

IMPROVING THE LEARNING EFFECTIVENESS OF MANAGEMENT INFORMATION SYSTEMS COURSE WITH COOPERATIVE LEARNING: LESSONS OF EMPIRICAL STUDY

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ABSTRACT

This paper reports the empirical results of implementing a cooperative learning method in a core undergraduate MIS course taken by business students with diverse backgrounds and interests. The results confirmed the effectiveness of cooperative learning but also showed interesting findings of students' perception of the method. The paper also reports factors identified by students that might be detrimental to the successful use of cooperative learning, which can be used by instructors to improve their implementation of cooperative learning.

Keywords: cooperative learning, management information systems, critical factors for cooperative learning, Student Teams-Achievement Divisions

INTRODUCTION

As the use of information technology (IT) is becoming ubiquitous in businesses, information system (IS) literacy is essential for employees in today's workplace. Most business curricula at universities require a core management information systems (MIS) course to prepare students with IS literacy. IS literacy means more than mastering knowledge of computer hardware and software. It includes knowledge of effective use of IT in decision making and knowledge of impacts of advanced IT on managers' and organizational performance. Due to the multidisciplinary nature of the subject matter, teaching a core MIS course has a variety of obstacles that might prevent a well-designed curriculum from achieving its objectives. Major obstacles include the lack of consensus on topics to be covered, diverse backgrounds and interests of students, and rapid changes of IT.

This paper reports the findings of implementing a cooperative learning (CL) method in a core undergraduate MIS course taken by business students with diverse backgrounds and interests. Many previous studies demonstrated the effectiveness of CL (4, 5, 9). Those claimed that using CL could make the learning experiences of students with diverse backgrounds more interesting and effective. Yet, no empirical data has been reported that shows the dynamics of CL used in a core MIS course, in which students learning IS literacy usually have various backgrounds and interests. This study focuses on how groups of heterogeneous students perceive CL experiences.

BACKGROUND

CL has been used in many fields at various levels of educational institutes, ranging from elementary schools to higher education. Slavin (7, 8), Cottel and Millis (2), and Alavi (1) reported that effectiveness of various types of CL methods was empirically supported at elementary, secondary, high school, and college levels.

According to Slavin (7, 8), CL methods can be categorized to Student Team Learning, Learning Together, Jigsaw II, Group Investigation, Complex Instruction, and Structured Dyads. Student Team

Learning methods are further categorized to Student Teams-Achievement Divisions (STAD), Teams-Games-Tournaments, Teams-Accelerated Instruction, and Cooperative Integrated Reading and Composition. STAD is one of the most-widely used CL methods.

There are several factors affecting successful CL. Those include positive interdependence, individual accountability, diverse group members, and teams formed by an instructor. CL is different from simply giving group assignments in many ways. An instructor must create an atmosphere in which each student in a group positively feels responsible for other students' learning (1). Meantime, an instructor must create an environment where each student is ultimately responsible for his mastery of the subject matters, and his level of the mastery is assessed individually (1). An instructor should create a group that consists of heterogeneous students in terms of previous course work completed, age, gender, cultural background, performance, and so on to maximize team's capability (7, 8, 9).

Nowadays, many instructors who teach business courses formally or informally introduce group activities in their classes to enhance student's team skills. Most instructors use at least group assignments to have students experience teamwork. The core MIS course is no exception. Yet, the core MIS course has unique characteristics that lend itself to a formal group learning method, such as CL.

First, the majority of students who attend the core MIS course are from different disciplines because most business curricula require this course. Thus, students not only differ in their ages, cultural backgrounds, working experiences and prior IT knowledge, but also in their interests and levels of learning motivation. This diversity makes it difficult preparing a set of topics that would satisfy students' needs. Second, the core MIS course, as a survey course, needs to cover a variety of topics. Unfortunately, the subjects of MIS do not have a common body of knowledge. A comparison among popular MIS textbooks reveals more difference than similarity shared by them. Yet, the core MIS course can be a good course where CL is applied because CL may well fit to a class consisting of students with diverse backgrounds and interests. A group of those students can help each other to learn various topics. A student with limited IT knowledge can learn from those with more advanced IT knowledge, while a student with limited business knowledge (such as knowledge of accounting, finance and so on) can learn from those with business knowledge. A student can enthusiastically initiate discussions on a topic she is interested in and thus makes the topic interesting to other students.

