

The study of different cooperative learning and problem-based instructions in promoting students' teamwork competences

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ABSTRACT: With the progression of an increasingly competitive business environment, the cultivation of the future workforce should put greater emphasis on their students' and workers' teamwork competences. In the study presented in this article, teamwork competence indicators were first identified, then a teamwork competence questionnaire was developed, with students of business administration departments at technology institutes taken as the subject to complete the teamwork competence questionnaire; this included a pre-test. After that, experimental teaching was carried out in a marketing planning course for 10 weeks; this was followed by a post-test and statistical analysis to evaluate the data. No significant differences were found between the *homogeneous* and *heterogeneous* groups in terms of teamwork competences in the pre-test or post-test scores. Further, after being taught cooperative learning techniques and receiving problem-based instructions, neither the *homogeneous* or *heterogeneous* group had an obvious improvement regarding teamwork competences. However, with some limitations, no significant differences were detected in the seven dimensions of teamwork competences in the post-test scores concerning practice in the marketing planning course.

INTRODUCTION

Because of growing global business competition and an increasingly diverse labour market, many business tasks are performed nowadays by teams instead of by one worker alone. According to the literature review, certain abilities are crucial for people who live in the 21st Century, where these abilities could be the key components to develop teamwork competences. These abilities comprise the following:

- *Literacy ability:* reading, writing, calculating, logical thinking, language use and the application of Information Technology (IT);
- *Personal ability:* communicating, thinking independently, problem solving, accommodating and life-long learning);
- *Civil ability:* being responsible, self-management, honesty, respecting others and appreciating different cultures.

In the past, Taiwan's education system neglected recognising the significance of teamwork competences, especially regarding personal and civil abilities. Teamwork competences, in fact, play an important role in students' future careers. Students who lack teamwork competences may even fail to find jobs after graduation, resulting in resource wastage in the education system. Further, each year, more and more students graduate from technology institutes or universities. As society expects the technical education system to cultivate students to meet the needs of industry, students who major in business administration should recognise that the business environment has changed to be one that is buyer-dominated. It is essential to satisfy the needs and demands of consumers. In addition, whether businesses create the value of commodities and services to earn large profits depends mainly on a well-defined marketing plan. Because an excellent marketing plan is the result of various team members' efforts, it is important to cultivate students' teamwork competences via the practice of a marketing planning course.

Therefore, this study focuses on students enrolled in marketing planning courses at technology institutes or universities as an example. The authors focus on the followings purposes:

- Determine the key indicators of teamwork competences;
- Develop a teamwork competence questionnaire;
- Formulate cooperative learning and problem-based teaching strategies;
- Revise the teaching materials used for students' of marketing planning course;
- Execute experimental teaching;
- Explore different cooperative learning and problem-based instructions in promoting students' teamwork competences;
- Provide suggestions for designing and arranging students' practice in marketing planning courses at business administration departments of technology institutes or universities.

COOPERATIVE LEARNING

Cooperative learning, structural and systematic teaching strategy, is popular in Europe and America, where it assigns students into different groups to work together, encourage each other, and develop active learning attitudes and seek best learning effectiveness [1-4]. There are many models developed for cooperative learning with the following being the common characteristics:

- Heterogeneous students: assigning students who have different abilities or different demographic variables, such as gender and race, to the same group;
- Individual accountability: each member in the group knows that he/she has the responsibility to make the group successful;
- Group processing: the group's performance is based on each member's interaction;

- Collaborative social and interpersonal skills: these include leadership, decision-making, trust-building, communication, conflict management and so on, and are the key factors for group productivity;
- Face-to-face interaction: enhancing group members to provide assistance, exchange resources and give feedback;
- Positive interdependence: each group member collaborates to complete a group task instead of competing with each other.

The Student Teams-Achievement Divisions (STAD) model was utilised for the current study. This model, developed by Slavin in 1978, has the following five process factors:

- Whole class lecture: before the group activity begins, the teacher has to introduce some important concepts;
- Group learning: according to student's prior learning performance and other personal characteristics (eg gender, race), the teacher assigns two to six students to the same group so that they can learn together;
- Test: the teacher will hold an individual test every couple of weeks;
- Impact of individual advancement: increased individual advancement boosts the group's performance;
- Praise of the group: the teacher publicly praises the student and groups for high performance [5-7].

