

# Structured Group Learning in Undergraduate and Graduate Courses

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## ABSTRACT

Students in both undergraduate and graduate courses often lack experience working effectively in groups. Instructors frequently find it easier to lecture rather than use group learning techniques. Lessons learned from implementing group learning using structured experiences in two courses are presented. Structured experiences refer to a process in which students learn as a group through discovery. Test results, quantitative and qualitative student assessments, and instructor observations were used to assess the effectiveness of group learning. From the instructors' perspective, we learned that a balance is needed between the amount of lecture content provided and time for group interaction. Increased planning time was needed to develop group experiences. From the students' perspective, more students became actively engaged, they learned group process skills, and they learned from each other. Student evaluation scores from the undergraduate course increased following adoption of group approaches. Final exam scores indicated that undergraduate students learned a similar amount of content with either approach. Qualitative evaluations indicated that graduate students who were practicing teachers gained valuable experience in group learning to apply in their own classrooms. During the actual delivery of a group activity, the role of the instructor shifted from lecturer to facilitator. The group format was found to enhance learning without sacrificing knowledge.

ENGAGING STUDENTS in a structured group learning process provides both challenges and opportunities. Cashin (1985) found that 71% of higher education classes used the lecture approach for content presentation. Lectures generally transfer knowledge and encourage comprehension (Ellington, 1984), but usually do not promote higher levels of thinking such as application, analysis, and synthesis (Hunter, 1982). Today's workplace expects more involved thinking from our graduates.

Group techniques have been applied widely to a variety of content areas in higher education ranging from biology (Goodwin et al., 1991) and physics (Duch, 1996) to statistics (Borresen, 1990) and social work (Latting and Raffoul, 1991). In agricultural and natural resources classes, group process techniques have been used for laboratory and field experiences. Arthur and Thompson (1998) implemented an active learning environment for a natural resource conservation and management capstone level course.

Initial planning is key to the success of group learning activities. The extent of planning is driven by class size, class level, time available, and content to be covered. The ideal group size is determined by the size and arrangement of the classroom space, and the nature of the group experience. In-

dividuals working alone have been found to be appropriate for generating information such as a list (Leone, 1992). Pairs have been useful for sharing information. Triads combine a pair with an observer who can provide feedback. Groups of four to six people are effective at generating ideas or large amounts of information in a short time. However, groups larger than six were not well suited for sharing information and developing skills, since some members may not actively participate (Leone, 1992).

Group composition depends on the objective for the group activity. Group membership can be random, assigned, or self selected by students. Cumming (1983) determined, in a statistics course, that students assigned to mixed-ability groups did not perform significantly different on tests compared to students assigned to similar-ability groups. However, Borresen (1990), in another statistics course, noted that performance was significantly different among high-, medium-, and low-ability groups. He further found that performance of both randomly assigned and voluntarily formed groups was higher than that of traditional nongrouped students. Finally, groups formed voluntarily outperformed randomly assigned groups on individual tests, and that difference increased as the semester progressed (Borresen, 1990).

Previous works also suggest that the teaching of group roles is important to an effective structured group experience (Ellington, 1984). Two major group functions are task roles to accomplish goals and group building or maintenance roles to strengthen group functioning (Nylen et al., 1976; Nandy, 1991). Nonfunctional roles, such as blocking discussion or dominating the group, interfere with group tasks. Nandy (1991) classified group roles by the broad functions of direction, guidance, or evaluation for the group. Members who posed questions or set ground rules provided direction. Members who clarified information, integrated data, or brought in nonparticipating members provided guidance. And members who assessed the progress of the group in achieving the tasks provided evaluation. Examples of these roles include the *instructor* who supplies data, the *coordinator* who integrates data, the *peacemaker* who works for harmony, and the *gatekeeper* who maintains discipline (Table 1).

Other planning options to consider include whether projects are completed in-class vs. out-of-class, whether students work as a group on individual projects or as a group on a group project. For out-of-class group projects, the decision of whether or not to incorporate time in class to initiate the group experience and to provide structure for the process can be considered.

