DOCUMENT RESUME

ED 437 115 JC 000 076

AUTHOR Morgan, Doris C.
TITLE Cooperative Learning in the Community College Biology Classroom.
PUB DATE 1999-07-00
NOTE 12p.; In: Issues of Education at Community Colleges: Essays by Fellows in the Mid-Career Fellowship Program at Princeton University, 1998-1999; see JC 000 068.
PUB TYPE Reports - Descriptive (141)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Biology; Cognitive Development; Cognitive Style; *College Science; Community Colleges; *Cooperative Learning; Group Activities; Group Discussion; Learning STrategies; *Science Education; Student Attitudes; Student Participation; Student Reaction; *Teaching Methods; Thinking Skills; Two Year Colleges

ABSTRACT

This paper criticizes traditional methods of science teaching for decreasing student interest in studying science. It describes cooperative learning and its usefulness in teaching biology so that the study of science becomes a social experience. The paper presents two methods used in biology lecture classes: the Introductory (Icebreaker) Workshop and the Small-Group Discussion. An example of each activity is presented in this paper. Students find that working in groups of three to five is less intimidating than raising their hands to ask questions or participating in class discussions. In small groups, students can all participate and the teacher is then free to circulate among the groups as a "guide at the side" rather than a "sage on the stage." Students lower their defenses and are thus more open to real communication and learning. The paper also explores the topics of computer-assisted cooperative learning and field trips. The paper argues that small-group cooperative learning is particularly important in the community college because of the diversity of the students, because students are commuters and do not have the time to get together on a regular basis out of class, and because it maximizes learning through a time-proven and well-researched activity. It gives students an increased chance of achieving course goals. (Contains 13 references.) (VWC)

Cooperative Learning in the Community College Biology Classroom

By Doris C. Morgan, AssociateProfessor
MIDDLESEX COUNTY COLLEGE,
EDISON, N.J.

PRINCETON UNIVERSITY MID-CAREER FELLOWSHIP PROGRAM

May, 1999

SCIENCE TEACHING:TRADITIONAL METHODS

Traditional methods of teaching science have come under increasing attack for decades. Critics have asserted that the traditional "stand and deliver" style of teaching no longer does the job, that it fails to develop students' critical thinking and problem-solving skills, and that it suppresses natural creativity and curiosity. Many college students today view the study of science as a tedious process involving rote-memorization of volumes of terms and facts with few interrelationships and little, if any, relevance to their daily lives.

Traditional science teaching methods have also increased "science anxiety" in many students and have contributed to what Karen Knorr-Cetina calls "the crisis of legitimacy in science". Knorr-Cetina states that "science is no longer taken for granted as a social resource, even by the general public". (Knorr-Cetina, 1981).

Science is not only a collection of facts but is a series of interdependent conversations between scientists and nature, and between scientists and other scientists. There is a relationship between the knowledge that science accumulates and the intellectual tradition that contributes to this accumulation. Acquainting the students with science is actually done in order to help them become members of the pragmatic intellectual community that science teachers represent, and should be among the first priorities of college and university science education. (Bruffee, 1993).

The failure of college science education to do this has resulted in a significant decrease in the number of students entering the field of science and math today. (Tobias, 1978) In the past twenty-five years "the proportion of college freshmen planning to major in science fell by half". (Tobias, 1990)

COOPERATIVE LEARNING IN BIOLOGY

Cooperative learning is the instructional use of small groups so that students work together to maximize their own and each others' learning. (Johnson, Johnson, and Smith, 1991b) In biology, students usually work in small groups in the laboratory, but in the lecture the instructor more often uses the traditional lecture or lecture-and-discussion format. Both methods are effective for the motivated, actively participating student, but the shy, less confident, more easily intimidated student is often left out of the discussions, further increasing isolation.

Faculty who are hesitant to "take time out" for group work and student-to-student interaction during lectures cite pressures to "cover the material", especially in classes of Health Technology students (Nursing, Dental Hygiene, Medical and Radiation Technology) that are being prepared for rigorous, intensive, and comprehensive Board Exams. Reserving class time for student involvement in small-group learning is often seen as requiring course content to be compromised.

Yet cooperative learning researchers and practitioners have shown that positive peer relationships are essential to success in college. (Smith, 1996) Studies have shown that two major predictors of lack of success in college are failure to establish a social network of friends and failure to become academically involved in classes. (Tinto, 1994) Working with small groups of medical students, Abercrombie found that students were better able to make medical judgments, to arrive at an unbiased consensus, and to diagnose patients faster and more effectively because they tended to "talk each other out of unshared biases and presuppositions". (Abercrombie, 1969)

BIOLOGY AS A LANGUAGE AND A SOCIAL EXPERIENCE

Students in introductory biology find that learning it is, in effect, like learning a new language. Yet we provide no "biology language lab" where students could practice using clinical and technical terminology, writing scientific terms in sentences, reading terms aloud, listening to the words used in context, and searching for meanings and interrelationships.

