NAVIGATING THE BUMPY ROAD TO STUDENT-CENTERED INSTRUCTION

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INTRODUCTION

In the traditional approach to higher education, the burden of communicating course material resides primarily with the instructor. In *student-centered instruction* (SCI), some of this burden is shifted to the students. SCI is a broad approach that includes such techniques as substituting active learning experiences for lectures, holding students responsible for material that has not been explicitly discussed in class, assigning open-ended problems and problems requiring critical or creative thinking that cannot be solved by following text examples, involving students in simulations and role-plays, assigning a variety of unconventional writing exercises, and using self-paced and/or cooperative (team-based) learning. In traditional instruction, the teacher's primary functions are lecturing, designing assignments and tests, and grading; in SCI, the teacher still has these functions but also provides students with opportunities to learn independently and from one another and coaches them in the skills they need to do so effectively. In recent decades, the education literature has described a wide variety of student-centered instructional methods and offered countless demonstrations that properly implemented SCI leads to increased motivation to learn, greater retention of knowledge, deeper understanding, and more positive attitudes toward the subject being taught (Bonwell and Eisen 1991; Johnson Johnson and Smith 1991a,b; McKeachie 1986; Meyers and Jones 1993).

We use student-centered instruction extensively in our courses and discuss it in teaching workshops we present to faculty members and graduate teaching assistants. The workshop participants generally fall into two categories. On the one hand are the skeptics, who come up with all sorts of creative reasons why student-centered methods could not possibly work. On the other hand are the converts, who are sold on SCI and can't wait to try it. We know the fears teachers have about the instructional methods we advocate, having had most of them ourselves, and we can usually satisfy most of the skeptics that some of the problems they anticipate will not occur and the others are solvable. We worry more about the enthusiasts who leave the workshop ready to plunge right in, imagining that the spectacular results promised by the literature will show up immediately.

The enthusiasts may be in for a rude shock. It's not that SCI doesn't work when done correctly-it does, as both the literature and our personal experience in two strikingly different disciplines richly attest. The problem is that while the promised benefits are real, they are neither immediate nor automatic. The students, whose teachers have been telling them everything they needed to know from the first grade on, don't necessarily appreciate having this support suddenly withdrawn. Some students view the approach as a threat or as some kind of game, and a few may become sullen or hostile when they find they have no choice about playing. When confronted with a need to take more responsibility for their own learning, they may grouse that they are paying tuition-or their parents are paying taxes-to be taught, not to teach themselves. If cooperative learning is a feature of the instruction, they may gripe loudly and bitterly about other team members not pulling their weight or about having to waste time explaining everything to slower teammates. Good lecturers may feel awkward when they start using student-centered methods and their course-end ratings may initially drop. It's tempting for instructors to give up in the face of all that, and many unfortunately do.

Giving up is a mistake. SCI may impose steep learning curves on both instructors and students, and the initial instructor awkwardness and student hostility are both common and natural. The key for the instructors is to understand how the process works, take some precautionary steps to smooth out the bumps, and wait out the inevitable setbacks until the payoffs start emerging.

TRADITIONAL STUDENTS IN A NONTRADITIONAL CLASS: A PAINFUL ODYSSEY

Woods (1994) observes that students forced to take major responsibility for their own learning go through some or all of the steps psychologists associate with trauma and grief:

1. **Shock**: "I don't believe it-we have to do homework in groups and she isn't going to lecture on the chapter before the problems are due?"

2. **Denial**: "She can't be serious about this-if I ignore it, it will go away."

3. **Strong emotion**: "I can't do it-I'd better drop the course and take it next semester" or "She can't do this to me-I'm going to complain to the department head!"

4. **Resistance and withdrawal**: "I'm not going to play her dumb games-I don't care if she fails me."

5. **Surrender and acceptance**: "OK, I think it's stupid but I'm stuck with it and I might as well give it a shot."

6. **Struggle and exploration**: "Everybody else seems to be getting this-maybe I need to try harder or do things differently to get it to work for me."

7. **Return of confidence**: "Hey, I may be able to pull this off after all-I think it's starting to work."

8. **Integration and success**. "YES! This stuff is all right-I don't understand why I had so much trouble with it before."

