AN ALTERNATIVE TECHNIQUE FOR TEACHING MATHEMATICS: STUDENTS TEACH

By:

Donna Saye
Math/CSC Department
Georgia Southern University
Statesboro, GA 30460

e-mail:
dbsaye@gsvms2.cc.gasou.edu

TEACHING MATHEMATICS USING TRADITIONAL METHODS

In this presentation I want first to discuss the traditional method for teaching mathematics, how it effects students negatively, and how It contributes to their tendency to do poorly in mathematics. Usually mathematics teachers lecture when they teach their classes. In a traditional classroom setting, the teacher will begin class by answering questions from homework, then she will teach the new lesson, and finally she will give a homework assignment that students may be able to begin working on in class if time permits. This method is often *boring* for students because their only job in the classroom is to passively sit and watch the teacher work mathematics problems on the board- The student watches, listens, and copies what the teacher does. The students begin to feel that mathematics is pointless and of little value to them in real life. It becomes a subject they are forced to study on school, but one that is useless to them in real life.

In the traditional classroom setting discussed above, both students and teacher are *often frustrated because* students' individual needs are unmet. Students generally have difficulty listening and copying a problem from the board at the same time, so when they begin working assigned problems at their desks they encounter difficulties. Students raise their hands for help, and the teacher moves around the room trying to answer everyone's questions. However, she cannot get to every student before time to leave. Students leave the classroom without having questions answered and unable to complete the assignment. The teacher is exhausted from moving about the room in her effort to answer all the questions, and she is discouraged that she cannot effectively meet the needs of her students.

ALTERNATIVES TO THE TRADITIONAL TEACHING OF MATHEMATICS

Mathematics teachers today are eagerly trying alternative methods in an effort to better meet the needs of their students. We want out students to do mathematics, not listen to and watch mathematics being done by the teacher. We want our students to be excited about doing mathematics. We want them to understand mathematics, pass their classes, and stay in school. We want students to solve problems that they recognize as relevant to their lives. Some effective alternative methods currently in use for teaching mathematics are the following: cooperative learning problem solving experiences, use of technology, use of manipulatives, and student projects. Students projects is the method I plan to discuss today.

I have had my students do projects 'in many of the classes I teach--college algebra, trigonometry, and learning support. The students are placed in groups at the beginning of the quarter and work together on a number of assignments before being given their group project. After students have gotten comfortable working with each other, I begin to assign topics for the groups to teach to the class. Each group is assigned a topic from the text to teach their classmates. On the pages that follow are the instructions given to the students concerning their teaching projects.

STUDENT PROJECTS

I) Students are placed in groups of 4-6 students per group.
2) Each group is assigned a topic from the text to teach to the class.
3) Each group has 5-8 days to read, plan, and prepare their lesson.
4) Each member of each group must do some part of the work.
5) Each group meets with the Instructor prior to teaching to discuss their plans.
6) Each group turns in a written copy of their lesson plans to the Instructor on the day that their group teaches.
7) Each group receives 2 grades on the project-oral and written.

IDEAS GIVEN TO STUDENTS AS THEY BEGAN TO PREPARE PROJECTS:

Determination of project grade:

Oral:

I)	Demonstration of understanding of material	20%
2)	Ability to explain topic	20%
3)	Creativity in presentation	20%
4)	Group unity	20%

Written:

1)	Neatness, grammar, organization, content quality	20%

Facts:

1) You should first choose a group leader.
2) Every member should read and study the topic before the first group meeting.
3) Meet together to plan who will do what.
4) Meet with me to practice.
5) Have a written copy of the presentation telling me who did what and summarizing the teaching to turn in the day you teach.
6) Give me any handouts you want to use, and I will run them off.
7) Remember that some of you may talk, some of you may run the overhead calculator, some of you may write on the board, some of you may do the written presentation, some of you may do the handout(s). Everyone must do something.

A quiz will be given to the entire class the day following each presentation.

