 minutes is greatly reduced.[4-7, 9-12] Indeed, Liebman[13] suggests that the attention span is as low as 8 to 10 minutes. McKeachie[14] reports that immediately after 50 minutes of straight teacher talk, students can recall about 70% of the content presented in the first 10 minutes but only 20% of the content in the last 10 minutes. To overcome this and to improve student learning, after 10 to 20 minutes of teacher talk, instructors can introduce activities to engage students actively in the learning process. Prince[15] reviews such options. Two ideas for active learning that are the focus in this paper are, 1) to use silence for individual student activity related to their learning; and 2) for the teacher to remain silent and allow wait time and then facilitate class discussion. Such activities also apply some of the Chickering-Gamson[1] principles to improve learning: using active instead of passive, using cooperation instead of competition, providing prompt feedback, and providing clear time-on-task.

Ramsden's[2] research has shown the importance of the social climate in the class on the development of deep learning. Ideas presented in this paper address how to develop a strong social climate in class and how to improve the quality of teacher-student interaction.

In section 2, we consider how to create silences for individual work. In section 3, we explore creating silences, or wait times, as a prelude to full class discussion. Then in section 4, ideas are given for overcoming student silences via peer activities and, in section 5, overcoming silences between teacher and students. Finally, in section 6, a measure of the effectiveness of these approaches is given. Each is considered in turn.

2. CREATING SILENCES FOR INDIVIDUAL WORK

After 20 minutes of teacher talk, instructors can create silences by asking students to do individual work such as writing reflections (section 2.1), solving a problem (section 2.2), or answering a test question (section 2.3).

2.1 Writing reflections

A **reflection** is a comment about what has been experienced in the past: knowledge, attitudes, feelings, or reactions to what was done or felt. The reflection could be free writing, prompted free writing, or perhaps a structured checklist. Here are some example details about the format and the timing.

Format: For prompted free writing, provide lined worksheets that have a title and a place for name and date. Table 1 is an example. This may include a prompt that can be given verbally or can be written on the form. Example prompts include:

"I discovered...", "The most important idea was . . . ," "The most interesting idea was . . . ," "Now I realize that . . .". The prompts could stimulate: a comparison of the present experience to past experience (corresponding to revised Bloom's cognitive taxonomy level 2 understand)[15, 16]; an evaluation of the experience (revised Bloom's level 5); a creation of something new based on the integration of past and present experience (revised Bloom's level 6[16]); or attitudinal comments and change (Krathwohl's attitudinal taxonomy level 4[17]). As a side note, for the cognitive domain, Bloom, *et al.*,[15] published a taxonomy or structured list representing increasing level of difficulty in learning in the cognitive domain. This has been revised by Anderson, *et al.*[16] Such a classification is extremely helpful in analyzing the degree of difficulty expected in a task. For example, on an exam students should be given a chance to demonstrate an ability to do tasks of varying levels, rather than assigning only tasks at Bloom's level 6. Similarly, students can use such a taxonomy to monitor their growth. For the affective domain, a similar taxonomy has been developed.[17]

A further example of a prompted format, applying Bloom's level 5 evaluate, is a listing of the topics plus a rating for each. An example is given in Table 2.

Another example of a prompted format (that combines Bloom's levels 2, 3, and 4—understand, apply, and analyze) is Larkin's checklist format in the context of physics.[18] In this example, the reflective tasks

TABLE 1
Example Reflections

Reflection	Name _____	Date _____
"Now I realize that . . . I need to study the text before I come to class. I thought I could pick up most of the ideas from lectures but in this course I need to come to class prepared."		
Reflection	Name _____	Date _____
"I discovered that . . . you can't push on a rope. This sounds simple, but I now realize this really helps me to solve pulley problems."		

are to write down an equation, and then, for each symbol, identify its kind (number, vector, tensor), the sign and direction, the units, the typical magnitude, and the meaning in words. Students are also asked to compare each concept with other similar quantities with which it might be confused.

Timing: two to three minutes; be specific:

> *"Please take out the reflection worksheet and write reflections for the next two minutes. For this reflection, please use the prompt 'I discovered.' Any questions? OK, time is running. Quiet please."*

2.2 Individual problem solving

Individuals are asked to solve a simplified problem. Usually we design the problem to test the student's comprehension of the most challenging parts of a concept. An example might be to plot, on log-probability paper, some particle-size data and determine the geometric average and geometric standard deviation. Instead of giving the students 50 data points, however, only two data points are given so that the task can be done within the allowed two minutes. The timing and instruction details are the same as for reflections, described above.

2.3 Individual response to test questions

An example of this approach is used by Mazur.[11] Instead of formally talking at the beginning of class time, Mazur posts reading that the students are expected to do before class. In the first activity each student is silently to solve multiple-choice questions. The time allowed is one minute. The test can be projected onto a screen.

