

# **Cooperative Learning and Teamwork Effectiveness in Maritime Education**

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## **ABSTRACT**

The maritime industry is a multinational industry where participants of several languages and cultures operate in a global teamwork environment. Seafarers' operating procedures are totally based on a teamwork infrastructure and climate. By the introduction of Safety Management Systems shore-based human resources are also included in the wider system of the maritime teamwork of the company where information and communication technologies have accelerated this integration. Goals and tasks for the team, team composition, team-player styles, phases of team development, communication and interpersonal skills, decision making, leadership, and evaluation of team performance are the key elements in developing the structure of the teamwork based systems.

Training and development is the main instrument in preparing the human resources for the teamwork climate of modern organizations. Education methodologies that support the characteristics which encourage teamwork and cooperation are widely applied in maritime education. Cooperative learning and problem based learning are among those approaches.

This study analyzes the effects of cooperative learning dimensions in a maritime higher education institute with regard to teamwork effectiveness. An empirical study has been realized to measure the effects of cooperative learning dimensions on 1) individual performance in groups, 2) effective team members.

The maritime industry requires dynamic orientations in education where the human resources should be developed with the intragroup and intergroup skills of working in a team and working with a team that transforms resources into a solution.

**Keywords:** Maritime education, teamwork, cooperative learning

## **1. INTRODUCTION**

Task groups are developed to reach organizational goals and the level of team performance effects is analyzed in order to be competitive in today's market conditions (Gladstein, 1984). Teams are essential in projects for solving complex problems requiring a variety of knowledge and skills, stimulating creativity and innovation, empowering and satisfying workers, and other positive consequences and team climate is an important factor in the pursuit of team effectiveness (Loo, 2003). Team skills, team training objectives and the objective assessment of team performance are essential in reaching the organizational goals and it is required to standardize team performance assessment and technologies in team training (Annett et al, 2000). The importance of work groups is also related to the psychological aspects and due to this they present many potential risks and opportunities and there is a need to understand the characteristics of work groups (Campion et al, 1993).

## **2. TEAMWORK AND EDUCATIONAL REQUIREMENTS**

Workplaces in the maritime industry have been changing in recent years. Today the problems related to the productivity, quality, speed, innovation, customer satisfaction, safety, environmental protection and security issues in maritime work life are so complex that no individual alone can solve them. Content knowledge in all disciplines will continue to increase at a rapid rate and no one can assimilate all of the available knowledge (Ventimiglia, 1995). In response to the demands of global competition and the increasing use of knowledge to create products and services, organizations have been moving toward a form of work that organizes employees into teams rather than a rigid management hierarchy (Naisbitt & Aburdene, 1990) and the use of work groups in organizations is gaining substantial popularity.

A team is a unit of two or more people who interact and coordinate their work to accomplish a specific goal (Daft, 1996). The ability to work together cooperatively and the ability to be a life long learner are the two skills needed to be successful in the workforce in the 21<sup>st</sup> century. Neither of them is taught as the content of a course or from a textbook. Ability to work together requires some people skills such as communication, teamwork, leadership, the ability to learn, and ability to adapt to change. But the existence of these necessary skills among students is questionable (Shullery & Gibson, 2001). Lecturers need a means to provide these skills to the students (Fellers, 1996). Life long learning is also crucial as industrial/organizational psychologists point out that in our fast-changing society, people will need to change or relearn their careers eight to thirteen times during their life span (Ventimiglia, 1995).

Education plays an important role for being equipped with and developing the basic social skills that are vital to play an active role in this environment. So these all must be covered in professional education (Magney, 1996). Students should prepare themselves for their future workplace teams during their education. It is difficult to achieve this by conventional education methods where students are mainly involved in education processes individually and motivated by competition rather than cooperation. It is suggested that the existing competitive/individualistic college structure must be restructured to a cooperative, team-based higher education structure (Johnson & Johnson, 1999).

Educators in areas such as public administration, accounting, marketing and management have noted the increased use of student teams to promote teamwork skills among college students (Werner and Lester, 2001). Teams are increasingly popular as a basic working unit in engineering education as the teams are an effective structure for developing student skills in accordance with several ABET EC 2000 outcomes, such as the ability to

function in multidisciplinary teams, and the ability to communicate effectively (Sullivan et al, 2002). These are the attempts to prepare students for the kind of team experiences they will face in their future work life.