This study reports that how a CL method (STAD) can be used in an undergraduate core MIS course as an effective learning method. The paper also shows empirical data regarding how students who attended the course have perceived this learning method.

IMPLEMENTATION OF COOPERATIVE LEARNING

An undergraduate core MIS was taught as a senior-level course all business students must take to graduate. The class met three times a week for 15 weeks. The learning objectives of the course include: an integrated framework-assimilate rapidly growing knowledge of MIS; uses, benefits, and limitations of different types of IS and IT; the IS development process-contributing to the construction of IS; and social and ethical issues accompanying with the use of IT. The textbook used was James A. O'Brien (6). Video tapes were also used to introduce topics, such as the history of IT, computer literacy of the future managers, productivity increased by IT, and so on.

The CL method used in the course was adapted from STAD (1, 7, 8). At the beginning of the semester, student’s background information was collected using a questionnaire and was used as a basis for the group member assignment. Specific group activities in each learning module were as follows: First, as suggested by Slavin (7, 8), a lecture was used to introduce concepts. Then, a group of 4 or 5 students conducted a group discussion to learn/teach the concepts from/to other group members. After the discussion, two randomly chosen students from each group took a quiz of multiple-choice questions. The other group members who did not take the quiz prepared a group report of the discussion. Also, they evaluated the participation performance of the two quiz-takers. The average quiz score was assigned to all group members; however, for the two quiz-takers, their individual quiz scores were weighted with peer evaluation they received. This process was repeated 14 times during the semester. The philosophy, process, benefits and evaluation (grading) policy of this STAD were explained to students in the first class meeting.

As mentioned before, important premises for successful application of CL were to enforce interdependence among group members and individual accountability. The premise of interdependence was enforced by incorporating group work and by assigning the average of quiz scores to all group members. Randomly choosing two members to take the quiz and assigning the average quiz score to all members motivate group members not only to learn for themselves but also to assist others to learn and, subsequently, enforce the interdependence. The enforcement of individual accountability was achieved by assigning the quiz scores weighted by peer evaluation to quiz takers.

A survey was conducted at the end of the semester. The purpose of this survey was to investigate students’ perceptions about the effectiveness of different components of the STAD, affective responses (such as motivation for learning, attending class, doing assignments), and their assessment of STAD. The survey questions were adapted from Hiltz (3).

RESULTS AND DISCUSSIONS

Eighty-three students participated in this study. The subjects were classified using three criteria: gender, major and computer skill levels. Table 1 shows the number of subjects in each category. As shown, the students who took the course had diverse backgrounds and interests. In this paper, only descriptive statistics is reported as the results from a preliminary data analysis.

Table 1. Classification and Distribution of Students.

Majors		Accounting		Management		Finance		International Business		Marketing		MIS		Others/Undecided		Total	
Gender		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Computer Skill Levels	Begin	4	1	3	3	1	4	0	1	1	4	1	0	1	3	11	16
	Intrmed	3	1	3	4	2	2	3	4	5	0	2	1	0	1	18	13
	Advanc	3	1	1	5	1	1	0	1	1	2	2	5	0	2	8	17
Total		10	3	7	12	4	7	3	6	7	6	5	6	1	6	37	46
Management major includes Business Administration, Human Resource Management, Management, and Entrepreneurship major students. Finance major includes one student who majored in Accounting and Finance. MIS major includes one student who majored in MIS and Computer Engineering. The Others/Undecided category includes the Economics major students and those who have not decided their major.																	