Learning is known to be a social experience; this is no less true in biology. Small-group, cooperative learning activities encourage students to work together, to help each other, to "bounce ideas off of each other", and to learn to "talk the talk" of science. Small group discussions allow students to "feel like they are becoming members in the discursive community". (Isenberg, 1991) It also converts "passive" learners into "active" learners who begin to "own" the course material and to gain control of their learning process. This does not mean that students won't learn important course content. Instead, "cooperative small-group activities involve shifting the professor's focus from covering course content through class presentations to devising activities that explicitly help students to "discover" and master essential course material. (Crawley, 1999) As Mortimer Adler once noted, "All genuine learning is active, not passive. It involves the use of the mind, not just the memory. It is the process of discovery in which the student is the main agent, not the teacher".

SMALL GROUPWORK IN BIOLOGY LECTURES

Two methods used in my biology lecture classes are the Introductory (Icebreaker) Workshop and the Small-Group Discussion. Students find that working in groups of three to five students is less intimidating than raising their hands to ask questions or to participate in class discussions. In small groups, students can all participate and the teacher is then free to circulate among the groups as a "guide at the side" rather than a "sage on the stage". Student-to-student interaction helps each student develop critical thinking and problem-solving skills while they begin the formation of small social groups. Students report that they feel more comfortable and relaxed in the class and are less overwhelmed by the course content; they also feel less intimidated by the professor. In small groups students are more likely to "take risks", to ask "stupid questions", and to say, " I don't know" or "I'm not sure". They lower their defenses and are thus more open to real communication and learning. They also begin to see things from "different angles" and start to appreciate others' points of view and ways of learning.

THE INTRODUCTORY (ICEBREAKER) WORKSHOP

During the first lecture class of each semester, after students have been given the course syllabus and have had the course requirements explained, a handout sheet is distributed. Directions are as follows:

INTRODUCTORY SMALL-GROUP WORKSHOP

DIRECTIONS:

A. Work together in groups of four, arranging your desks to form a small circle.

B. Each student in your group is to choose one question from those listed below and will then interview each group member, using the question chosen. As you question each member, record their answers in your notebook or on a piece of paper. Include your answer to the question as well.

C. Repeat this process for each of the four questions. (Student #2 asks each group member question #2, student #3 asks each member question #3, etc.).

D. You have 30 minutes to conduct and record all of the interviews; assign one member of your group to be the "timekeeper". Assign another group member to keep the group focused on the task.

E. After the workshop is completed, each group member will read his/her answers to the class.

Questions:

1. What is your name? Your curriculum? Your year at college? What are your career goals?

2. Why are you taking this course? What do you hope to learn in this class? Which course topics are of particular interest to you?

3. Where do you live? What are your interests/hobbies?

4. List some of the benefits and some of the problems (economic, social, and ethical) that have resulted from modern biomedical research and technology.

When the 30 minutes are up, students are asked to return their desks to their original position in the room. Students in each group who chose question 1 now report their group's answers to that question; students 2, 3, and 4 follow suit. The reporting process takes about 50 minutes, therefore, the entire workshop takes approximately 80 minutes.

Some faculty have told me that they would not want to use their entire first lecture session for what they evidently consider a "waste of time". However, it has been my experience that using the first lecture period in this way is time well spent because:

1. It allows students to get to know each other on a personal level. It reduces feelings of isolation and facilitates the formation of study groups outside of the classroom and the sharing of ideas and problems inside the class.

2. Students emerge from this first workshop feeling less overwhelmed by the course syllabus, less intimidated by the professor, less "alone", and more relaxed. (They **love** it!)

3. The atmosphere created during this first session sets the tone for the rest of the semester. Student participation in lecture discussions increases, students are less hesitant to ask questions, and they feel more in control of their own learning process.

4. It helps students to clarify their own course goals and interests and it gets them to focus on the topics in the course from the very start.

5. Students begin to "get a feel for" learning by thinking critically. They also start to listen to each other more closely

and begin to toss around ideas without worrying that they will say the wrong thing or give the wrong answer.

6. Students start to appreciate the viewpoints and thinking of others. This is important in classroom settings with the increasing ethnic, social, educational, economic, gender, and age diversity that we see today at community colleges.

SMALL GROUP WORKSHOP: THE SPINAL CORD

Students are given a reading assignment prior to the day scheduled for this workshop.

