Incorporating Student Centered Learning Techniques into an Introductory Plant Identification Course

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Abstract

Introductory plant materials courses have traditionally been taught utilizing the lecture method. A plant identification course was adapted to include several Student Centered Learning techniques including: having students assist in syllabus development, assignment development and assessment, development of a student and instructor "code of conduct", and the use of students as teachers. Students also participated in the creation of study materials for exams, writing exam questions, group projects and discussions. Although initial reaction was apprehension, all students eventually responded well to the changes. Attendance was excellent through the entire quarter and student participation was greatly increased. Students report learning more, enjoying the class more and feeling a greater sense of responsibility toward the class, which increased their intrinsic motivation to succeed. It was difficult to give up control of many aspects of the course and the inclusion of these techniques vastly increased the amount of time spent on daily preparation as well as assessment; however, the overall level of participation and satisfaction reported made it worth the time and effort.

Introduction

College courses have traditionally been taught utilizing the lecture method (Lorenzen, 2002). The lecture method is highly efficient for large courses or when presenting background information to students. However, instructors around the country noted from the earliest of times that students weren't learning when only exposed to the lecture method and began to ponder the value of the lecture in higher education (Davis, 1886). When sitting in a lecture, the students report feeling bored, having trouble focusing on the material, and staying attentive over time. These students are not engaged in the highest forms of cognition: synthesizing, analyzing and evaluating (Johnson et al 1991).

Active learning allows the student to move from the role of note taker to participant in the learning process. Activities such as group work, discussion, role-playing, and hands-on projects are all components of the active learning classroom. These activities allow the students control over their learning and force them to take more responsibility in the classroom, not only for their behavior, but for their own learning as well. In 1984 the National Institute of Education drafted a report entitled Involvement in Learning: Realizing the Potential of American Higher Education. One of the basic recommendations by the group was to encourage faculty to include more active learning techniques into their classrooms. "Faculty should make greater uses of active modes of teaching and require that students take greater responsibility for their learning" (p. 27).

Plant identification courses are often traditionally taught with the lecture format. There is a large quantity of information to be disseminated and this style is very efficient. Lectures are also useful when the material is introductory and students do not have the necessary background to hold a discussion or participate in a more student-centered style. Large class size will also tend to increase the use of the lecture. New plants are often introduced with slides showing the plant through various stages during the growing season. This is advantageous because students can at least be exposed to how the plant will change during the growing season, which is something they would not get to fully appreciate during a ten-week quarter. Slides also allow various cultivars and varieties not available in the gardens to be shown. This allows the students to be exposed to the latest trends in cultivars.

At The Ohio State University Agricultural Technical Institute (ATI), Herbaceous Plant Materials (Horticulture Technologies T245) has been taught for many years in this manner. Lecture, slides and a limited amount of containerized plants have been utilized with varying degrees of success. Class size also varies greatly ranging from 60 plus students during the winter quarter to approximately 20 students during summer quarter. The seasonal changes, as well as the disparity between the numbers of students enrolled during the various quarters, have meant the lecture has held a prominent place in the classroom.

Because of concerns regarding the lecture style in

the classroom and an interest by the author in more active learning techniques, I decided to incorporate several new techniques into an introductory plant identification course.

Recent attendance at Skip Downing's On Course seminar series provided many different techniques specifically designed to increase student learning and responsibility for their own education. Student acceptance of the new techniques was critical for successful adaptation of this course from the teacher paradigm to the learning paradigm. At every phase of the course, an attempt was made to explain not only the changes they were going to experience, but also why these changes were being implemented. Students were also involved in structuring several of the changes and took responsibility for their classroom.

Materials and Methods

After careful consideration, I decided the best section for implementation of these new techniques was the summer quarter, 2001 section of Herbaceous Plant Materials. I chose this section for several reasons:

1. Its small size. Past summer quarter enrollments were traditionally 18 to 23 students, making it the ideal size.
2. The composition of the class. These students had all been enrolled as full time students for at least three quarters. Thus all students had an idea of what was required to successfully complete a college level course in plant identification.
3. I had taught the course the previous winter quarter and predominantly utilized the lecture style of teaching. This meant there would be a basis for comparison between the two courses.