Part A of the survey asked students to rate the effectiveness of four critical components of STAD using a 7-point Likert scale. Table 2 shows the summary of the survey results. The average rating of the

effectiveness of STAD, compared with the traditional lecturing method, was 4.93 (4.0 means no difference between the two methods). The students perceived STAD as significantly more effective than the traditional lecturing method (p-value < 0.0001). This confirmed the results of the previous studies. The average ratings of the effectiveness of case discussions, quizzes, peer evaluation and group reports were 4.93, 5.08, 3.88 and 4.95, respectively. The students perceived that case discussions, quizzes and group reports were effective. However, they did not perceive peer evaluations positively. On average, the male students rated all of these components higher than the female students did, indicating the possibility that male students like STAD more than female students do. MIS students rated overall CL method, case discussions, and group reports higher than students who majored in other fields did. Marketing and Accounting students rated most of these relatively worse than students majored in other fields did. Students with the beginning computer skill level rated all components but peer evaluation higher than students with advanced or intermediate computer skill levels. This may indicate that those students could learn more from their peers with higher computer skill levels.

Table 2. Learning Effectiveness of Cooperative Learning Activities Perceived by Students (Average scores measured in a 7 point scale).

	Total	Gender		Majors							Computer Skill Levels		
		F	M	Acct	Mgmt	Fin	Int'l Bus	Mktg	MIS	Other	Beg	Intermediate	Adv
Overall Procedure	4.93	4.59	5.20	4.46	5.05	5.09	5.11	4.15	5.70	5.14	4.93	5.13	4.68
Case Discussion	4.93	4.57	5.22	4.62	4.95	5.00	5.44	4.00	5.80	5.14	5.00	4.81	5.00
Quizzes	5.08	4.89	5.24	4.85	5.00	5.73	5.56	4.92	5.00	4.43	5.37	5.19	4.64
Peer Evaluation	3.88	3.57	4.13	3.77	3.74	5.00	4.22	2.54	4.00	4.57	3.89	4.03	3.68
Group Reports	4.95	4.81	5.07	4.62	5.05	5.27	4.89	4.54	5.30	5.00	5.11	4.81	4.96

Table 3. Motivational Effectiveness of Cooperative Learning Activities Perceived by Students (Average scores measured in a 7 point scale).

	Total	Gender		Majors							Computer Skill Levels		
		F	M	Acct	Mgmt	Fin	Int'l Bus	Mktg	MIS	Other	Beg	Intermediate	Adv
Motivated to Learn More	4.87	4.57	5.11	4.46	5.11	4.73	5.33	4.15	5.90	4.43	4.85	5.13	4.56
Motivated to Read Before Class	4.70	4.57	4.80	4.69	4.47	4.73	5.00	3.92	5.60	4.71	4.59	4.74	4.76
Motivated to Attend Classes More	5.57	5.46	5.65	5.85	5.95	5.36	5.56	5.46	5.40	4.86	5.26	5.84	5.56
Motivated to Participate in Discussions More	4.88	4.78	4.96	4.77	5.21	5.18	4.56	4.08	5.70	4.43	4.67	4.90	5.08
Made Classes More Interesting	5.29	5.08	5.46	5.00	5.68	5.36	6.00	4.62	5.30	4.71	5.04	5.39	5.44
Motivated to Get Involved in Class More	5.30	5.19	5.39	5.38	5.47	5.27	6.00	4.62	5.30	5.00	5.15	5.29	5.48
Motivated to Work Harder	4.95	4.97	4.93	5.00	5.47	5.00	4.33	4.46	5.10	4.57	5.11	4.71	5.08
Motivated to Communicate More	5.94	5.84	6.02	6.31	5.74	5.91	6.44	5.31	6.30	5.86	5.63	5.90	6.32

Part B of the survey asked the students to rate how STAD motivated them using a 7-point Likert scale. Table 3 shows the summary of the survey result. In overall, it seemed that STAD motivated students to communicate with their peers, attend classes, and get involved in class. The students also perceived that STAD made classes more interesting. Again, the male students rated all except for “motivation to work harder” higher than the female students did, indicating the possibility that male students like STAD more

than female students do. Marketing students rated most of the items lower than students who majored in other fields. Interestingly, the students with the beginning computer skill level rated most of these items lower than students with advanced and intermediate computer skill levels.

