

## THE EFFECT OF COOPERATIVE LEARNING TEAM COMPOSITIONS ON SELECTED LEARNER OUTCOMES

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### Abstract

*The purpose of this study was to determine the effect of cooperative learning team compositions on selected learner outcomes. The research hypotheses were as follows: (1) heterogenous learning style teams will achieve higher course grades and higher scores for team activities than homogenous learning style teams; (2) homogenous learning style teams will report higher levels of satisfaction with team activities and will have a higher rate of class and team activity attendance. The sample consisted of 90 students, including 75 enrolled in a junior level leadership class in agricultural education and 15 enrolled in a senior level agronomy class at Iowa State University. Students were organized into teams at the beginning of the semester based upon their preferred learning style. In this study, four different team compositions were used including field-dependent, field-independent, field-neutral, and mixed. The results led to the following conclusions: (1) cooperative learning teams formed to achieve heterogeneity of learning styles do not achieve higher course grades and higher scores for team activities than homogenous learning style teams; (2) cooperative learning teams formed to achieve homogeneity of learning styles do not report higher levels of satisfaction with team activities and do not have a higher rate of class and team activity attendance.*

### Introduction

Cooperative learning is being used more frequently at all educational levels and across many subject areas. It has proven to be an effective instructional tool for enhancing student achievement (Slavin, 1996). Decisions about how to apply cooperative learning can be based on one or more theoretical perspectives. Slavin identified four major theoretical perspectives on cooperative learning that include motivational, social cohesion, developmental, and cognitive elaboration.

The motivational perspective seeks to impact student learning by establishing an incentive structure that rewards individuals only when group goals are attained. Even though there is a focus on group goals, all team members must learn. This system encourages members to help each other succeed. One way of accomplishing this type of team atmosphere is by factoring members' achievement scores based on individual

performance into the team's grade. The social cohesion perspective suggests that cooperative learning is successful because members of the group genuinely want each other to succeed. With this perspective the importance of incentives and individual responsibility for learning are not as important. The developmental perspective is a cognitive theory that assumes student interaction in relation to appropriate tasks impacts achievement. Learning is enhanced through discussion because of the cognitive processes that accompany conflict and the exploration of different levels of understanding. The developmental perspective, like the social cohesion perspective, does not support the use of extrinsic incentives for collaborative learning. The cognitive elaboration perspective presumes the impact of cooperative learning to be a result of cognitive restructuring. By thinking about information and explaining it to someone else, students can enhance learning. Cognitive elaboration strategies are often employed with student dyads (Slavin,

1996).

Cooperative learning can be used as an effective teaching tool. A key question related to cooperative learning is: How should cooperative learning teams be formed? Factors such as students' ability, gender, friendship, age, personality and use of rewards may affect group achievement (Kutnick and Rogers, 1994). In addition, Hertz-Lazarowits, Kirkus, and Miller (1992) listed five essential requirements for groups to function successfully. The requirements included sharing a common fate; striving for mutual benefits; having a long-term time perspective; having a shared identity as an individual and as a group member; and mutual obligation, responsibility, and investment.

Group heterogeneity with regard to skills, abilities, and perspectives has been associated with effective groups (Abrami et al., 1995; Shaw, 1983). Sharon and Sharon (1976) recommended forming heterogeneous groups with regard to personality and expressive styles. They suggest that this can help stimulate group discussion and provide needed skills and abilities. Learning styles information may provide a useful means of achieving group heterogeneity. Romero-Simpson (1995) reported that a balance of diverse learning styles in teams significantly reduced fear, enhanced effective problem solving, and contributed to group synergy. In a study of community college students, Price (1992) concluded that heterogeneous learning style groups contributed to reduced test anxiety.

Keefe (1987) defines learning styles as "the characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (p. 5). A much researched conception of learning styles in agriculture relates to the field-dependence/independence psychological dimension (Miller, 1997). Most of this research has been descriptive in nature; yet it has been implied that

this descriptive information could be used to guide decisions about teaching. Could learning styles information be used as an effective tool for forming cooperative learning teams in college-level agricultural courses?