The first step in adapting this course began with an explanation to the students on the first day of the quarter. This involved letting them know what was going to take place and why. Several minutes of discussion ensued so students could voice their thoughts and concerns regarding this new style. It was difficult to engage the students at first, but once a few began, most of the rest of the students voiced their opinion, either positive or negative.

The second step in this process was to allow the students the opportunity to determine the course content. I handed a 3x5 index card to each student and asked him or her to list his or her top 5 topics on the card. I listed mine on one side of the blackboard. We went around the room and students added topics to the list. If a topic arose more than once, tick-marks were utilized to indicate how many students were interested in the given topic. Several topics were on all students' cards and these were incorporated quickly into the course. Other topics were added as dictated by the level of interest indicated. Interestingly, this did not alter my original topics list; however, the students indicated this gave them an increased stake in the course, which they also felt improved their self-motivation. They recognized they set up the course; it was their course.

The next step in the process was syllabus development. I explained to the students they were to be allowed some control over the syllabus. I started by listing several assignments on the board. A midterm exam, final exam, final plant identification exam, plant identification quizzes, written report, design project, fertilizer calculations and plant notebook were among the topics listed for evaluation. Students added attendance and participation to this list. Most students felt this would help keep them coming to class and provide that external motivation that is occasionally required to keep them on track during the quarter. Everyone, myself included, was allowed the opportunity to voice their opinion, but in the end, majority ruled in all cases. They were then to decide which assignments they were to do, if there were some that could be removed, while still meeting the overall objectives for the course. Eventually all assignments listed were recognized as important and playing a valuable role in their education. Thus, all assignments listed became part of their course.

The students then selected the point values for each assignment based upon the perceived work involved with that assignment. Since all students had taken at least one prior plant identification course, they were all aware of the time involved in memorizing the various plants. This meant that identification quizzes and the identification final exam were given a very high initial percentage. Initially, students also wanted to have “Participation and Attendance” account for 20% of their grade, but after much discussion, they modified their decision and allotted only 10% of their grade to this topic. We also agreed to revisit the allotted percentages halfway through the quarter. This would allow them the opportunity to make changes based upon the amount of time that was actually being spent on a given assignment, whereas the initial percentage was assigned based upon perceived time.

During the discussions about assignments, the question arose of who would evaluate their performance on a given assignment. Some students wanted the opportunity to evaluate each other; others wanted this to remain strictly a private matter between the student and instructor. After careful consideration and much discussion, it was decided that I would retain control over the evaluation of performance. I then suggested they could easily evaluate each other during the oral presentations, which could still be anonymous and would not be shared with the other students in the classroom. They would also be the best person to evaluate the contributions of each member of the group. This was agreeable to all students. We spent considerable time in the development of an acceptable RUBRIC for the group project. As the instructor, I provided feedback; occasionally suggested ideas and only offered my opinion when asked. This gave the students almost

complete control, while providing a support system for information and suggestions.

Finally came a listing of goals and expectations for both students and instructor. Students listed behaviors that, if followed, would enable them to get the grade they desired. The list included items such as "Come to class on time and prepared to learn," "Respect the knowledge level of all students in the class," and "Complete all assignments on time." The final list consisted of eight behaviors. The students then voted on all the behaviors.

Without 100% agreement from the students, this behavior was made a goal, but not an expectation, for the class. The three previously mentioned behaviors were all expectations, meaning that all people involved in the class were expected to do these things at all times, including the instructor. The students also created a separate list of expectations for me as the instructor, which was also voted on. The final list of instructor expectations included:

- Come to class on time and prepared for the topic
- Listen to our opinions
- Make the class as fun as you can

Topics that were not agreed upon unanimously were made goals to strive for, rather than expectations. One example of an instructor goal was, "Go on an all day field trip." Everyone agreed this would be a great expectation in an ideal world, but realistically, there might be several people who simply might not be expected to participate in this type of activity for various reasons. The class took a local trip during lab.

Other Techniques

Jigsaw Puzzle. This interactive method is detailed during the On Course Seminar (Downing, 2000). One of the best methods of learning material is to teach the material to someone else (Downing, 2000). The purpose of The Jigsaw Puzzle is to have students become experts in a small area and have them teach the other students their knowledge. Students were divided into small groups and given handouts on the material. They were to read a small section of the material quietly for 5-6 minutes, after which, they each rotated into a different group. Each student in the group was then given 5-7 minutes to "teach" the other students in their group what they had just learned.