DIRECTIONS:

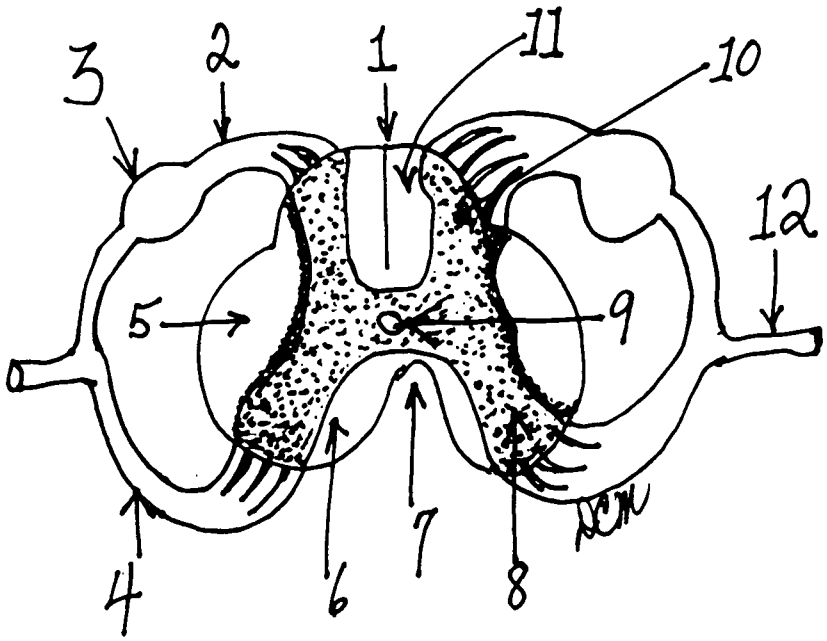
A. Work in groups of three to five students, arranging your desks in a small circle.

B. Using your textbook readings assigned for today, work together as a group to answer the following questions.

C. You have 30 minutes to complete this workshop. Assign one member of your group to be the "timekeeper". Assign another member to record the answers for the group (the "recorder").

Questions:

1. Label the sketch of a cross-section of the spinal cord below using the list of answers located beneath the diagram. Place your answers on the lines below the list of terms.



List of Terms:

Central canal	Dorsal median sulcus	Ventral root
Anterior funiculus	Posterior funiculus	Lateral funiculus
Dorsal root	Ventral median fissure	Anterior gray horn
Posterior gray horn	Dorsal root ganglion	Spinal nerve

Your Answers:

1. _____ 7. _____
2. _____ 8. _____
3. _____ 9. _____
4. _____ 10. _____
5. _____ 11. _____
6. _____ 12. _____

2. Draw a horizontal line through the spinal cord diagram, right through the central canal. Label the gray matter above and below the line with a letter "S" if the region is sensory, and with an"M" if motor.

3.a. What structures are located in regions 6, 7, and 12? _____

_____

3.b. What structures are located in regions 9 and 11? _____

_____

4. On the back of this paper sketch a "flow chart" listing, in order, the parts of a spinal "reflex arc". Define the term "reflex" and give several examples of reflexes in the body.

At the end of the thirty minutes, the students move their desks back to their original position in the room. The instructor draws the diagram of the spinal cord on the chalkboard, and asks students to use their answers to label it. A class discussion of the answers to questions 2, 3, and 4 follows.

As a result of this workshop the following results were evident:

1. The students seemed to learn the anatomy of the spinal cord much faster and were less confused by the pictures of it labeled in their textbook.
2. Students were better able to relate each structure to its function.
3. Class participation "went through the roof"! Students who previously may have been hesitant to answer in class or who were afraid to ask questions now were able to participate in a more confident manner.
4. Learning the structure of the spinal cord cross-section and the function of the spinal cord structures seemed to occur more easily.
5. Listing the parts of a reflex arc and examples of typical reflexes made the class discussion more interesting and relevant to the experiences of the students.

COMPUTER-ASSISTED COOPERATIVE LEARNING

Some of the lab sections in Human Anatomy & Physiology at Middlesex County College are presently using computer programs (A.D.A.M. and Interactive Physiology CD-ROMS from A.D.A.M Software and Benjamin/Cummings) to simulate human cadaver dissections and human physiology experiments. Computer-assisted laboratory exercises are ideal for cooperative, small-group learning. Students may work in pairs on one computer or, better yet, if the computers are clustered in groups of four, small groups of students may work together while completing their answers in a tutorial booklet.

At Vanderbilt University, human cadaver dissection in the Nursing Department's anatomy laboratory have been completely

replaced with interactive, computer-based programs. A study is currently being conducted by Alvin M. Burt, Ph.D. to determine the effectiveness of the computer-based laboratory. At Middlesex County College, a similar study will be conducted. How effective this type of laboratory will prove to be remains to be determined.