DETERMINATION OF QUARTER GRADES

ORAL GROUP GRADE (80%)

I)	Demonstration of Understanding of the Material	(20%)
2)	Demonstration of Ability to Explain the Topic	(20%)
3)	Creativity in Presentation	(20%)
4)	Group Togetherness	(20%)
TOTAL OF ABOVE		(80%)
WRITTEN GROUP GRADE		(20%)
TOTAL GRADE		(100%)

QUARTER AVERAGES

PROJECT	1/10
CLASSWORK/HOMEWORK/QUIZZES	2/10
TESTS	7/10

CONCLUSION

There are of course difficulties with having students teach the class as well as some very positive aspects. During this session, I hope to have participants offer answers to the eight questions I have listed on the next page and discuss the eight positive aspects that I have noticed. I will also share some comments made by some of my students who participated in student projects. They are listed along with three positive results from *students' teaching* on the page immediately following the difficult and positive aspects of student projects. A sample lesson will be given to participants in the session and a video will be shown of my students teaching that lesson.

DIFFICULT ASPECTS OF STUDENT PROJECTS

1) How will the Instructor know when a group member does not do his part? What will the Instructor do about it?
2) How can the Instructor help those really shy students be able to relax about doing a project?
3) What will the Instructor do if a student cannot meet with the others in his group to plan his part?
4) How does the Instructor manage the daily schedule to allow for student projects and follow-up exercises and still be able to allow time for each topic that must be covered in the course?
5) How can the Instructor carry out the workload involved in meeting with each group outside of class?
6) How can the instructor ensure that the entire class will take notes during a group's teaching and participate in the same way that they would if that instructor were teaching?
7) What should the instructor do if members of a group withdraw during the quarter?
8) How will the Instructor assess student learning?

POSITIVE ASPECTS OF STUDENT PROJECTS

I) An increase in mathematics communication among students.
2) An improvement in student ability to read mathematics.
3) An increase in the understanding of mathematics by the students because of:
   a) the "hands-on" experiences they have while learning without
   the guidance of an Instructor,
   b) a thorough learning of the assigned topic by group members who must later teach their classmates,
   c) the presence of several minds working together on the same
   problem.
4) A greater use of mathematics vocabulary by students.
5) An increased student interest in the class because of the variety in "teachers" throughout the course.
6) An increased student attitude toward the class and mathematics.
7) A more "student-centered" classroom.
8) An increase in student creativity as they prepare their lessons.

STUDENT COMMENTS

1) "I really did a lot of work in this class."
2) "Having so many different people to teach made class more enjoyable."
3) "The project forced me to read my book Later when I didn't understand how to factor cubes, I read the lesson in my book and really figured it out myself."
4) "To have students teach the class mode class fun."
5) "It helped us really get to know all the students in the class."
6) "It gave me a chance to see how it will be to teach in the future. It was hard planning ahead to be ready to answer any and all questions."
7) "it was fun planning together. I wish we had more time for that."
8) "I felt that I really learned how to do the problems in the section which my group taught. I felt good about that."
9) "One of the guys in my group was a big dork, but it was interesting how we were able to work around him and still teach our lesson in an interesting way."
10) "Some of the groups were good and some were notBut you always knew that after that day the bad ones would not be back."

RESULTS

1) Positive student attitudes towards the class
   Students were actively involved

2) Students were not frustrated
   Individual needs were met

3) High pass rate
   Students saw value and importance in what they were doing

The following pages include a sample lesson that was taught by a group in a Learning Support class. The lesson covers pages 136 -140 in the textbook, Beginning Algebra by K. Elayn Martin-Gay.

Multiplying Polynomials

Student 1

In my part of the project, I taught the students in my class how to multiply a monomial times a monomial and a monomial times other polynomials. Here are the examples that I used:

$(-5x^3)(-2x^4)$ Multiply the coefficients and add the exponents

$5x(2x^3+6)$
$-3x^2\ (5x^2 +6x - 1)$ Distribute the monomial
$(3x^2 -5x +4)\ (2x)$

Student 2 and Student 3

We taught the students to multiply a binomial times a binomial. One of us taught the students to foil horizontally and the other taught the students to multiply the same problems vertically. These are examples that we used:

$(x+3)\ (x+ 1)$
$(3x+2)\ (2x-5)$
$(2x - y)^2$

Student 4

I taught how to multiply a binomial times a trinomial and a trinomial times a trinomial. I used these examples:

$(x+2)\ (3x^2 -4x+2)$
$(2x^2 -3x+4)\ (x^2 +5x-2)$

For homework we gave the odd problems 1-65 on page 139. We let them start in class and answered their questions.