After each student took a turn teaching the group, the students went back to reading a second small section of the material. They proceeded to move to yet a different group and teach this new material. No student taught the same group twice. Everyone in the class had the opportunity to learn from everyone else in the class. This provided them with a chance to get to know each other, work with each other without the pressure of a project due and to teach small portions of the material to their fellow students. I simply facilitated movement from group to group and answered questions about the material when needed. The lab for that week repeated much of the same material and those students who were "experts" in a given area were asked to present their knowledge once again.

Evaluation. I used several methods to enhance learning during test time and also try to reduce test anxiety. The first method was to ask the class to help develop the exams. Students were allowed to discuss amongst themselves and with me what they felt was important. After making a list of concepts, the students were asked to come up with several questions that would assess their knowledge in these areas. These questions were written on the board and their correct answers discussed in class. Many students wrote down everything that was said, both by the instructor and by other students. Others took few notes, and spent more time listening, still others took no notes at all.

Second Chance Exam. Affixed to the back of each exam was a blank piece of paper. Each student had the opportunity to write down any question(s) of which they were unsure, or felt were missed entirely. The student would take this page with them, look up the answers and return the corrections at the next class meeting. They could utilize any resource available except the instructor. This sheet was attached to the original and both sets of answers were graded. If the student missed a question on the original exam, but answered it correctly during the "second chance" exam, half the credit lost was recovered.

Pretest. The pretest for this course consisted of 20 true or false questions, 10 matching and one fertilizer calculation. Students were given this test during the first lab period. Tests were graded and discussed, but not returned. At the end of the quarter, the same test was administered as a surprise quiz. Once graded, both tests were returned. Students were then able to see what they learned through the quarter and they seemed to enjoy tracking their progress in this manner.

Student Evaluation. After making major changes to many sections of this course, I felt it necessary to give the students the opportunity to evaluate the changes. After each change or activity, students were given the opportunity to record what they liked, what they didn't like, and/or what could be done to make it better, even if they liked the change. The comments were put into an envelope and taken to the Horticulture Division Assistant, who typed up all the comments and shredded the originals. I also employed the University Student Evaluation of Instruction, which is required by The Ohio State University.

Results and Discussion

One of the key components of SCL is to move

away from the lecture as the primary format for the dissemination of information. The lecture is not abandoned altogether, but included with several other techniques incorporating a range of teaching and learning styles. This helps to ensure that most students will be able to learn at least one topic in the manner in which they learn best. It also provides variety during the course, which not only keeps the student's attention, but the instructor's as well. During this course, the lecture became simply another tool, rather than the main teaching style.

Student evaluations showed that all students enjoyed the changes to the course. Attendance was increased over previous quarters and my personal enjoyment of the class was greatly increased. During quarters where SCL techniques were not utilized, student evaluations were somewhat positive although many students felt the course was not intellectually stimulating and needed something to help catch their interest better. They felt the course was too hard and proceeded at too fast a pace. They also indicated they learned little and memorized too much. Attendance was poor.

After I incorporated SCL, student comments were highly positive. No student indicated they felt the course was too hard or conducted at too fast a pace, although the same number of plants and the same material was covered. They enjoyed the different activities and liked having more of a say in the course. Several mentioned they wished more courses were taught in this manner; it would make their college career more rewarding. Attendance was also improved. Most students came to class every day.

Those who knew in advance of conflicts called me in advance to let me know. However, one student didn't come to class on a regular basis, missing class for 3 out of 10 weeks. Tardiness was also a major issue for this student. No excuses were provided, nor were there any attempts to make up the work, and performance for this student suffered. Other students commented that this person was not respecting the class, or the rules of the class, which were unanimously agreed upon. No comments by any student in the class changed the behavior of this particular student, although they tried on several occasions. As it turned out, this was the only student to do poorly in the class.

During the initial stages, students expressed concern they would not be able to handle the responsibility of developing parts of the syllabus. They also worried that they were not the most effective teachers in the classroom, which was why there was an instructor in the first place. Several students commented that I was there simply to teach them; they were not there to teach themselves. After a lively discussion and repeated reassurances that I would still maintain an active role in the classroom, most students were at least willing to keep an open mind. Students elected to maintain the right to go back to tradition if the new style wasn't working. Without realizing it, this was the first step in taking control over the classroom; they could dictate the style of instruction!