This article describes the lessons learned from implementation of structured group learning experiences in an undergraduate natural resources class and a graduate education class. The implementation of structured group experiences required us to consider what course lecture content would be forfeited, what techniques would be used to engage students in group experiences; and how we would assess student learn-

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**Table 1. Group roles (after Nandy, 1991).**


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A. Instructor: Answers questions and supplies data.
B. Follower: Provides support and encouragement.
C. Coordinator: Links and integrates data.
D. Peacemaker: Works for harmony and compromise.
E. Gatekeeper: Maintains rules and discipline.
F. Monitor: Makes sure relations are working.
G. Pioneer: Asks questions and seeks data.
H. Leader: Initiates group norms and style.
I. Commentator: Elucidates and analyzes relevant data.
J. Promoter: Helps and encourages the quiet members.
K. Critic: Assesses and analyzes relevant data.
L. Reviewer: Periodically checks and corrects people.

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ing. Student learning was evaluated using a quantitative approach in the undergraduate class and a qualitative approach in the graduate class. Structured group learning experiences were designed to teach students to apply concepts learned from the lectures to experiences based on real world examples.

### Application to the Undergraduate Course

Introduction to Water Resources (NRME 245) is an upper division undergraduate elective course taken by natural resources majors. The three-credit course is taught in alternate years; enrollments have ranged from 39 to 57 students. The course had been traditionally taught using three 1-h lectures per week for 14 wk. During the first year of the conversion to group format, the course met for one 3-h group period each week. Outside readings from a text replaced lecture content. However, students struggled with text assignments without guidance on what specific content was important. During the second year of the group format, a 1-h lecture session was added to the 3-h group period to discuss course content. Attendance was mandatory with one unexcused absence for the semester accepted. Points were assigned for completed in-class exercises with no credit given when a student was absent.

Permanent groups were created to help students develop long-term working relationships among members. Groups had five to six randomly selected students each, typically resulting in 8 to 10 groups in the class per semester. Groups were named after components of the hydrologic cycle (e.g., precipitation, evaporation).

The typical group session included a 20 to 30 min lecture, a 2-h group exercise(s), and a closure or report-back period. The outlines found in the Annual Developing Human Resources Series (Pfeiffer, 1994) were useful in developing a group learning experience. These outlines included goals, group size, time required, materials needed, physical setting, and a step-by-step listing of the process used. A few examples illustrate the format.

Two class sessions focused on group member roles and responsibilities. The initial class session on roles was a cooperative learning experience called Lost at Sea (Nemiroff and Pasmoe, 1975). This exercise measured improvement in survival success by comparing individual to group decision-making. The second session, conducted at the midterm, included a *team effectiveness* evaluation worksheet, a lecture on group roles, an activity assigning roles to group members, and a reading assignment on multiple group roles (Nandy, 1991). During the group roles activity, students assigned the names of group members to the roles listed in Table 1. They were in-

**Table 2. Instructions for Jack and John's BMP Mall from NRME 245.**

Instructions: A 14-unit townhouse development is being proposed in the town of Waterford, CT. Your objective is to develop a program of Best Management Practices (BMPs) that reduces the potential nonpoint-source pollution from the project by 80%. You should consider nonpoint source pollution to include suspended solids, nutrients, oxygen demand, bacteria, and heavy metals in runoff. Measures should be recommended for the planning, construction, and long-term operation of the development. You may change the development in reasonable ways, such as building and road locations. However, you may not reduce the number of townhouse units on the property.

Your group will be given \$30 810 with which you can buy the BMPs. To purchase an item, one member of your group should go to "Jack and John's BMP Mall" where the cost of each BMP is listed. Watch for the "Blue Light" special. Once you have purchased your BMPs, your group must locate the BMPs and redraw the development on the flip chart pad. Choose a spokesperson to present your results to the rest of the class. You may find it useful to divide up the jobs in doing this exercise, such as a draft person, the buyer, someone to calculate basin sizes, economist, BMP effectiveness expert, spokesperson, or any other needed position.

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structed that some roles might be assumed by more than one person, and some roles might never be assumed by any group member. All of the roles described in Table 1 were positive roles. The lecture also discussed negative group roles including blocking, dominating, avoiding, and recognition seekers.

Three of the 14 group sessions encouraged intergroup competition to increase group working relationships, while all sessions involved cooperative learning within groups. An example of intergroup competition involved two separate sets of instructions for a group activity performing complex mathematical unit conversions. One set instructed students to rush as fast as they could with a yell when the exercise was completed. A group leader was instructed to push the group members to rush the exercise process along. The second set requested caution, as time was not a factor. The session goal was to determine the correct answer, not to work at the greatest speed. Groups that did not rush obtained the correct answer more frequently than those that rushed the process.