The survey also asked students to identify factors that might negatively affected the success of using STAD. Their opinions were classified into ten categories. As shown in Table 4, lack of participation was rated as the top factor that interfered with the use of STAD. About half of the students expressed it as a problem. The female and male students equally expressed this as a problem. Sixty percent of the students with advanced computer skill level expressed this as a problem, significantly higher than the students with beginning and intermediate computer skill levels. This was because 88% of the female students with advanced computer skill level expressed this as a problem.

Table 4. Factors Harmful to the Use of Cooperative Learning Method. (Percentage of students who expressed opinions).

	Total	Gender		Majors							Computer Skill Levels		
		F	M	Acct	Mgmt	Fin	Int'l Bus	Mktg	MIS	Other	Beg	Intermediate	Adv
Lack of participation by group members	46%	46%	46%	46%	37%	45%	33%	62%	55%	43%	41%	39%	60%
Insufficient time allocated for activities	29%	27%	30%	23%	42%	27%	11%	23%	45%	14%	30%	26%	32%
Unfair grading/free ride	17%	11%	22%	31%	5%	27%	22%	8%	18%	14%	22%	16%	12%
Insufficient preparation by members	13%	8%	17%	15%	5%	0%	22%	15%	27%	14%	7%	19%	12%
Uneven chance to take quizzes	13%	16%	11%	15%	21%	0%	0%	23%	18%	0%	7%	16%	16%
Lack of cohesiveness, Uncomfortable with members, Bad attitude	12%	16%	9%	31%	11%	0%	11%	0%	9%	29%	22%	13%	0%
Unrelated/uninteresting discussion topics, Confusing materials	8%	11%	7%	8%	5%	9%	33%	0%	9%	0%	4%	16%	4%
Lecture is better	8%	14%	4%	23%	5%	0%	0%	15%	9%	0%	15%	6%	4%
Insufficient number of members	4%	5%	2%	15%	0%	0%	11%	0%	0%	0%	4%	3%	4%
Too dependent on other members	4%	3%	4%	8%	5%	0%	0%	0%	0%	14%	4%	0%	8%

Table 5. Suggested Time Allocations by Students to Three Different Learning Activities.

	Total	Gender		Majors							Computer Skill Levels		
		F	M	Acct	Mgmt	Fin	Int'l Bus	Mktg	MIS	Other	Beg	Intermediate	Adv
Lecturing	57% (86)	57% (86)	57% (86)	52% (78)	55% (82)	55% (83)	55% (83)	60% (90)	66% (99)	64% (97)	62% (92)	58% (87)	52% (79)
Discussions	29% (44)	29% (44)	29% (44)	37% (55)	30% (45)	30% (44)	31% (47)	26% (39)	21% (32)	27% (40)	24% (36)	29% (43)	35% (53)
Quizzes/Group Reports	13% (20)	14% (20)	13% (20)	11% (17)	15% (22)	15% (23)	13% (20)	14% (22)	13% (19)	9% (14)	15% (22)	13% (20)	13% (19)

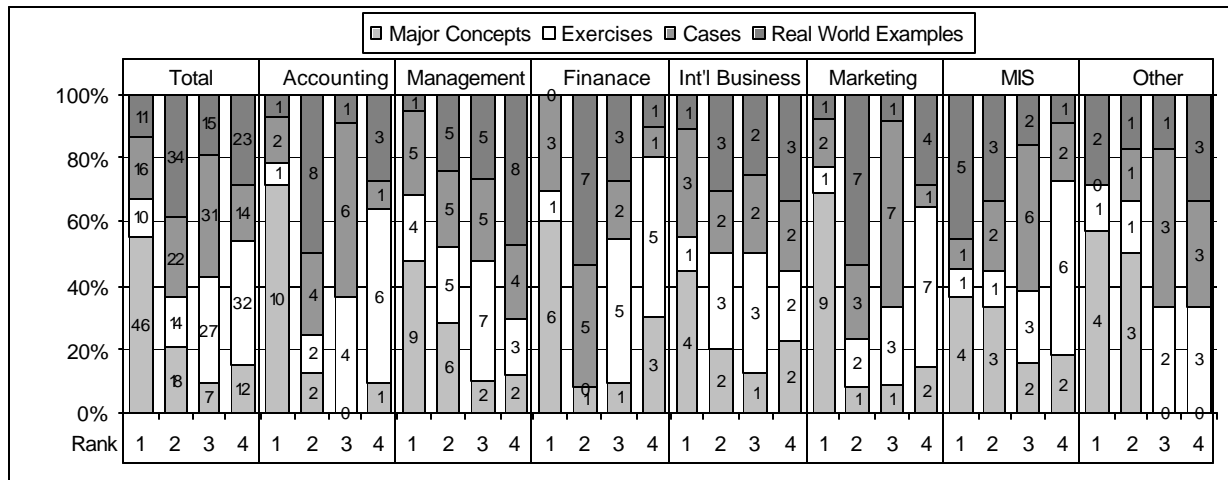
The numbers in % are percentage allocations to three types of learning activities assuming the total of the three is 100%. The numbers in parentheses are allocations in minute, assuming that one learning module uses 150 minutes.