When the discussion turned to choosing assignments, one student suggested each student could adopt a section of the gardens around campus and be responsible for its care and upkeep during the quarter. This assignment drew the most conversation. Some students had allergies and felt it was unfair to be forced to work outside if their allergies were acting up. Others were worried they would spend a lot of time on menial labor and not learn much. Some had full time jobs. Those in favor of the assignment pointed out the opportunity to become intimately involved with a few species of plants, thus making those plants easier to learn. They also felt it would be a relatively easy, though perhaps time consuming, project for the quarter. After a lively discussion, the students agreed that a student could choose either to do a written report or work in the gardens. Students agreed to my stipulation that once they decided, they could not change their minds, but that I would also give them a week to come to a decision. Allowing students not only to choose topics, but also to set goals and expectations for the class as well as delineating the point values for various assignments gave them control of the classroom. This practice put the students into the two highest categories of cognitive learning: creating and evaluating.

During The Jigsaw Puzzle students commented that moving around the room was confusing at first, but after the first couple of times, they knew where to go and what to do. Written suggestions indicated that music in the background would have been nice, at least during times of quiet reading. Having students present the same material during lab served to reinforce their knowledge. I noticed that many students did not require the use of notes at the second presentation of their material, and the nervousness generated from oral presentations appeared to be greatly diminished. Anonymous, written comments from the students were positive. However, one student wrote that the lecture was preferable, although it was nice to do something different. A few students indicated that although this exercise was a nice change of pace, they would not want to do it every class period, but that it was an enjoyable and different way to learn the material.

During development of the written exams is where the liveliest conversations took place. As students listed topics on the board and as those topics developed from one word into a phrase and finally into a possible question, they talked about many aspects of the topic. Although students could suggest a question, most of the time, the question developed in response to discussion from many students. For many questions there were no correct answers, but the ability to defend an answer became important. These types of questions were discussed at great

length, giving all students the opportunity not only to hear various opinions, but the reasons behind those opinions as well. It also gave students whose writing skills were not as strong the ability to hear how to defend a question well. The way people interpreted the question often prompted the most changes not the validity of the question itself. For me, this was the most valuable aspect of this exercise; I was able to see how one question could be interpreted. In the end, I became better a seeing these possibilities and started thinking more about the questions I write for exams. As a new teacher, this lesson was invaluable to me.

Comments from students showed they enjoyed having this small amount of control and responsibility for the creation of part of the exam. It became a source of pride for those students whose questions appeared on exams. During the last week of the quarter, an informal and friendly competition arose between students to see who could come up with the best questions. Most questions were well thought out and accurately represented the material covered in class. One student kept trying to present questions that were easy to answer. This person was quickly rebuffed by the rest of the class and eventually started asking some of the most thoughtful questions.

Students enjoyed the second chance exam for several reasons. They obviously enjoyed getting the "extra" credit on their exam, which directly impacted their grade. However, several students also stated they felt they learned more by looking up the answers rather than simply being told the correct answer. They also felt they were more likely to remember the material they had to look up. Many indicated their stress level was greatly reduced, knowing they had the opportunity to look up material when they "drew a blank." Students still had to study to do well on the exam; they were still required to know their material and to think about how to process this material. However, the pressures generated from a testing situation were greatly reduced. Instituting a "second chance" exam put the students into a higher cognitive level of learning. They had to think about the question, come up with an answer, and then determine if that answer was correct. Finally they had to locate the correct answer. This provided reinforcement for the material, which is also important for learning.

The major disadvantage of the "second chance" exam is the increased workload for the instructor. Exams must be graded twice. This also delays the time it takes to return exams. This kind of additional workload may not be possible for professors with very large classes. However, the increased workload is more than justified by the multitude of positive student comments. Students not only appreciated the opportunity to potentially get a higher grade, but many realized it was a very good learning opportunity as well.

The above-mentioned techniques have many advantages. The students report increased satisfaction. Increased satisfaction can also translate into increased student evaluations, which can directly impact the instructor's career. Students who enjoy a course will put forth more effort in the classroom and become more active participants. This increases enjoyment for all involved, students as well as instructor. As the instructor sees that students are participating more actively in the classroom, the instructor often reciprocates this excitement by more enthusiastic presentation of the material. Student participation can also increase instructor confidence, which also has a positive impact on the students. A confident instructor is often more willing to try new things. This cycle is never ending and overall enjoyment of the teaching/learning process increases for all involved.