As the semester progressed, group projects became less competitive and increasingly problem-solving oriented. Exercises included evaluating the major source of lake eutrophication and managing a watershed to produce more water for an expanding population. For example, the goal of "Jack and John's BMP Mall," was to gain experience in selecting best management practices (BMPs) for improved water quality. The exercise began with a brief (20 min) lecture on urban BMPs. Then each group received \$30 810 in play money to be divided equally among its members, handouts on urban BMPs and their effectiveness, instructions (Table 2), maps, and materials for measuring areas and recording their plans. The BMPs were then purchased for an urban subdivision. Members of the groups had to "give up their money" as a way of agreeing on the BMPs used.

### Assessment of Student Learning

Each student was individually graded based on completion of problem sets in class by the group, individual computational homework assignments, and a midterm and comprehensive final exam. Grading was equally split among the four categories. Exams were based on material presented in lecture, the readings, and group exercises.

Members critiqued the group activity via a team effectiveness evaluation instrument from Alexander (1985). During the first year, evaluation occurred at semester's end; during the second year, evaluation was conducted at midterm to

be used as a learning tool. A seven-point scale was used for each question. To simplify data analysis, responses were re-grouped into three categories: generally agrees, unsure, and generally disagrees. The  $\chi^2$  statistic tested frequency differences among category responses.

Generally, group members were satisfied with group function effectiveness (Table 3). Groups indicated that they had agreed on goals, that members' resources were utilized and trusted, that participation and communication were open, and that creativity was fostered. However, groups were uncertain that they adequately evaluated their functioning in the group process. Second-year responses were likely more positive than during the first year, perhaps because of the increased time spent in teaching group roles and responsibilities.

Student course evaluations indicated greater preference for the structured group experience than the lecture format. According to a university-wide instrument, overall student evaluations rose from 9.0 to 9.1 and 9.6 (on a 10.0 scale) when the previous year's lecture format was compared with the first and second year's group format, respectively. Average overall point totals on the final exam indicated that students learned about the same content with either approach (87, 83, 85; for lecture, group year 1, group year 2, respectively).

### Lessons Learned

Preparation for the structured group approach required more time than a typical lecture course. The instructor's teaching activity during the group session was, primarily facilitative rather than lecturing. Actual time of completion for a group activity was often over- or underestimated and required experience for improved accuracy. Different groups were found to operate at different rates. Fast groups were given their homework assignments early so that they could remain active. Involvement of all students in the group activities was important. One successful way of guaranteeing involvement was to separately deal out information (e.g., cards with different pieces of information on them) to each member of the group. To solve the group problem, each student had to share their information verbally with other group members. One example of this was an exercise in complex unit conversions. Partial information was given to each group member on pieces of paper, including some irrelevant information. The correct answer could only be obtained by sharing the information.

Informally, students indicated more willingness to speak out in a small group than before the whole class. This was a surprise finding. Many students are likely intimidated by speaking out in large groups created by the lecture approach. Small groups create a more comfortable situation for communication among members.

### Application to the Graduate Course

The following assumptions guided the design of structured group experiences in the graduate course, Curriculum and Evaluation EDUC 545:

1. Students are a good source of information for other students.
2. Students come with knowledge gained from prior learning and experience, and this prior knowledge base may vary widely within a class.

**Table 3. Summary of student critique of effectiveness in group situations in NRME 245 (based on an instrument from Alexander, 1985).**

	Percentage agreement, %†							
	Year 1 (n = 57)				Year 2 (n = 39)			
	A	U	D	$\chi^2$	A	U	D	$\chi^2$
Goals and objectives understood and agreed upon	86	11	4	44.67***	97	3	0	47.57***
Member resources recognized and utilized	68	18	14	20.18***	92	5	3	39.32***
High trust among members, conflict dealt with	77	14	9	30.08*	97	3	0	47.57***
Full participation in leadership, roles shared	68	14	18	16.33***	74	24	3	25.12***
Effective procedures to guide team functioning	76	9	15	25.74***	90	8	3	35.97***
Communication between members open	84	9	7	38.63***	97	3	0	47.57***
Agreed on problem solving, decision making approaches	73	15	13	11.65***	89	5	5	33.96***
Experiments with different methods, creative	83	11	8	35.01***	97	3	0	46.25***
Evaluated frequently	51	20	29	4.52	69	13	26	5.23

\*, \*\*, \*\*\* Significant at  $P = 0.05$ ,  $P = 0.01$ , and  $P = 0.001$ , respectively.

† Percentages categorized as Agree (A), Unsure (U), and Disagree (D).

3. Students should be actively engaged in their learning, thereby assuming responsibility for their own learning.
4. Group learning experiences work best when there is no one right answer to a problem.
5. With group experiences, lecture content must be reduced.