Just as some people have an easier time than others in getting through the grieving process, some students may immediately take to whichever SCI method you're using and short-circuit many of the eight steps, while others may have difficulty getting past the negativity of Steps 3 and 4. The point is to remember that the resistance you encounter from some students is a natural part of their journey from dependence to intellectual autonomy (see Kloss 1994). If you provide sufficient structure and guidance along the way, by the end of the course most of them will reach satisfactory levels of both performance and acceptance of responsibility for their own learning.

In the remainder of this paper, we list common faculty concerns about student-centered instructional methods and offer responses. Much of the discussion involves issues associated with cooperative learning, the method that in our experience occasions the most vehement student resistance.

FACULTY CONCERNS

If I spend time in class on active learning exercises, I'll never get through the syllabus.

You don't have to spend that much time on in-class work to have a significant impact with it. Simply ask questions occasionally and give the students a short time to come up with solutions and answers, working either individually or in small groups. Then collect answers from several randomly selected individuals or groups. One or two such exercises that take a total of 5-10 minutes can keep a class relatively attentive for an entire period.

On a broader note, much of what happens in most classes is a waste of everyone's time. It is neither teaching nor learning. It is stenography. Instructors recite their course notes and transcribe them onto the board, the students do their best to transcribe as much as they can into their notebooks, and the information flowing from one set of notes to the other does not pass through anyone's brain. A more productive approach is to put substantial portions of the course notes-lengthy prose, detailed derivations, complex diagrams-in handouts or coursepaks, leaving gaps to be filled in and sprinkling questions and instructions like "Prove," "Justify," "Verify," "Explain" throughout the presentation. Spend class time only on the most critically important and conceptually difficult parts of the notes, leaving the students to cover the rest for themselves. The many hours of class time you will save by doing this should be more than sufficient for all the active learning exercises you might want to use. Your classes will be more lively and effective, you will still cover the syllabus, and you might even be able to augment it to include topics you never had time to cover before. Moreover, if you announce that some of the gaps and exercises in the handouts will be the subject of test questions and then keep your promise, the students will even *read* the handouts-at least after the first test.

If I don't lecture I'll lose control of the class.

That's one way to look at it. Another is that several times during a class period your students may become heavily involved in working on or arguing about what you're trying to get them to learn,

and it may take a few seconds (never longer once you get the hang of it) to bring their attention back to you. There are worse problems!

I assign readings but many of my students don't read them and those who do seem unable to understand the material independently.

In our experience, the only reliable way to compel most students to read the assigned material is to test them on it without covering all of it in class. Some instructors use short quizzes at the beginning of every period for this purpose; others who don't want to spend that much class time giving and grading quizzes prefer to include questions on the readings in their regularly scheduled examinations. In either case, the instructors soon learn that testing students on material not explicitly covered in class inevitably leads to vigorous protests. There are several ways to ease the students' transition from reliance on the instructor to self-reliance. Create graphic organizers that visually illustrate the structures and key points of the readings (Bellanca 1990) and later ask the students to do so. Prepare study guides that summarize critical questions answered by the readings and then include some of the questions on the exams. Give brief or extended writing assignments that call on the students to explain portions of the readings in their own words. Well-constructed writing assignments compel students to process material actively, identifying important points or connecting the material to their prior knowledge (Brent and Felder 1992).

Some of my students just don't seem to get what I'm asking them to do-they keep trying to find "the right answer" to open-ended problems, they still don't have a clue about what a critical question is, and the problems they make up are consistently trivial.

An essential feature of any skill development program is practice and feedback. Most students have never been taught to solve open-ended problems or think critically or formulate problems, so that the first time you assign such an exercise they will probably do it poorly. Collect their products and provide constructive comments. In addition, reproduce several products (perhaps slipping in one of your own as well), hand them out without attribution, go over some of them in class to illustrate the sort of thing you're looking for, and suggest ways to make good products even better. Modeling of this type helps students understand the process they need to go through to improve their own work. After several similar assignments and feedback sessions, students will start giving you the kind of results you're looking for and they will also begin giving one another meaningful feedback in group work. This approach serves a double purpose: the students gain more skill and confidence and you gain a classroom of teaching assistants who can help each other learn. By the end of the course some of them may be performing at a surprisingly high level.

When I tried active learning in one of my classes, many of the students hated it. Some refused to cooperate and made their hostility to the approach and to me very clear.

Instructors who set out to try student-centered instruction in a class for the first time are often unpleasantly surprised by the fierce negativity of some responses. Many who don't anticipate such reactions get discouraged when they encounter them, give up, and go back to more comfortable but less effective methods.