My own personal experiences incorporating SCL techniques into the classroom bear witness to this. I was very nervous to try these techniques, especially as the students displayed initial reluctance on the first day. Once the ice was broken and everyone warmed to the idea of dramatically changing the way the course was taught, I became increasingly confident that these techniques were valid and worked well for the students. As my own confidence increased, I decided to try new techniques, often making handouts and course materials the day prior to a topic in an attempt to try something new as soon as possible. I appreciated the student's candor in honestly evaluating these new techniques. In my opinion, this group of students not only learned a great deal about plant identification, but about the teaching and learning process as well. This is sure to benefit them as they proceed through the rest of their college careers.

However, there were several disadvantages that warrant mention. The entire first 2-hour class period was devoted entirely to syllabus development. For a class having only one lecture session per week, this cuts into time that might otherwise be used to introduce material. At the end of several class and lab sessions, time was needed for students to be able to evaluate the technique or style tried. Review sessions for exams also took time away from introducing material. Generation of exam questions, especially the style of questions that require higher levels of thinking, discussion of several possible answers, and putting all this information on the board was very time consuming. In class discussions concerning the development of the course were also very time-consuming. One class period was spent on syllabus development and one class period was spent developing the exams. These were class periods that could have been used to introduce new topics or go into further detail about a previous topic.

The amount of time spent preparing materials and grading assignments dramatically increased during the quarter SCL techniques were incorporated versus the time involved in quarters taught in a

more traditional manner. Due to the second chance exam, all exams were graded twice before they could be returned to the students. This increased the amount of time spent grading written exams. Exams took longer than usual to return the students. For projects where the students were grading each other, I spent considerable time compiling and typing responses for each student to read. This also took far more time than simply evaluating based upon how accurate the information was.

For an introductory course in plant materials, where the students may not have had much experience with plants, the lecture may remain the standard method of dissemination of information, at least at the beginning of the quarter as new concepts are introduced and mastered. As students gain confidence and knowledge the second half of the class time could readily be devoted to incorporation of one to several SCL techniques. As students recognize how to organize information and transfer this information from one topic to another, they begin to enjoy their classroom experience more and this, in turn, increases student participation.

For instructors who are reluctant to give up large amounts of control from the start, there are several techniques mentioned here that could be incorporated without having to relinquish much control in the classroom. A “second chance” exam is perhaps the ideal place to start. It doesn't have to alter the style of current exams, nor does it require a dramatic change in the course itself. It places the students into a higher cognitive state of learning and seems to reduce test anxiety in some students. The only two requirements of the second chance exam are a willingness of the instructor to spend some extra time in grading and a willingness of the students to have a slight delay in having exams returned to them.

Conclusion

In the future, I would like to try some of these techniques in larger classes. They are highly effective in the small classroom, but their effectiveness in the large classroom may be limited by the instructor's ability to monitor many smaller groups. Some techniques would probably not be possible logistically in a larger classroom, for example the Jigsaw Puzzle. However, even freshmen can be allowed some say in the syllabus, including assigning point values, and determination of some of the course content. Large classrooms are inherently more challenging for a multitude of reasons and I am not fully confident in my ability to maintain control over the entire class if I allow students some control. I will continue to incorporate these techniques into my smaller classes.

Qualitative studies should be done on student learning and the impact of these techniques on overall performance. For this paper, no such data were gathered; everything was based upon observation. Qualitative data would serve to show if these techniques help students learn better because of the technique itself, or if learning is increased simply due to increased satisfaction and a feeling of responsibility for the classroom environment. Possibly, these students would have done well regardless of teaching style. Qualitative data would help to prove increased learning.

Despite the increased hours spent preparing materials and grading assignments, I found this class to be far more enjoyable than previous classes. The students were more active participants and this kept me focused during the quarter. As their excitement levels increased, mine did as well and in the end, I think we were all happy with the outcome of the course. Most students did very well through the quarter and reported enjoying the class better than the traditional lecture style. As I learn new techniques, I will be sure to at least give them a try and to listen to the students' suggestions for improving the course further.

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