Ideas in Practice

Structured Controversies

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Structured controversy is an instructional technique, based on cooperative group learning, that has been effective in stimulating student involvement in issues concerning technology and society. Controversy exists when one person's ideas, information, conclusions, theories or opinions are incompatible with those of another person, and the two seek to reach an agreement.[1] Since controversy is an inevitable part of any group's natural interaction, it follows that if it is managed effectively, controversy can lead to an exciting and effective group learning experience. The structured controversy format, proposed by Johnson and Johnson in 1979,[2] provides the means for managing controversy constructively.

Preparing first-year and second-year students for a professional career in engineering requires more than ensuring their technical competence.[3] They must learn to analyze effectively, think critically and synthesize different perspectives on difficult technological and societal issues. The purpose of courses that use the structured controversy format at the University of Minnesota is to focus student attention on such issues as energy production, hazardous waste, air pollution, acid rain and wilderness areas. The courses focus less on content acquisition than on helping students develop collaborative skills (through working in small groups), constructive conflict management skills (through structured controversy discussions) and perspective-taking skills (through presentation and discussion of differing perspectives on each issue).

Research has been conducted using the structured controversy instructional format since it was first described in 1979. These studies in science, engineering and social studies classes concluded that controversy, compared with concurrence-seeking and individualistic study, promoted higher achievement and retention, greater searches for information, and more cognitive rehearsal (acquiring, organizing and retaining information through repetition and elaboration), accurate understanding of the perspectives, continuing motivation, and positive attitudes toward controversy and classmates.[4-8]

The Structured Controversy Format

Although considerable research has been conducted using the structured controversy format, it is relatively new to the classroom teacher. Two excellent summaries of instructional strategies for constructive controversies are available.[9,10] Conducting a class using the structured controversy format involves the following steps: 1) choose a discussion topic, 2) prepare instructional materials, 3) prepare students for structured controversy, 4) structured controversy, and 5) wrap-up/evaluation.

1) Choose Discussion Topic: Choosing among the many potentially controversial topics depends on the instructor's interests and the focus of the course. Criteria for selection include that the controversial topic have several well-documented positions and that content be at a level that students can handle. Most environmental, energy, wilderness, endangered species, national defense and other topics involving technology and public policy are appropriate.

2) Prepare Instructional Materials: A balanced presentation should be given of all sides of the controversy. Materials should be separated into packets containing papers supporting each position. Specific points on preparing materials depend on whether a short (one class period) or long (two or more class periods) discussion time is planned. For the short structured controversy it is important to include a statement of the central issue (the problem to be solved or decision to be made), a written summary of the key arguments of each position, a few papers

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supporting each position and a clear description of the group's task. For the longer discussion the same items are needed, with the possible exception of the listing of key arguments; students could be required to generate these arguments. Also needed are several papers describing the issue and providing factual information and support for each position, a bibliography of additional papers, and the expected outside class preparation.

3) Prepare Class for Structured Controversy: The principal prerequisites for a successful structured controversy are a cooperative context, skillful group members and a clear procedure. A cooperative context, set by the teacher in establishing a group goal, is essential. A cooperative group learning experience that has emphasized social-skill development is usually adequate preparation for the students. The structured controversy format and discussion rules, as well as the process monitoring procedure,[11] should be reviewed with the students before the discussion. Students are assigned to groups of four, and each pair of students is assigned a position (or side) on the controversy. Heterogeneity among the group members adds to the resources and perspectives of the group and can contribute to the quality of the structured controversy experience.

Briefly, the discussion format involves preparation, presentation and discussion of the assigned position, as well as the opposite position, and is followed by a general discussion and group decision before a final group report is prepared.

4) Conduct Structured Controversy: The structured controversy procedure promotes a cooperative context, active participation of group members, open communication, enthusiastic airing of all ideas and emotions, several cycles of differentiation and integration, and rational argument. Specific procedures are needed to be sure students are motivated to search for information, take new perspectives, master material, be creative, cohesive and contribute a high quality of decision making and problem solving. The teacher and representatives from each group monitor the interaction to provide information on the group's performance for later evaluation. Instructions are given to students concerning the structured controversy:

Instructions to Students

a) Meet with your partner and plan how to argue effectively for your position. Make sure you and your partner have mastered as much of the position as possible.

b) Each pair presents their position. Be forceful and persuasive in presenting your position. Take notes and clarify anything you do not understand when the opposing pair presents their position. Remember, you do not have the same information as the opposing pair.