PROBLEM-BASED LEARNING (PBL)

Problem-Based Learning (PBL) is learner-centred. Students who learn in the same group can actively explore the assigned problem and develop a plan to find out the solutions. The teacher instructs students to learn by themselves, instead of attending lectures or directly providing them with solutions. The problem-based teaching model used in this study has been adopted from Barrows [8]. It includes five stages as follows:

- Problem analysis stage: the teacher uses many questions to help each group identify problems;
- Information-gathering stage: learners utilise self-direction in order to collect related information;
- Synthesis stage: learners discuss and evaluate the information they have collected;
- Abstraction stage: learners find out the solutions of the problem and summarise what they have learned;
- Reflection stage: learners undertake self-evaluation, as well as receive evaluations from colleagues.

TEAMWORK COMPETENCES

A team consists of two or more persons to achieve specific goals through members' interaction and coordination. Idol and West stated that teamwork means the process to plan, make decisions and solve problems together [9]. They further affirmed that each member has to contribute his/her knowledge and skills to the team, and be treated equally. Additionally, Idol and West, as well as West and Cannon, found that a lack of teamwork competences obstructs successful teamwork [10][11]. Teamwork competences refer to the essential knowledge, skills and capacities that team members should have when they try to accomplish their team's missions and goals.

STUDY DESIGN AND IMPLEMENTATION

This study followed a flow chart (see Figure 1), which included interviews, the Delphi technique, panel discussions,

experimental teaching and statistical analysis were the main methodology applied in this study.

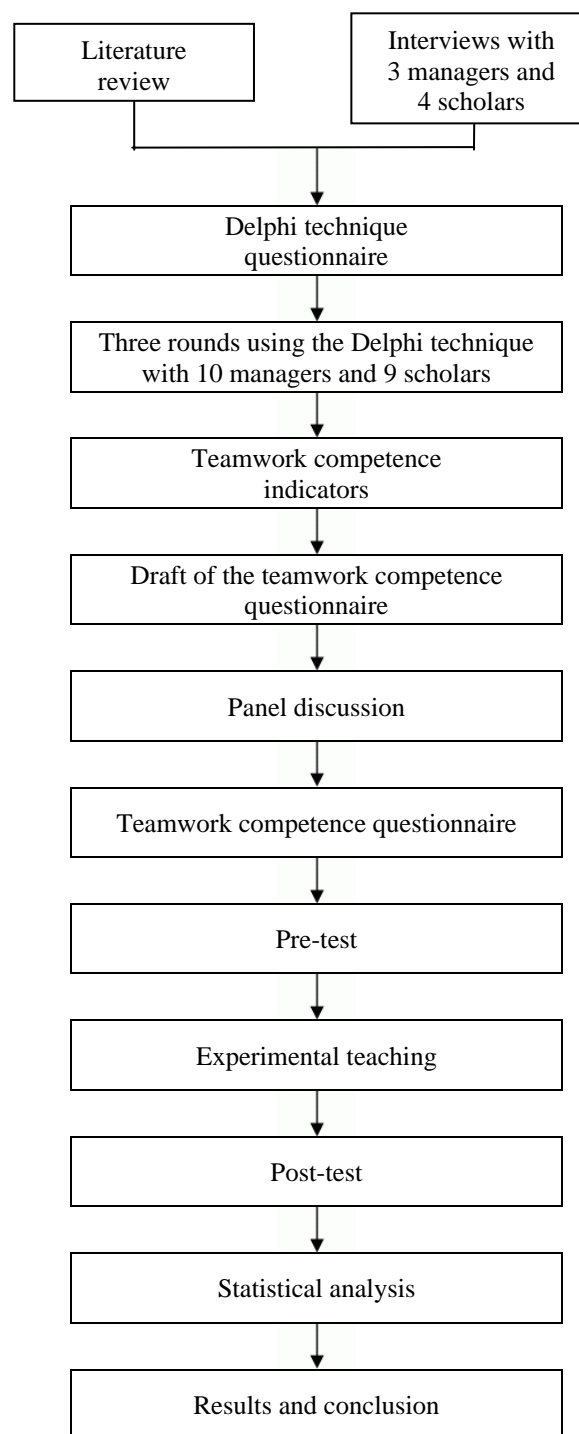


Figure 1: Flow chart of the study's progress.