All of the three examples listed require that the student silently does the task alone. What options are available to provide closure for this individual activity, or, is closure needed?

In our experience, closure is indeed needed. After any of these silent activities, three actions can be used.

A first action is to share the experience. Whenever students are given an individual task, we have found that most want to tell someone about the activity. Two options include: a) a leader summary where the teacher asks for feedback from the students and records ideas from students, which usually takes about 10 minutes of class time for a class of 30 because most students want to ensure that their ideas are noted by the instructor; b) ask students to *"Turn to a neighbor and say 'That was an interesting activity because . . .' and talk to your neighbor for the next 90 seconds. You need not share what you wrote. You may be more comfortable talking about the ease with which you did the task. Any questions? OK, noise level up."* For the problem-solving or test activity, the prompt might be *"Convince your neighbor that your answer is correct."* This provides prompt feedback to each because the instructor can a) provide the correct answer and then have further peer dialogue; b) collect responses to the questions (via clickers, or a show of hands) and then elaborate on the correct answer and the reasons why one might mistakenly select the other answers. In collecting the responses, do not stop after the "correct" answer has been received. Rather, continue with a prompt such as *"OK, we are collecting answers, what other answers are there to this?"* Or *"Are you sure we have all the possible answers here?"*

A second action is to follow this activity with applause. Applause helps to close the activity; applause suggests that this is a desired classroom activity, and encourages students to come prepared for class, and to do the individual activity

TABLE 2
Example Reflect-Rate Form

Rate the ideas	Already do this	Would work	Might work	Not my style
Create silences for individual reflections				
Create silences for individual activities				
Create wait times after posing questions				
Overcome silences for diad "Turn to a neighbor..."				
Overcome silences for diad TAPPS				
Overcome silences with small group activity				
Use ombudspersons				
Use written feedback at the end of each class				
Ask them to reflect in class				
Know the names of your students				
Overcome silences between you and students				
Other _____				
What conclusions do you draw from your responses?				

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to the best of their ability. Applause nurtures even the wrong answers being presented.

A third activity is to collect, mark, and return the written responses to the students or to ask them to use this as evidence in a weekly reflective journal in which they self-assess their learning journey. Suggestions about self assessment via reflective journals are given by Woods and Sheardown.[19]

Creating silent times for individual student activity is an excellent "active" addition to the classroom.

3. CREATING SILENCE TO NURTURE FACILITATED FULL-CLASS DISCUSSION

An approach to encourage active learning in the classroom is for the instructor to pose a question and solicit student response and a "lively discussion" from a "full class" of about 30 students. (If the class is larger than 30, then a large class—of say 200—can be divided into groups of about 30 so the instructor engages in discussion with one particular group at a time.)[20, 21] When an instructor poses a question to prompt classroom discussion, inevitably the students know that if they are silent, the instructor will answer his/her own question. To combat this, after a question has been posed, allow a silent wait time. How long is a wait time? The research evidence is not clear. Rowe's research[22, 23] identified a wait time of 1 second. Whitman and Schwenk[24] discuss using a wait time of 3 to 5 seconds. Woods, *et al.*,[9] talk of a wait time of 30 seconds. Gedalof[20] suggests 7 to 10 seconds. Huntsberger[25] distinguishes between a 3- to 7-second wait time (if the question is addressed to an individual) and a wait time of "several minutes" (if the question is asked to a group in general). Rogers[26] notes that an average wait time faculty allow is 2-3 seconds. Increasing wait times will significantly increase the number of student responses and Rogers says that the literature actually suggests 17 seconds as the optimal wait time. Rasmussen[21] recommends a wait time of 10 to 15 seconds. Whether the wait time is 1 or 30 seconds is not the issue. The importance is to recognize and cope effectively with the phenomena "as a question poser." Here are some options. Explain that often when a question is asked that the students know if they are silent that the teacher will rephrase the question or answer the question. One might say *"I really want you to think about and answer the questions I pose. There will be a silent wait time to give you a chance to create a response to the question. I really want to gather ideas from you."* Then, when an answer or response comes in, acknowledge it by writing it down and with applause. Continue gathering ideas beyond the right answer. Do not criticize the ideas when they come in. Gather the student's ideas. If no student response is given after a wait time of 20 to 30 seconds, then invoke *"Turn to a neighbor and say 'How would you respond to this question?' Noise level up for 2 minutes."* Then at the end of two minutes say *"Please share with us what you talked about."*

4. OVERCOMING STUDENT SILENCES TO USE STUDENT/STUDENT INTERACTION

An effective learning environment engages students actively in the learning, uses cooperation not competition, provides prompt feedback, and creates a good social climate. After 20 minutes of teacher talk or when the students seem confused or their eyes glaze over, ask pairs of students or small groups to talk. The talking should be on task. For diads a useful prompt is *"Turn to your neighbor and say . . .*

- *'Did you understand that?' "*
- *'Summarize what's happened so far.' "*
- *'Do you believe that?' "*
- *'The key point so far is . . .' "*
- *'A practical application of this stuff is . . .' "*
- *'Let's compare lecture notes that we have taken so far . . .' "*
- *'So what's that all about?' "*
- *'Please explain that to me in simple terms.' "*

Instead of using diads, a small group of three to five students could be used. The size is dictated mainly by the classroom configuration. If the students are unfamiliar with group discussion, the talking-stick approach can be used. An object, such as a stick, pen, or paper, is given to the speaker, who talks briefly and then passes the stick to the right so that, in turn, all have a chance to talk. If one prefers not to talk, they can pass. The ground rule is that only the person holding the stick can talk at a time.