### **Purpose and Hypotheses**

The purpose of this study was to determine the effect of cooperative learning team compositions on selected learner outcomes. The research hypotheses were as follows:

1. Heterogeneous learning style teams will achieve higher course grades and higher scores for team activities than homogeneous learning style teams.
2. Homogeneous learning style teams will report higher levels of satisfaction with team activities and will have a higher rate of class and team activity attendance.

### **Procedures**

The sample consisted of 90 students, including 75 enrolled in a junior level leadership class in agricultural education and 15 enrolled in a senior level agronomy class at Iowa State University. Data were collected from two sections of the leadership course during the fall semester of 1996. Data were also collected from students enrolled in one section of the leadership course during the spring semester of 1997.

Fall enrollment was 48 and spring enrollment was 27 in the leadership course. Teams consisting of four to six members were formed early in the semester. The teams worked together throughout the semester to complete assignments and activities related to the leadership and group dynamics theory presented in lecture. Activities covered topics that included leadership characteristics, leadership roles, goals, group dynamics, stages of group development,

delegation, and group decision making. Student teams received grades for their work on five different assignments completed during the semester.

Data from the agronomy course were collected in the fall semester of 1996. In the lab component of this course, consulting teams of three students were organized to work with a client to provide a crop and soil management plan for a portion of the client's farm. The development of the consulting report spans the entire semester and is the sole team project. It involves a visit to the client's farm to observe livestock facilities and crops and to take soil and manure samples, group work with industry-based software to determine fertilizer rates, compliance with soil loss restrictions, pesticide recommendations, seed genotype recommendations, and a manure management plan. At the end of the course, an extensive written report is presented to the client and the team defends its work in a presentation given to the client at his place of business.

The static group comparison design (Campbell and Stanley, 1963) was used to test the research hypotheses. The major weakness of the static group comparison design is selection. With this design a difference between treatment groups on the dependent variable could have been observed because of factors extraneous to the occurrence of the independent variable. The selection threat was controlled by determining if the treatment groups differed initially on one important extraneous variable. It was hypothesized that students' past performance in college course work would be a good predictor of future performance. Therefore, the mean cumulative grade point averages for the treatment groups at the beginning of the semester were compared. A one-way analysis of variance procedure revealed no significant differences between the grade point averages of the groups. Mortality was not a threat to the internal validity of this study. No students dropped out after teams were established and teamwork had begun.

The active independent variable was student team composition. Students were organized into teams at the beginning of the semester based upon their preferred learning style. Students' preferred learning style was assessed with the Group Embedded Figures Test (GEFT)(Witkin, Oltman, Raskin, and Karp, 1971). The GEFT is a standardized instrument with a reliability estimate of .82. Also, concurrent validity with the Embedded Figures test was .82 for males and .63 for females. Scores on the GEFT can range from 0 to 18. Persons with relatively high scores are referred to as field-independent while those with relatively low scores are labeled field-dependent. A field-neutral label can be ascribed to persons who score near the middle of the range of possible scores (Dyer and Osborne, 1996).

In this study, four different team compositions were used including field-dependent, field-independent, field-neutral, and mixed. The mixed group consisted of persons with GEFT scores in the dependent, independent, and neutral ranges. To form the groups, GEFT scores for each course section were listed from high to low. The highest third of scores were considered field-independent, the next highest third were labeled field-neutral, and the lowest third were labeled field-dependent. GEFT scores were arranged into the four different team compositions. Finally, students with scores matching those grouped together were identified and placed on a team. There was a total of six mixed teams, four field-dependent teams, five field-independent teams, and four field-neutral teams with mean GEFT scores of 12.27, 8.74, 16.24, and 13.21, respectively. Students were not informed of the procedure used to form teams and were not aware that they were part of a study.