To minimize resistance to any student-centered method, try to persuade the students from the outset that you are neither playing a game nor performing an experiment, but teaching in a way known to help students learn more and understand better. You can reinforce your point about the effectiveness of SCI by offering variations on one or more of the following observations:

- *You've all had the experience of sitting through a good lecture, believing that you understood it, and then later when you tried to do the homework you realized that you didn't get it at all. By putting you to work in class I'm giving you a jump start on understanding the material and doing the homework efficiently.*

- *Unless you're a Zen monk, you can't sit still and keep your mind focused on one thing for more than a few minutes. In lectures your attention drifts, first for short intervals, then for longer ones, and by the end of a straight 50-minute lecture you're probably getting less than 20% of what's being said. Doing something active from time to time during the lecture substantially increases the amount of information you actually get. It also cuts way down on boredom.*

- *When you go out to work, I guarantee you'll be working in teams. When companies fill out surveys asking them what skills they want their new employees to have, teamwork skills are usually ranked either first or second. Since working in teams is what you're going to be doing on your job, you may as well start learning how to do it now.*

- (To students complaining about being slowed down by having to explain material they understand to slower teammates.) *If you ask any professor, "When did you really learn thermodynamics (or structural analysis or medieval history)?" the answer will almost always be "When I had to teach it." Suppose you're trying to explain something and your partner doesn't get it. You may try to put it in another way, and then think of an example, then another one. After a few minutes of this your partner may still not get it, but you sure will.*

In our experience, most students bright enough to complain about being held back by their classmates are also bright enough to recognize the truth of the last argument.

I'm having a particularly hard time getting my students to work in teams. Many of them resent having to do it and a couple of them protested to my department head about it.

Cooperative learning tends to be the hardest student-centered method to sell initially, especially to high academic achievers and strong introverts. The points given above about the prevalence of teamwork on most jobs, the importance of teamwork skills to most employers, and the fact that we learn best what we teach, can help. Perhaps the most effective selling point for cooperative learning (unfortunately) involves grades. Many research studies have demonstrated that students who learn cooperatively get higher grades than students who try to learn the same material individually (Johnson *et al.* 1991b). Before assigning group work for the first time, we may mention a study (Tschumi 1991) in which an instructor taught an introductory computer science course three times, once with the students working individually and twice using group work, with common examinations in the first two classes. In the first class, only 36% of the students earned grades of C or better, while in the classes taught cooperatively, 58% and 65% of the students did so. Those earning A's in the course included 6.4% (first offering) and 11.5% (second

offering) of those who worked cooperatively and only 3% of those who worked individually. There was some student resentment about group work in the first cooperative offering and almost none in the second one, presumably because the instructor was more skilled in the method the second time and possibly because the students in the second cooperative class knew about the results from the first class.

Persuading students that group work is in their interest is only the first step in making this instructional approach work effectively. The instructor must also structure group exercises to promote positive interdependence among team members, assure individual accountability for all work done, facilitate development of teamwork skills, and provide for periodic self-assessment of group functioning. Techniques for achieving these goals are suggested by Johnson *et al*. (1991a), Felder and Brent (1994), and many other books and articles in the recent education literature. Instructors new to cooperative learning are advised to have several such references handy when planning activities and assignments and dealing with problems.

If I assign homework, presentation, or projects to groups, some students will "hitchhike," getting credit for work in which they did not actively participate.

This is always a danger, although students determined to get a free ride will usually find a way whether the assignments are done individually or in groups. In fact, cooperative learning that includes provisions to assure individual accountability-such as individual tests on the material in the group assignments-cuts down on hitchhiking (Johnson *et al.* 1991a,b). Students who don't actually participate in the homework will generally fail the tests, especially if the assignments are challenging (as they always should be if they are assigned to groups) and the tests truly reflect the skills involved in the assignments. If the group work only counts for a small fraction of the overall course grade (say, 10-20%), hitchhikers can get high marks on the homework and still fail the course.

One way to detect and discourage hitchhiking is to have team members individually or collectively distribute the total points for an assignment among themselves in proportion to the effort each one put in. Students want to be nice to one another and so may agree to put names on assignments of teammates who barely participated, but they are less likely to credit them with high levels of participation. Another technique is to call randomly on individual team members to present sections of project reports or partial solutions to problems, with everyone in the group getting a grade based on the selected student's response. The best students will then make it their business to see that their teammates all understand the complete solutions, and they will also be less inclined to put a hitchhiker's name on the written product and risk having him or her be the designated presenter.