Diads could also solve problems using the Whimbey Talk Aloud Pairs Problem Solving, or TAPPS. Here each person has a specific role. One person plays the role of the talker/problem solver: Verbalize thoughts, focus on being accurate (instead of rush! rush! time pressures), have clear communication so that others can follow and understand—this is the role of the talker/problem solver when given a written problem statement. The other person plays the role of the listener; his/her role is not to solve the problem, but to encourage verbalization, to encourage a focus on checking and double checking, and to ensure that he/she comprehends the other's approach. The listener is not to correct or make value judgments about the other's efforts. Typically this activity would last 5 to 15 minutes. Then, each should write out reflections about what he/she discovered. Brief diad discussion of the process is useful. Then, the people reverse roles. Feedback forms can be used to help each see how the roles are being played. More is given by Woods.[27]

5. OVERCOMING SILENCE BETWEEN INSTRUCTOR AND STUDENTS

Two basic ideas are given: how to break the silence to get feedback about the learning and how to establish connections with students to improve the social climate.

5.1 Overcoming silences to monitor the quality of the teaching and learning

Instruction is a two-way street. Teachers should seek feedback throughout the semester about the quality of the teaching/learning. Some options include the use of class ombudspersons, clickers, red cards, half-minute papers, and a wide variety of ideas given by Angelo and Cross.[28] Ombudspeople are a team of volunteers from the class who provide feedback to the instructor throughout the year about the quality of the teaching and learning. Clickers refers to a method to receive anonymous response to questions via audience response systems, referred to as clickers.[29] In red cards, each student is given a display card that they can hold up whenever they are confused. A half-minute paper asks students to anonymously respond to such questions as "What was the muddiest point in this class? What was the most important point?" The papers are then collected to provide feedback to the teacher about that particular class.

5.2 Overcoming silence between students and instructor to improve the social atmosphere

Here are ideas on how to improve the social atmosphere and to have quantity and quality time between faculty and students: know and call students by name; celebrate their successes; help them network with visitors to the department, including seminar speakers; critique their resumes; build trust and be willing to confidentially hear about their concerns and personal problems; personalize feedback on assignments; come early to class and stay late; take time to chat in the hall; walk with them between classes; attend events that they think are important and where you are comfortable (such as convocation and the iron ring ceremony for engineering students); create special events (such as a Christmas carol sing-song with a class band); invite them to your home; and be willing to share personal experiences, attitudes, and values. Invest time in explaining your role and their role in the teaching and learning process. This includes explanations in the course syllabus/outline and time spent in class explaining your choice of learning environment. Here is an example from a course syllabus:

> *The process of teaching and learning is a two-way street. I want you to do well and succeed in the course and in your career. Here is what you can expect from me: clear indication of the objectives, support and encouragement, sharing of experience, prompt feedback, respect and trust, response to your suggestions, and a caring environment in class. Here is what I expect from you: participation and success in all activities, feedback on how best I can help you, helping to create a caring environment in class, and respect and trust in me and your colleagues. In this class I use ombudspersons to provide input about how best I can create the best learning environment for you.*

In another example, there was a dramatic improvement in student performance in problem-based learning when up-front explanation and preparation time for this new learning environment was increased from two hours to six hours.[30]

In summary, many simple things can be done to break the silences between students and teacher.

6. EFFECTIVENESS OF THESE APPROACHES

We have used these approaches in our classes for the past 15 years. One measure of effectiveness is to compare the student response to the Course Perceptions Questionnaire (developed and validated by Ramsden[2]) for straight lecture-style courses vs. student response to our courses that use silences as described in this paper. For straight lecture-style courses the responses were 18 to 20 whereas for our courses the responses were 28 to 32. A larger number is desired.

7. SUMMARY

Silences can be created to allow individual students to actively engage in reflection and adaptation of new ideas. Silences, or wait times, should be created after a teacher poses a question to the class. Such wait times encourage students to participate in discussion instead of waiting for the teacher to answer his/her own question.

Silence between students can be overcome by using a variety of diad and small-group activities in class to actively engage students in the learning process. Ideas are given on how to overcome the silence between students and faculty.

Research evidence supporting these suggestions is given.

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