Five dependent variables were measured including final course grade, grade for team work, percentage of class sessions attended, percentage of team activities attended, and satisfaction with team activities. The instruments used for grading were teacher-made tests and activities. Grading procedures were handled as if there was not an

experiment taking place. For team activities, one grade was determined for each team and all members of the team received that grade. The grades used in this study counted toward students' final course grades. The final course grade and the teamwork grade were reported as percentages and then converted to T-scores to remove the effect of instructors on grades and make scores comparable across course sections. T-scores have a mean of 50 and a standard deviation of 10, and according to Hopkins, Hopkins, and Glass (1996, p. 76), the T-score is "the most commonly used standard score for reporting test performance." The percentage of class sessions and team activities attended was based on the instructors' attendance records. Attendance data were not available for the agronomy course.

The instrument used to measure member satisfaction with team activities was developed by the researchers. Students enrolled in a senior level curriculum course in agricultural education were asked to write down three statements that would reflect a feeling of satisfaction with team activities or assignments. The list of statements was presented to this group of students on another occasion so that they could recommend additions or deletions. The researchers used the student input to develop a five-point Likert-type scale with response options ranging from strongly disagree (1) to strongly agree (5). Agricultural students and faculty judged the instrument to possess content and face validity. The Cronbach's alpha reliability coefficient for the instrument was .93.

Table 1. Final Course Grades

Teams	<u>M</u> <sup>2</sup>	<u>SD</u>	<u>N</u>
Mixed	49.54	10.61	27
Field-neutral	54.61	6.66	19
Field-dependent	47.08	10.05	19
Field-independent	49.57	10.86	25

Note.<sup>1</sup>T-scores. <sup>2</sup>F (3,86) = 1.97, p>.05.

All data were analyzed with the SPS S personal computer program. Means and standard deviations were used to describe the experimental groups on each of the dependent variables. One-way analysis of variance was used to test each of the research hypotheses. The alpha level was set at .05 for determining statistical significance.

## Results

### Hypothesis 1

Students assigned to field-neutral teams attained the highest final course grades (Table 1) and teamwork grades (Table 2) and were followed by students on field-independent teams, mixed teams, and field-dependent teams. Based on results of a one-way analysis of variance, it was determined that team means were not significantly different. The research hypothesis that heterogeneous teams would achieve higher course and teamwork grades was not supported.

### Hvnothesis 2

Overall, students provided positive ratings of their satisfaction with team activities regardless of team composition (Table 3). Students assigned to field-independent teams provided the highest mean satisfaction score followed by students on mixed teams, field-neutral teams, and field-dependent teams. A one-way analysis of variance procedure

Table 2. Teamwork Grades

Teams	<u>M</u> <sup>2</sup>	SD	<u>N</u>
Mixed	49.00	10.77	27
Field-neutral	52.00	7.17	19
Field-dependent	48.72	11.11	19
Field-independent	50.46	10.39	25

Note. <sup>1</sup>T-scores. <sup>2</sup>F (3,86) = .46, p>.05.

Table 3. Satisfaction With Team Activities

Teams	<u>M</u> <sup>1</sup>	SD	<u>N</u>
Mixed	3.74	.40	24
Field-neutral	3.73	.48	19
Field-dependent	3.66	.58	18
Field-indeendent	3.84	.35	24

Note. Scale: 1=Strongly Disagree, 2= Disagree, 3=Undecided, 4=Argee, 5=Strongly Agree. <sup>1</sup>F (3,8 1) = .62, p>.05.

detected no statistically significant differences between any of the groups. Results did not support the hypothesis that homogenous learning style teams would report higher levels of satisfaction with team activities.

Students assigned to field-neutral teams had the highest rate of class attendance and were

followed by students on field-dependent teams, mixed teams, and field-independent teams (Table 4). Results of the one-way analysis of variance indicate that there was no statistically significant difference among the teams. The hypothesis that homogeneous learning style teams would have a higher rate of class attendance was not supported.

Table 4. Percentage of Classes Attended

Teams	<u>M</u> <sup>1</sup>	SD	<u>N</u>
Mixed	87.74	11.14	21
Field-neutral	92.84	5.04	16
Field-dependent	89.47	9.28	16
Field-independent	86.32	13.62	22

Note. <sup>1</sup>F (3,71) = 1.23, p>.05.

