

# *From Traditional to Radical: One Teacher's Odyssey*

*By James N. Spencer*

**W**hen I came out of graduate school to begin my college teaching career, I was told to go into the classroom and teach. I had no knowledge of teaching other than what I had observed along the way to my degrees. I had no training in how students learn; in fact, I had never thought about how students learn. I knew nothing of the literature that would introduce me to the subtleties of the teaching-learning process.

That there was no teacher preparation necessary for the college classroom struck me as odd because as the son of a long suffering secondary teacher I had come to believe that most of my summers would be spent in various certification schools learning how to comport myself in the classroom.

I was surprised to learn that, indeed, it was not even part of my particular disciplinary culture to study the art and craft of teaching. I assumed that somehow between the end of high school and college, students must have learned how to learn so that all we needed to do at

the college level was deliver content that would be recorded and absorbed by the student. Hence, mastery of my area of specialty and an organized lecture were sufficient to ensure learning.

I further assumed that, at some time in the past, some great body of teachers came together and set out the rules and methodologies that all my instructors followed. This assumption seemed reasonable because all of my classes were taught in the same way.

Conventional teaching practice clearly supported the impression that what needed to be known about teaching was already known. Teaching is telling and knowledge is acquisition of facts according to time-tested pedagogy. If students could demonstrate sufficient recall of facts, this showed understanding and effective teaching had taken place.

Even though continuing study was necessary to maintain oneself in one's chosen field, no study of teaching was needed. The traditional teaching paradigm was simply

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not concerned with how students learn.

After ten years of dutifully meeting my traditional classes, I realized that, even though my students did well on my exams, I was being misled as to their level of understanding. For the next ten years, I used all the ploys to enhance learning that I had learned by obedient observation of my own instructors. I talked louder and slower, I had students work more problems on the board, I assigned more homework problems, I prepared a study guide, I demonstrated how to solve problems, and I set up recitation sections.

None of this produced any improvement in the students' understanding. By now, my pedagogical arsenal was exhausted, and I was about to fall into the trap of blaming the students. After all, I had done everything I knew to do. Nothing worked, so it couldn't be my fault.

I had noticed that instructors rarely fault themselves but tend rather to find deficiencies in student background, motivation, or ability. More experienced teachers assured me that students were much better in years gone by. But I knew these students. They were bright, their secondary preparation was better than mine had been, and they worked diligently at what I told them to do.

I suspected that students never were as good as they used to be. I began to question whether the time-tested methods could accomplish what I wanted for my students. Courses structured according to custom and tradition seemed to have failed.

About this time—beginning my third decade as a teacher—I chaired a national task force on the teaching of general chemistry. This study group was composed of 25 distinguished teachers and educators from a wide variety of institutions across the country. There was no lack of experience or ideas.

From this diverse collection of teachers of first-year chemistry, I began to learn about teaching. I learned that there was a literature on teaching, that cognitive scientists had begun to unravel how we learn, and that classroom experiments provided information on how to provide the best environment to produce learning.

I found that no erudite body had established the accepted method of delivery for the classroom. Indeed, most of the current classroom staples, I discovered, were in opposition to what had been shown to be the most effective stratagems for producing learning.

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unique and that 40 years ago the ploys I had used in an attempt to enhance learning were shown to be useless, just as I had recently discovered.

Fortunately, about this time, two of my colleagues, John Farrell and Rick Moog, had begun to explore alternative teaching styles. The three of us fell into a natural partnership and together began to explore what was known about teaching and learning.

What did we learn about the process of learning? We discovered that during the learning process, new information passes through a filter that connects to the learner's long-term memory. This filter draws from the long-term memory experiences, perceptions, misconceptions, and biases to regulate what goes to the working memory.

Relying on the connections and exchanges between short-term and long-term memory, the filter determines what fits with previous understanding in the mind of the learner. New information may be stored as meaningful learning or rote learning, or it may be ignored.

**T**he crucial point: What goes on in the learner's head is dramatically influenced by what is already there. Knowledge is personal. To effectively promote learning, the instructor needs to know what the students already

know and what is going on in their minds, and must be able to ascertain when a student is having difficulty.