DEVELOPMENT OF THE TEAMWORK COMPETENCE INDICATORS

Interviews with three managers and four scholars revealed that teamwork competences for students, whose major is business administration at an institute of technology or university, could be summed up in seven dimensions and 26 indicators. The findings were also based on the results of a Delphi Technique questionnaire. After gaining feedback from six professionals, a draft of the Delphi questionnaire had seven dimensions and 40 indicators. The study then proceeded with three rounds of the Delphi technique. Finally, the contents of teamwork competences were generalised in the seven dimensions and 50 indicators.

During the processes, *mode* was utilised to identify the opinions of most experts, *average* was used to determine the central trend and *standard deviation* was used to ascertain the degree of dispersion. The Kolmogorov-Smirnov and Kruskal-Wallis tests were utilised in order to show the consistency of the opinions of all the experts.

The seven dimensions obtained for teamwork competences are as follows:

- Interpersonal communication;
- Goal setting and performance management;
- Planning and task coordination;
- Conflict resolution;
- Characteristics of the team members;
- The formation and execution of cooperative and innovative ideas;
- The problem-solving proficiency of the team [12].

DEVELOPMENT OF THE TEAMWORK COMPETENCE QUESTIONNAIRE

Based on the results of the three rounds using the Delphi technique, a draft of the teamwork competence questionnaire was designed, which was comprised of seven dimensions and 50 items. After speaking to four experts in a panel discussion, the descriptions of some of the items were modified and the teamwork competence questionnaire was revised with seven dimensions and 46 items.

Briefly, the teamwork questionnaire contains the following dimensions:

- Interpersonal communication (eight items);
- Goal setting and the performance management (seven items);
- Planning and task coordination (eight items);
- Conflict resolution (six items);
- Characteristics of the team members (eight items);
- The formation and execution of cooperative and innovative ideas (four items);
- The problem solving proficiency of the team (five items).

A Likert-type, 5-point scale was utilised for this study. This had five levels (fully qualified, qualified, average, less qualified, not qualified), which were classified from 5 to 1, respectively.

EXPERIMENT DESIGN

The quasi-experimental design was developed to evaluate strategies to facilitate cooperative learning and problem-based teaching. The samples of the study were students from two classes at the Department of Business Administration in the Overseas Chinese Institute of Technology in Taichung, Taiwan. They undertook the same course, but in two different class sessions in the same semester.

Based on students' curriculum scores, the students of one class were assigned into *homogeneous* groups, while those in the other class were distributed *heterogeneously* across groups. *Homogeneous* means that students in that group had less variable curriculum scores. In contrast, *heterogeneous* refers to large curriculum score variability for students in the same group. There were nine groups in each of the two classes. The research design is shown in Table 1.

Table 1: Design of the experimental teaching model.

Group	Pre-test	Treatment	Post-test
Homogeneous	O ₁	X	O ₂
Heterogeneous	O ₃	X	O ₄

X: Cooperative learning and problem-based teaching method.

In Table 1, the X represents treatment variable, ie cooperative learning and the problem-based teaching method. O₁ to O₄ stand for students' teamwork competences while engaged in the marketing planning course. There were 53 students in the homogeneous class and 46 students in the heterogeneous one. These two classes had the same teacher, as well as the same teaching materials. The experimental teaching continued for 10 weeks in one semester with 100 minutes of class time per week. These two groups were pre-tested, administered a treatment and then post-tested. Finally, regarding the data analysis, t-tests were primarily used in order to compare the pre-test and post-test data.