Insufficient time allocation to activities was identified as the second major issue. Approximately one third of the students expressed this as a problem. The survey also asked how much time should be allocated to the three major learning activities of STAD (see Table 5 for the results). On average, the students expressed that 57% of class time (86 minutes of 150 minutes assuming one learning module

needs 150 minutes) should be allocated to lecturing, 29% (44 minutes of 150 minutes) to group discussions, and 13% (20 minutes of 150 minutes) to taking quiz. Students with the beginning computer skill level wanted more time for lecturing (62% or 92 minutes) while students with advanced computer skill level wanted more time for discussions (35% or 53 minutes).

The survey also asked the students to rank four types of materials used in the group discussions about how much they contributed to their learning. Those four are: major concepts explained in the textbook, exercises at the end of the chapters, cases in the textbook, and real world examples available on the Internet. As shown in Figure 1, 46 students ranked the discussion of major concepts as the top contributor. Only 11 students ranked the real world examples as the top contributor, and 23 students ranked it as the least contributor. Five of 11 MIS students ranked it as the top contributor, while students in other fields ranked it as the second or third contributor.

Figure 1. Ranking of Materials Used in Discussions by Students.



LESSONS LEARNED

A cooperative method, STAD, was used to facilitate the learning of students with diverse backgrounds and interests in a core undergraduate MIS course. Students perceived STAD more effective than the traditional lecturing method. This concludes that CL could be positive in many aspects regarding learning, as shown in many previous studies. However, our study shows that its effectiveness is highly dependent on how it is applied in the classroom setting. In this section, we summarize a few lessons that we believe important for those who are considering applying CL in a core MIS course.

1. Keep learning in perspective: One simple yet easily forgotten principle is that the application of CL is a means, not the end. Because CL has been widely applied and its benefits were broadly reported, it is not unusual that the first-time adopter might follow the procedure of the method as a cookbook. Although in general, CL is beneficial to students' learning, it should not become a mechanic practice. In this study, the method was highly structured and applied through the whole semester to fully investigate its utility. The rigidity resulting from the high level of structuredness could have reduced the positive effects of the method.
2. Be selective of components and topics: An implication of the above lesson is that an instructor should be selective in deciding when to apply the method and what components of the method to

use. This study shows that even though most components of the method have positive influences on students' perceived performance, a few components are not so effective as expected. For example, students perceived peer evaluation as relatively less effective in motivating their learning. The benefit of using quizzes as a tool for holding students' accountability was not so successful as expected either.

3. Provide timely feedback: The study showed that the effectiveness of peer evaluation as a measure for holding students accountability was not well perceived by students. Although the exact cause is not clear, one remark by a student might shed the light on the issue. "[s]ince I have no idea of what I have received on the peer evaluations it doesn't help to assist me". As a result, other measures that provide immediate feedback should be used to enforce accountability.
4. Consider workload: Different materials could be used for group discussion. One general myth about group discussion is to use real world-like cases. However, it should be noted that while CL might "turn over" part of teaching activities to students in classroom and could be very rewarding, it takes a great deal of time to choose and prepare appropriate cases for group discussion. In order to keep the workload at a manageable level, different materials should be used for group discussion. Furthermore, it should be noted that students don't positively perceive the use of real-world cases in CL (Please refer to the results and discussion.)

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