These cognitive studies have shown that it is not possible for me as an instructor to transfer an idea intact from my head to the heads of students. This realization was profoundly unsettling but enlightening. The basic assumptions on which I organized my classes were turned upside down. Telling is not teaching.

In the past, I had assumed that, if I could give examples that were clear to me, these examples would be equally clear to the students. I believed I could make direct transfer from my mind to theirs. I had what educational psychologists term an egocentric point of view. The student would see exactly what I was seeing. But I was wrong.

The basic structure of a classroom setting that maximizes the opportunity to learn was beginning to emerge. The deficiencies of my classroom were becoming apparent.

First, the learning environment had to be restructured so that I could observe and listen to the students. Next, there must be student-student interaction. Then, I had to find a way to present material that moved away from the "stand in front of the class and tell them" mode. Finally, I needed a method to deliver the content of the course—

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and critical thinking skills.

I was fortunate; nothing had to be invented. Cognitive studies and classroom experiments had established the necessary components of the classroom I intended to create. My new pedagogy was based on constructivism, the idea that students construct their own knowledge based on what they already know.

Also, cooperative techniques had been so thoroughly investigated and their effectiveness so well established that cooperative learning had to be a part of any innovative classroom strategy.

**N**ext, I would use a three-step learning cycle approach that helps improve critical thinking skills and has the further desirable characteristics of following the way scientists are generally taught to proceed in any study.

First, students are confronted with data, information, case studies, or any other materials that constitute a hands-on exploration. Second, students ascertain any patterns or trends and form their own images to arrive at a concept—only then are terms and definitions attached by the instructor. The third step is an application of what has been learned. This step is designed to organize the knowledge and lead to a higher level of thinking. I also prepared classroom

activities that would use inductive and deductive reasoning processes to guide the student through a learning cycle.

A cooperative teaching structure that relies on constructivist principles and uses the learning cycle provides for social interaction gives the learner the opportunity to test the new knowledge through interaction with peers, while allowing the instructor to mentor and follow class discussions. The instructor is then in a position to listen to and learn from the students. A classroom set up in this way conforms to the principles developed by cognitive and classroom studies that sought to maximize the learning opportunity.

The basic premise was that students would be the learners and the teachers. There were to be no lectures of more than a few minutes. Groups of about four students would form the active learning units. Each student had a role to play within the group. In addition, the basic tenets of the learning cycle would be followed throughout the course. This meant a substantial change from the usual classroom-text relationship.

Texts usually begin study of a topic by introducing terms, definitions, and concepts before providing any rationale for the study. Thus the first two steps of the learning cycle are reversed. In order to pre-

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serve the integrity of this cycle, students were told to read the text after an exploration of the subject matter in class. Once students had become familiar with certain terms and had begun to ask questions of themselves, a text explication should be more meaningful and more readily followed. A three-minute lecture at the end of the period would sum up the day's activity and provide the opportunity to address any common misunderstandings observed while circulating among the students.

A myriad of questions went through my mind as I moved to this radical departure from the way I had been taught. Would the students be able to master all the course material? The risk would be great; what were the rewards? Is it really too late for a lecturer of 30 years to change? Can I give up the performing aspect of teaching? Will I be able to submerge myself and let the students take control of their learning? Will I lose complete control of the classroom? Am I being true to a hard-nosed, rigorous discipline that has always been taught through the lecture method? How will the students react?

The first day of class would be crucial. I needed to explain to the students why we were doing the class in this atypical manner. First

I established the daily routine. I told them that all class work was to be in groups. Each group would be given a folder at the beginning of every period. The folders contain the daily activity, communications from the instructor, and a sheet designated as the recorder's notes.

One student served as manager of the group, one would act as recorder of group work, one was to present oral reports to the class, and one group member observed and commented on the group dynamics. The groups were to change membership frequently throughout the semester and no group member could play the same role two days in a row.

Each class would begin with a five-minute quiz on the material of the last class. The group's answers to the learning cycle activity were to be entered on the recorder's notes and placed in the folder at the end of the period. The group observer entered comments on how well the group worked together and what might be done to improve the performance of the group.

The following period, the folder would be returned with the instructor's comments and a new recorder's sheet, along with any other needed instructions to the group. I pointed out that working together as a group would improve their communication and reading skills, and that their learning and

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understanding would be enhanced. I reminded them of their responsibility to the group and the group responsibility to each individual member.