Table 5 shows that students assigned to field-neutral teams had the highest rate of activity attendance followed by students on field-dependent teams, field-independent teams, and mixed teams. Overall, homogenous groups had

higher rates of activity attendance than the heterogenous groups. However, the one-way analysis of variance did not detect statistically significant differences among the groups.

Table 5. Percentage of Team Activities Attended

Teams	<u>M</u> <sup>1</sup>	SD	<u>N</u>
Mixed	81.91	22.39	21
Field-Neutral	93.06	9.86	16
Field-Dependent	88.00	15.43	16
Field-Independent	87.18	18.32	22

Note. <sup>1</sup>F (3,71) = 1.23, p>.05.

Based on the results of the above statistical analyses of data pooled from all classes, one would conclude that grouping teams according to learning style had no effect on student performance. Qualitative data gathered by one of the researchers indicated that group processes may have been influenced by team composition, however. One of the researchers who worked with the leadership class kept written observations of group processes during the spring semester of 1997. This researcher participated in grouping students at the beginning of the semester, but put the group composition information away at that point. A sports team name was assigned to each group for routine course record keeping purposes. Two weeks had passed from the time groups were formed until the first activity was conducted and evaluated. The researcher tried to remain ignorant of the learning style composition of the teams, but recognizes that the observations probably were not completely unbiased.

The researcher observed that teams engaged in behaviors that were consistent with those suggested by learning styles theory. The field-dependent team enjoyed the greatest amount of group discussion. They were always cheerful and supportive of each other. The field-dependent group mixed task and relationship behaviors more evenly than other teams, but the products of their work focused on people or social issues to a great extent. The field-independent team was very organized and task oriented. All members of this team accepted a role and made an important contribution to the team. Members of the team got along well with each other. The field neutral team

was also task oriented. A leader that was respected and supported clearly emerged. Other members of the group accepted important group member roles. Typically quiet members of the team were involved in positive ways by their peers. The mixed group experienced a great deal of difficulty in working together effectively. They physically distanced themselves from each other and engaged in very limited discussion. On one occasion, the mixed group finished their assignment, stopped talking to each other, and either watched other groups or daydreamed for several minutes.

Data from all of the classes were pooled in order to increase the number of teams for the experiments. When the individual classes were analyzed separately, there were no significant differences between teams in the leadership classes. Results from the agronomy class, however, showed significant differences between teams. In general, the field-dependent team had lower final grades, lower team scores and lower satisfaction levels than the other teams. The authors are reluctant to put much emphasis on these differences because of the low numbers (3) in the teams. Nevertheless, there was enough difference in the nature of the team assignments to cause us to wonder if the type and length of the team assignments (numerous short-term assignments vs. one long-term assignment) might be a factor in the nature of these results. The prudent approach would be to repeat the experiment in another section of the agronomy class. Unfortunately, the class has been changed in such a way that replication is not possible.

## Conclusions

1. Cooperative learning teams formed to achieve heterogeneity of learning styles do not achieve higher course grades and higher scores for team activities than homogenous learning style teams.
2. Cooperative learning teams formed to achieve homogeneity of learning styles do not report higher levels of satisfaction with team activities and do not have a higher rate of class and team activity attendance.

## Recommendations

1. Learning styles information should not be used as a primary consideration in forming cooperative learning teams, especially those organized to work on numerous short-term assignments. Instructors should instead rely on factors such as students' ability, background or knowledge base, gender, friendship, and age.
2. Additional research is needed to determine if an effect of learning styles composition of cooperative learning teams might depend upon the nature of the cooperative learning activities.
3. Researcher observations indicate that the learning styles composition of cooperative learning teams might affect group processes. Further research should be conducted to document the group dynamics of teams formed to achieve heterogeneity and homogeneity with respect to learning styles.

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**Journal Paper No. J-18039 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project No. 3265, and supported by Hatch Act and State of Iowa funds.**