Based on these five assumptions, structured group experiences were designed for students to teach each other what they had read, to discuss what they knew from other classes or from work experiences, and to design a project or presentation that applied their learning to a real world situation.

This 3-credit-hour course was taught for two semesters as one class session per week in the evening and was also taught for two semesters during the summer with two afternoon class sessions per week. Class size ranged from 6 students (who functioned as a single group) to 20 students. Class members were practicing teachers, so student time constraints were a factor.

Three texts were used with the first being *Curriculum and Aims* (Walker and Soltis, 1992), a theoretical overview of curriculum development. The second text, *Smart Schools, Smart Kids* (Fiske, 1991), was a practical application of curriculum reform, which was primarily used as the basis for the extended group experience. The third text, *Creating the Thoughtful Classroom* (Udall and Daniels, 1991), focused on critical thinking strategies and was used for class lectures and incorporation of teaching strategies into group presentations.

During the first 2 wk, the same journal or popular press article, relevant to curriculum development or school reform, was given to each student. During class time, working in randomly assigned small groups, the article's content was discussed with other group members. During Week 3, groups of four randomly assigned students worked collaboratively to mind-map (a technique for visually representing information), or outline the content of an assigned article. During Week 4, each student read one of four different articles. Working in groups of four, students presented the content of their articles to other group members. These techniques allowed



class members to meet other members of the class and to self-select into groups of five students for the structured group experience based on *Smart Schools, Smart Kids*.

During Weeks 5 through 9, groups received minimal written instructions for the group experience, providing maximum flexibility as each group determined its course of action. Students were told that Chapters 1 and 10 would be covered by lecture. Working as a small group, students decided how to divide the other eight chapters of *Smart Schools, Smart Kids* among themselves. The group assigned each student a portion of the text; then the student presented those chapters to the small group. Each group determined the work division, the order for presenting the chapters, and the teaching methods to be used. The course syllabus outlined questions to consider in preparing the presentation such as:

- What are the main points covered in the chapter?
- What are some ideas about which I was surprised?
- How does this chapter apply to my classroom or the classroom of others in the group?
- What would be an effective way to present this chapter other than lecture?
- What do I want the other group members to remember as a result of what I say?

The content of the class lectures followed the content of the chapters in *Smart Schools, Smart Kids*. Group members not presenting the chapter from the text read supplemental materials on curriculum reform related to the lecture content. The group presenter focused on the Fiske text, presenting two chapters during each 1-h period. No grades were given for the individual presentations within the groups. Lecture content built on the Fiske text but did not duplicate.

Each group selected a topic related to school reform or curriculum development to present to the entire class. The course syllabus provided suggested topics for presentations. Each member of the group was expected to present, to the instructor, physical evidence of what the group member had learned. This could be a paper, a curriculum outline, or a bibliography on the topic.

### ***Assessment of Student Learning***

This course included a learning contract in which students determined how they would be evaluated in five areas, within a given point value range. The five areas were weekly journal entries (10–15 points), structured group presentation to the entire class (5–10 points), class participation including group involvement (10 points), a reflective paper on the Fiske chapter presented to the small group (5–15 points), a curriculum project (30–50 points), and an assignment of choice based on options presented in the syllabus (5–10 points).

Each person completed an evaluation form to assess the involvement of every member in their *Smart Schools, Smart Kids* group. This instrument, designed by the instructor, used a 50-point scoring system to assess performance. Structured group participation was considered as part of the final class participation assessment (10/100 points). Students were evaluated by other group members as follows: 20 points for the small group presentation including preparation, techniques used, content learned, and suggestions for improving; 10 points for each person's role in the group presentation to the

total class; and 5 points each for dependability, willingness to share information, cooperation, and ability to communicate.

The instructor and all class members evaluated the final group presentation to the class. Class members each received a file card. On one side, they placed a plus sign (+) for positive remarks and on the other side a minus sign (–) for suggestions for improvement. The instructor collected and reviewed the comments before returning the cards to the group that had been evaluated. All comments were anonymous, were used for feedback purposes only, and were not considered in the grading process.

The instructor also generated an evaluation form to assess the group presentation. This form consisted of 5 points each for introduction, presentation methods and techniques, involvement of the class, timing of the presentation, and the question and answer period; 10 points for evidence of learning; and 15 points for the content.