FIELD TRIPS AND COOPERATIVE LEARNING

Mario W. Caprio uses small-group cooperative learning for group projects such as field trip reports. He believes that cooperative learning combined with activities of this sort "encourage lifelong learning of science by revealing it as both emotionally and intellectually satisfying". (Caprio, 1993)

SUMMARY

There are many ways that college professors can use small-group cooperative learning exercises in lecture, laboratory, and in discussion classes. My opinion is that this is particularly important in the community college because of the diversity of the students, because students are commuters and do not have the time to get together on a regular basis out of class, and because it maximizes learning in a time-proven and well-researched manner. It gives students an increased chance of achieving course goals. In an expository classroom, many of these students would only have their lecture notes and their textbooks to rely on. Small-group learning gives them alternate sources of information, teaches teamwork, is enjoyable, and lets the learning occur through social interaction and group dynamics. Preparing for cooperative learning sessions is hard work for the professor and it takes much practice, but it is certainly worth the time and the effort. The rewards are not only academic.

A leader is best

When people barely know he exists.

Not so good when people obey and acclaim him,

Worst when they despise him.

But of a good leader, who talks little,

When his work is done, his aim fulfilled,

They will all say, "We did this ourselves."

Chinese philosopher Lao-Tse (Bynner, 1962)

REFERENCES

Abercrombie,M.L.J. The Anatomy of Judgment. Hammondsworth, England: Penguin, 1969.

Bruffee, Kenneth A. Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge. Baltimore, Md. Johns Hopkins University Press, 1993.

Burt,A.M. "Interactive Computer Programs in the Anatomy Laboratory". In: Human Anatomy & Physiology Society Educator (HAPS-ED), February 1998.

Caprio, Mario. "Cooperative Learning----The Jewel Among Motivational-Teaching Techniques." In: The Journal of College Science Teaching. March/April 1993.

Crawley,A., Eisen,J., Gillespie, K.H., and D. Lieberman. "Exploring the Active Learning World." In: Thriving in Academe. NEA and POD Network in Higher Education, 1999. podnet @valdosta.edu or clehane@nea.org.

Isenberg,Jane. "Talking Across the Curriculum: Why and How." A paper presented at Princeton University, Mid-Career Fellowship Program, May 1991.

Johnson,D.W., Johnson,R.T., and K.A.Smith. Cooperative Learning: Increasing College Faculty Instructional Productivity. ASHE-ERIC Higher Education Report No. 4, Washington, D.C.

Knorr-Cetina, Karen D., The Manufacture of Knowledge: An Essay on the Constructivist and Contextual Nature of Science. Oxford: Pergamon, 1981.

Smith, Karl A. "Cooperative Learning: Making Groupwork Work." New Directions for Teaching and Learning, no.67. Jossey-Bass Publishers, Fall 1996.

Springer,L. "Research on Cooperative Learning in College Science, Mathematics, Engineering, and Technology." Cooperative Learning and College Teaching, 8(3), 2-4.

Tinto,V. Leaving College: Rethinking the Causes and Cures of Student Attrition, (2nd ed.). Chicago: University of Chicago Press, 1994.

Tobias, Sheila. Overcoming Math Anxiety. New York: Norton, 1978.

Tobias, Sheila. They're Not Dumb, They're Different: Stalking the Second Tier. Tucson, AZ.: Research Corporation, 1990.

Contributor

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Issues of Education at Community Colleges. Essays by Fellows in the Mid-Career Fellowship Program at Princeton University 1998-99	
Author(s): Fellows of the MCFP Program, 1998-9	
Corporate Source: Mid-Career Fellowship Program at Princeton University	Publication Date: July 1999

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign at the bottom of the page.

The sample sticker shown below will be affixed to all Level 1 documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

Level 1

X

Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g., electronic) *and* paper copy.

The sample sticker shown below will be affixed to all Level 2A documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2A

Level 2A

☐

Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only

The sample sticker shown below will be affixed to all Level 2B documents

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2B

Level 2B

☐

Check here for Level 2B release, permitting reproduction and dissemination in microfiche only

Documents will be processed as indicated provided reproduction quality permits.
If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Sign here.→

Signature: TK Rabb	Printed Name/Position/Title: Theodore K. Rabb, Director
Organization/Address: Mid-Career Fellowship Program at Princeton, 129 Dickinson Hall Princeton, NJ 08544-1017	Telephone: (609) 258-4994 FAX: (609) 258-5382
	E-Mail Address: tkrabb@princeton.edu Date: 11/30/99