Now, I anticipated a student rebellion. There was none. They immediately moved into assigned groups, assumed their roles and started to discuss the material presented to them in the activity. I realized that most of my fears were misplaced. Students treat the instructor as an authority figure, so whatever they are told to do they do.

As I moved among the groups, I began to see weaknesses in my former approach. By putting myself in a position to listen to and observe students my misconceptions about teaching were made clear. Instead of the brief exchanges between student and teacher that characterized my former classroom I had substituted a student-active classroom. This environment encouraged students to interact with other students. Monitoring these exchanges taught me how students learn.

My expectations of what the student brings to the class were much too high. Misunderstandings and faulty reasoning plagued each group of students. What I saw as clear trends and patterns in the data were obscure to them. Many of the terms that, I had assumed,

meant the same thing to them as to me, in fact, didn't convey the identical concept. The most revealing to me, though, was that for the first time in my teaching career I was learning something about teaching while I was in the classroom. I had always learned about content as I taught but never was in a position to learn about teaching. The students were teaching me.

How did it go over with the students? The overwhelming majority found the group dynamic very helpful in learning the concepts. Class sessions seem to fly by. Students felt that the time they spent in class was useful.

**M**y two colleagues and I analyzed nine years of class data to compare previous performance to performance after introduction of the guided inquiry pedagogy. These data showed that the W, D, F rate fell from 22 percent to 9.6 percent.

Significant gains were seen in all students' critical thinking skills, but the lower end of the class showed the largest gains. Absenteeism was cut, failure rates dropped dramatically, and student satisfaction with the course was very high. Since the introduction of guided inquiry my upper-level courses have been redesigned to follow the guided inquiry philosophy. The amount of material cov-

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ered in each course is essentially the same as when I used the lecture method.

My odyssey has taken me from the safety of the teacher-centered classroom through the maelstrom of change to an unpredictable student-centered classroom. After a 35-year voyage, I believe I have learned some things about learning.

I have found that active modes of learning and teaching are better than passive modes. In spite of themselves, students learn something if they are actively engaged and thinking during class. Students do not make the same connections as their teachers; no matter how clearly we may say it, students do not learn by being told.

Students draw on their previous knowledge to reconstruct their classroom experiences. They bring misconceptions and inconsistent beliefs with them that can interfere with learning. These interferences can only be addressed by active involvement of the instructor.

Students must be provided the opportunity to test their newly found knowledge against their peers and their own previous understanding if more than rote learning is to occur.

Students teaching students in an instructor-guided inquiry is more effective in promoting learning than are lectures.

Students learn better in cooperative groups. By analyzing and discussing ideas together students are less likely to leave the classroom confused. Working together helps them to develop concepts and problem solving skills.

**O**ur teaching needs to be instructed by some philosophical and pedagogical basis that allows us as teachers to learn, to acquire new skills, and to enhance creativity. Teachers frequently overestimate what students know and underestimate what they can do if given the chance.

At the college level no beginning teacher is allowed to enter the classroom without a strong content background check in the area of specialty, but there are no such requirements for teaching. It is assumed that those who want to teach will somehow figure it out on their own, on the job. Graduate programs or those institutions hiring faculty to teach should provide practical and required instruction in teaching and learning theory.

It is easier than teachers like to think for students to become lost after the first few minutes of a class. For these students, the remainder of the time spent in the classroom is useless. A short lecture after students have developed sensory images is more effective than a

longer lecture that begins with a purely verbal description.

I have learned that the barriers to change in teaching are high, despite new pedagogical insights obtained through classroom experimentation and cognitive research. For new teachers it is more reassuring to follow the practices of previous teachers than to consider innovation. For experienced teachers the pull of “this is the way I learned it” is very strong. We should feel free to experiment. Most new ventures could not be much worse than current practice.

**A**s my journey nears its end, I have developed an understanding of teaching. I now realize that while we have a model for research, we have none for teaching. Without a model, teaching comes down to trial and error. Rather than following any guiding theoretical principles, egocentric assumptions and tradition are relied upon to establish classroom norms.

Perhaps the most important thing I have learned is that to teach is to engage students. To engage them fully we must have knowledge of how students learn, as deep as our knowledge of our own specialized content. ■