The instructor's evaluation and the class members feedback, written on the ± file cards, were returned to the group that had presented. Each group member received the same grade for the group presentation. This grade was based solely on the instructor's assessment and counted for 5 to 10 points of the final grade, depending on the individual's learning contract.

### ***Evaluation of the Group Experience***

In individual course journals, students reflected on the structured group experiences, reviewing their contribution to the group, applying what they had learned to another setting, and deciding skills they still needed to learn. This alternative form of assessment encouraged student feedback and helped to monitor student understanding, thus strengthening the connection among the structured group learning experience, course content, and real life experiences of the student. The instructor read and commented on each journal entry every 4 wk, providing suggestions to strengthen the reflective process.

Course evaluation included both the official university end-of-semester quantitative evaluation form and a final journal entry evaluation of the course. Students consistently rated the quality of instruction and the overall class quality as high or very high on a five-point Likert type scale. Qualitative comments related to the structured group experience were reported by 39 of the total 46 (84.8%) students over the four semesters the course was taught. Positive comments indicated students found working in small groups to be intellectually challenging and stimulating (51%); small groups provided an opportunity to communicate with other professionals (44%); the balance among individual, paired, small group, and whole group activities was appreciated (39%); working in small groups offered a personal stake in learning because students read more closely, listened better in class, learned from the peer-to-peer teaching, and were more comfortable participating in the total group (38%); working in small groups created a sense of trust and learning was enhanced; (33%); students had a higher level of understanding of how groups work (28%); the format for the class seemed overwhelming at first (23%); and working in small groups helped students to better understand the course content that had been presented during lecture and that they had read (10%).

As expected, the qualitative evaluation of the structured group experience also resulted in negative comments including: group projects created more work for students (15%); students thought this class would be boring (13%), however, 80% of those said it was not; and some students were uncomfortable paired with people they did not know (5%).

Regarding the Fiske chapter presentation experience, students reported an increased focus on the readings because of an obligation to the group. Students reported finding the strategy of dividing the class into small structured groups a very thoughtful one since working with different people created new relationships. These structured groups provided an opportunity to engage each other's thinking over time.

While these data were collected from the end-of-semester journal entries, they form the basis for a quantitative assessment, which could be added to the university-wide evaluation form. Focusing the instructions for writing the final journal entry by asking for specific comments on group experiences would lead to more quantifiable data. While no data were collected to assess knowledge gained, the majority of students self-reported a perceived increase in learning.

### **Lessons Learned**

The length of structured group experiences varied from 10 min to share the highlights of an article, to 1 h to develop a project idea or to teach a chapter from the Fiske text. Determining what lecture content to eliminate was not easy. Reading assignments were carefully selected for content, and students were told that they were responsible for text content, even if it was not covered in a lecture. Structured group experiences assumed that students had read the assignment before class. The balance between lecture content and time for group experiences evolved over time with approximately half of class time devoted to group experiences.

The graduate structured experience had few problems related to group composition or attitude of members. While members did not know each other when the course began, for the most part they worked well collaboratively. As class size increased, the time needed for group experiences increased. The greater the enrollment in a class was, the easier it was to structure group experiences as students had more options for class members with whom to work and topics to discuss.

On the final course evaluation, students commented that evaluating the contributions of other group members was insightful, yet difficult to make an honest assessment of the work accomplished. Final evaluations indicated that structured group learning provided students valuable experiences in group learning to apply in their own classrooms.

### **DISCUSSION AND CONCLUSIONS**

Incorporating group learning into both the undergraduate and graduate classes presented opportunities and challenges. The benefits of group learning were many and included increased sharing of knowledge, more open communication, increased group process experience, and increased peer-to-peer interaction. Shifting from the lecture approach to group learning increased active student involvement. Students gained an understanding of how groups function, which may be as important as course content in today's working environment.

Based on discussions with colleagues, one of the greatest fears in shifting the course format from lecture to group is that content will be sacrificed and students will learn less. Course content, typically presented in class lectures, was reduced using the group approaches described here, but students appeared to learn content through other means. These other methods included (i) outside reading and (ii) focused reading during group exercises. Test results in the undergraduate course indicated no difference in content learned using the two different approaches of lecture and group learning. The graduate course focus was less on lecture than was the undergraduate course. Instructors might consider first trying group approaches in graduate courses.

Preplanning is crucial for group exercises and will take more time than preplanning for the traditional lecture approach. During the actual delivery of a group activity, the role of the instructor shifts from being a lecturer to being a facilitator. Some instructors may benefit from training in facilitation. Teaching the roles and responsibilities of group interactions will increase group effectiveness.

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