Many of the cooperative teams in my class are not working well-their assignments are superficial and incomplete and some team members keep complaining to me about others not participating.

The interpersonal challenges of cooperative learning may be severe. Students have widely varying intellectual abilities, work ethics, and levels of sensitivity to criticism, and a substantial part of the cooperative learning experience is learning how to confront and work through the conflicts that inevitably arise from these variations.

One way to get groups off to a good start is to have them formulate and write out a set of team standards and expectations, sign it, make copies for themselves, and turn in the original to you. As the course proceeds, have them periodically evaluate how well they are working as a team to meet those standards and what they might do to work more effectively. You may invite teams with serious problems to have a session in your office. If they do, try to help them find their own solutions rather than telling them what they should do.

Taking a few minutes in class to focus on critical teamwork skills can make a major difference in how groups function. Periodically select an important activity like brainstorming or resolving conflicts and offer tips in class on effective ways to carry out the activity. An effective technique is to present a short scenario describing a common problem and brainstorm solutions with the class.

You may also give teams the last resort option of firing uncooperative members after giving them at least two warnings, and you may give individuals carrying most of the workload the option of joining another group after giving their uncooperative teammates at least two warnings. In our experience, teams almost invariably find ways of working things out themselves before these options have to be exercised.

Teams working together on quantitative problem assignments may always rely on one or two members to get the problem solutions started. The others may then have difficulties on individual tests, when they must begin the solutions themselves.

This is a legitimate concern. An effective way to minimize it is for each team member to set up and outline each problem solution individually, and then for the team to work together to obtain the complete solutions. If the students are instructed in this strategy and are periodically reminded of it, most of them will discover its importance and effectiveness and adopt it. There is also merit in assigning some individual homework problems to give the students practice in the problem-solving mode they will encounter on the tests.

I teach a class containing students in minority populations that tend to be at risk academically. Does active, cooperative learning work in this kind of setting?

In fact, the most frequently cited cooperative learning success story comes from the minority education literature. Beginning in the mid-1970's, Uri Treisman, a mathematics professor then at the University of California-Berkeley, established a group-based calculus honors program, reserving two-thirds of the places for minority students whose entering credentials suggested that they were at risk. The students who participated in this program ended with a higher retention rate after three years than the overall average for all university students, while minority students in a control population were mostly gone after three years. Treisman's model has been used at many institutions with comparable success (Fullilove and Treisman 1990). In another study, George (1994) tested several cooperative learning techniques on a predominantly African-American psychology class and compared their performance with that of a control group taught noncooperatively. She found that group work led to significant improvements in both academic achievement and attitudes toward instruction.

When using cooperative learning in classes that include minority students-ethnic minorities, or women in engineering and other nontraditionally female fields-try to avoid groups in which the minority students are isolated. Felder *et al.* (1995) report a study of cooperative learning in a sequence of engineering courses. Women responded to group work with overwhelming approval, but many indicated that they tended to assume less active roles in group discussions and some reported that their ideas tended to be devalued or discounted within their teams. The likelihood of these occurrences is reduced if a team contains more than one member of the minority population.

Even though I've done everything the experts recommend, some of my students still complain that they don't like the student-centered approach I'm using and they would have learned more if they had taken a "normal" class.

They could be right. Students have a variety of learning styles and no instructional approach can be optimal for everyone (Claxton and Murrell 1987; Felder 1993; Grasha 1990, 1994). In the end, despite our best efforts, some students fail and some who pass continue to resent our putting so much of the burden of their learning on their shoulders. One of our students once wrote in a course-end evaluation, *"Felder really makes us think!*" It was on the list of things he disliked. On the other hand, for all their complaints about how hard we are on them, our students on the average do better work than they ever did when we just lectured, and many more of them now tell us that after getting through one of our courses they feel confident that they can do anything. So you may lose some, but you can expect to win a lot more.

In short, we are convinced that the benefits of properly implemented student-centered instruction more than compensate for any difficulties that may be encountered when implementing it. Instructors who follow recommended SCI procedures when designing their courses, who are prepared for initially negative student reactions, and who have the patience and the confidence to wait out these reactions, will reap their rewards in more and deeper student learning and more positive student attitudes toward their subjects and toward themselves. It may take an effort to get there, but it is an effort well worth making.

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