c) Open discussion. Argue forcefully and persuasively for your position, presenting as many facts as you can to support your point of view. Listen critically to the opposing pair's position, asking them for the facts that support their point of view. Try to think of counter arguments. Remember, this is a complex issue and you need to know both sides to write a good report. Work together as a total group to get all the facts out. Make sure you understand the facts that support both points of view.

d) Role reversal. Reverse the perspectives in the group by each pair's arguing the opposing pair's position. In arguing for the opposing position, be as forceful and persuasive as you can. See if you can think of any new facts that the opposing pair did not think to present. Elaborate their position.

e) Come to a group decision that all four of you can agree on. Try to reach a consensus supported by facts. Change your mind only when the facts and rationale clearly indicate you should do so. Summarize the best arguments from both points of view. Detail the rationale for each argument. When you have consensus in your group, organize your arguments for inclusion in your report.

Discussion rules are an integral part of the procedure to ensure an effective structured controversy. The discussion rules that students are instructed to follow during the controversy are as follows:

- I am critical of ideas, not people. I challenge and refute the ideas of the opposing pair, but I do not indi-

Lesson Plan for Two-Hour Structured Controversy

"Regulations in Hazardous Waste Management: More vs. Fewer"

Objective: Following this exercise students will be able to cite the major arguments for more and fewer regulations and will be able to give rationales for each.

Task: Students will work cooperatively in groups of four to discuss the issue of regulations in hazardous waste with the goal of arriving at joint recommendations. Begin by differentiating the positions, seeking rationales and clarification, and then try to integrate. A group report, entitled "The Role of Regulations in the Management of Hazardous Waste," is required.

Activities:

Review procedure and rules (5 minutes)
Prepare presentation with partner (10 minutes)
Present arguments (5 minutes for each side)
General discussion (15 minutes)
Reverse roles
  Prepare presentation with partner (10 minutes)
  Present arguments (5 minutes for each side)
Discussion, decision making and report preparation (30 minutes)
Whole class sharing of group's decision (10 minutes)
Processing of experience (10 minutes)
Closure and assignments for next class

Evaluation: Each group's report will be evaluated for the clarity of the recommendations and the quality of the rationale given for each position.

cate that I personally reject them.
- Remember, we are all in this together, sink or swim. I focus on coming to the best decision possible, not on winning.
- I encourage everyone to participate and to master all the relevant information.
- I listen to everyone's ideas even if I don't agree.
- I restate what someone has said if it is not clear.
- I first bring out all ideas and facts supporting all sides, and then I try to put them together in a way that makes sense.
- I try to understand all sides of the issue.
- I change my mind when the evidence clearly indicates that I should do so.

5) Lead Wrap-up/Evaluation: As with all group learning experiences, an important step is to process the performance of the group by discussing information from the teacher, designated observers and group members. An analysis of controversy-management skills may provide information for improving a student's effectiveness. Other topics for discussion include suggestions for improving structured controversies and plans for improving knowledge and understanding of controversial issues.

Applications

The structured controversy format has been used in several courses for engineering and liberal arts students at the University of Minnesota. These included two-hour to four-hour discussions of energy production (coal vs. nuclear), hazardous waste (dispose vs. eliminate) and hazardous-waste regulations (more vs. fewer) in metallurgical engineering courses; ten weeks of structured controversies on hazardous-waste issues in a two-hour honors seminar; and ten weeks of structured controversies on environmental issues in a two-hour honors colloquium. A 20-week joint Institute of Technology and College of Liberal Arts honors seminar for about 120 first-year students is planned; the structured controversy format will be featured for several issues involving technological choices and public policy alternatives.

A lesson plan for a two-hour structured controversy in a metallurgical engineering course with 42 students is shown above. Students were randomly divided into groups of four, and each person was assigned a partner and a position on an issue. The lesson plan, discussion format and discussion rules were given to each group of four students to review and clarify the task. Each pair was then given a packet that contained a summary of the issue, several statements supporting their assigned position, and a few relevant articles. Students were then instructed to begin the structured controversy process.

A longer class period, or multiple class periods, is desirable for conducting the structured controversy in order to give students the opportunity to prepare outside of class and develop a more complete understanding of the issue and the process. Activities that contribute to increased understanding include periodic talks with a partner to identify the best arguments for both sides, caucusing with other pairs representing the same side to share best arguments and strategies, shedding an assigned role to reach a consensus, and carefully reviewing the effectiveness of the group in managing the controversy.

Conclusions

Structured controversies have been found to be extremely interesting and stimulating to students. Although used to discuss societal and technological issues at Minnesota, they could equally well be applied to different approaches to solving engineering problems. Structured controversies have great potential for helping engineering students master content, develop perspective-taking skill and improve their ability to work with and understand others.

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