RESULTS AND DISCUSSION

Using a t-test analysis to compare the homogeneous and heterogeneous groups (see Table 2), it was found that there was no significant difference in terms of the teamwork competence pre-test scores. Also, no significant difference was found in the post-test scores. However, the mean scores in the post-test data in both groups were higher than those in the pre-test.

Table 2: Differences in teamwork competences between the two groups.

Test	Group	No.	Mean	S.D.	t-value
Pre-test	Homogeneous	53	3.48	0.31	0.39
	Heterogeneous	46	3.45	0.38	
Post-test	Homogeneous	53	3.67	0.34	1.63
	Heterogeneous	46	3.56	0.34	

Table 3 presents the pre-test and post-test scores for teamwork competences for the homogeneous and heterogeneous groups. For both of the two groups, there were significant differences between the pre-test and post-test scores. This means that after being taught using cooperative learning and problem-based strategies, obvious improvements regarding the students' teamwork competences could be found in both groups.

Table 3: Difference of teamwork competence between pre-test and post-test in a same group.

Group	Test	No	Mean	S.D.	t-value
Homogeneous	Pre-test	53	3.48	0.31	-3.85***
	Post-test	53	3.67	0.34	
Heterogeneous	Pre-test	46	3.45	0.38	-2.14**
	Post-test	46	3.56	0.34	

** p<0.05; ***p<0.01

Table 4 shows that there was no significant difference detected in the seven dimensions of teamwork competences for the post-test scores between the homogeneous and heterogeneous groups. However, the mean of the homogeneous group for each dimension was higher than those for the heterogeneous group.

The seven dimensions for teamwork competences are numbered in the table as follows:

1. Interpersonal communication;
2. Goal setting and performance management;
3. Planning and task coordination;
4. Conflict resolution;
5. Team members' characteristics;
6. The formation and execution of cooperative and innovative ideas;
7. The problem solving proficiency of the team.

Table 4: Summary of the post-test data for teamwork competences between the two groups.

Dimension	Group	No.	Mean	SD	t-value
1	Homogeneous	53	3.69	0.40	1.98
	Heterogeneous	46	3.53	0.40	
2	Homogeneous	53	3.51	0.48	0.78
	Heterogeneous	46	3.44	0.39	
3	Homogeneous	53	3.59	0.51	1.44
	Heterogeneous	46	3.44	0.48	
4	Homogeneous	53	4.04	1.25	1.70
	Heterogeneous	46	3.71	0.41	
5	Homogeneous	53	3.86	0.39	0.55
	Heterogeneous	46	3.81	0.43	
6	Homogeneous	53	3.56	0.51	1.33
	Heterogeneous	46	3.43	0.43	
7	Homogeneous	53	3.55	0.51	0.78
	Heterogeneous	46	3.47	0.48	

The reasons for the insignificant differences found in the study might be explained by the following:

- 10 weeks of experimental teaching was not long enough and a longer duration is needed;
- While cooperative learning and problem-based teaching is good method to learn, students in Taiwan are seldom taught this way and are not used to cooperating with other team members. Therefore, a teacher has the responsibility and needs to have the patience to guide students to become better acquainted with other group members, to be familiar with this method and to accept it without resistance [13].

CONCLUSION

Teachers actually play a critical role in choosing and utilising different teaching methods during students' learning processes. In this study, it was found that different cooperative learning and problem-based instructions do indeed promote students' teamwork competences. Moreover, the duration of this study is one of the key factors in ascertaining whether cooperative learning and problem-based instructions could effectively enhance students' teamwork competence.

Therefore, it is recommended that future researchers should have suitable experimental teaching periods so that they have sufficient time to observe the effects of the teaching experiment. Additionally, cooperative learning and problem-based teaching are different from the traditional methods. Students will be equipped with enhanced competences after being taught using this method. The education system could train teachers to utilise cooperative learning and problem-based teaching strategies. As the mean of the homogeneous group in each dimension of teamwork competence was higher than that for the heterogeneous group, teachers could apply this result to assign students, who have less variability in curriculum performance, in the same group so that they can learn together.

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