Cooperative learning in any discipline gives students the opportunity to learn the above mentioned skills (Ventimiglia, 1995). Cooperative learning can provide a highly relevant and effective model for the higher education institution for teaching and developing teamwork skills for future workforces.

Feller, explained the differences between the old and new paradigm of teaching. The new paradigm is embodied in the cooperative learning model. (see **Table1**). In the new paradigm students are involved in construction of the knowledge. The aim of the instructor is to develop students' competencies and talents and cooperative learning is applied instead of competitive learning.

**Table 1.** The Old and New Paradigm of Teaching

	<b>Old paradigm</b>	<b>New paradigm</b>
<b>Knowledge</b>	Transferred from faculty to students	Jointly constructed by students and faculty
<b>Students</b>	Passive vessels to be filled by faculty's knowledge	Active constructor, discoverer transformer of own knowledge
<b>Faculty purpose</b>	Classify and sort students	Develop student's competencies and talents
<b>Relationships</b>	Impersonal relationship among students and between faculty and students	Personal transactions among students and between faculty and students
<b>Context</b>	Competitive /individualistic	Cooperative learning in classroom and cooperative teams among faculty
<b>Assumption</b>	Any expert can teach	Teaching is complex and requires considerable training

Source: (Fellers,1996).

### **3. COOPERATIVE LEARNING AND TEAMWORK SKILLS**

Cooperative learning, collaborative learning, peer learning and group learning are interchangeably used to define a process by which students work jointly in small groups to accomplish an educational task (Boud et al, 1999).

Cooperative learning (CL) is a popular instructional technique. A recent search of the ERIC education database provided over 6,000 citations associated with this subject. Cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other's learning (Johnson & Johnson, 1999).

Although there are many types of teams that can be used in classrooms, study groups, project groups, lab groups, homerooms and reading groups are groups, but they are not necessarily cooperative (Johnson & Johnson, 1999). Seating people together does not make them a cooperative group.

There are other studies as mentioned below related to the relations between cooperative learning and teamwork.

Ledlow (1999), mentioned that successful cooperative learning requires balancing six different areas: climate setting, team formation, teambuilding, cooperative skills development, lesson design, classroom management. Problem Based Learning (PBL) is a learning method based on the principle of using problems as a starting point for the acquisition and integration of new knowledge. Smith (1995), explained the relation

between PBL and CL, and how to implement cooperative learning in engineering classrooms.

Strom and Strom (2002), examined the limitations that are commonly associated with cooperative learning. Hoegl and Gemuenden (2001), examined the Teamwork Quality (TWQ). Hoegl concluded that the quality of collaboration in teams can be captured through the six facets of TWQ; communication, coordination, balance of member contributions, mutual support, effort, cohesion. In Gupta's study (2004), students in a physical sciences course were introduced to cooperative learning. The results suggest that cooperative learning was very well received by students, and they expressed willingness to join cooperative learning groups in other courses. In addition, cooperative learning offered many benefits to students in terms of graduate attributes such as teamwork, communication, lifelong learning and problem-solving. Physical sciences students found this new learning experience educationally valuable and socially enjoyable. Werner and Lester (2001), investigated whether the variables influencing work team performance in organizations also affect student teams at the collage level and examined student teams working on business case studies.

### **3.1. Benefits of CL**

A real and effective application of CL method has many benefits both to students and to educational outcomes of higher education institutions.

Researchers commonly report student gains in problem solving skills, more favorable attitudes toward education, increased willingness to try new and difficult tasks, an enhanced sense of belonging, more positive relationships among students, greater appreciation for persons of other ethnic backgrounds, greater productivity, reduction of misbehavior, more caring, supportive, and committed relationships, greater psychological health, social competence, and self-esteem. Students also grow from listening to the viewpoints of others, encouraging teammates, showing empathy, negotiating conflict, and making an effort to help peers understand lessons (Strom and Strom, 2002). Also by eliminating the competition and working together, students will learn more in a shorter amount of time while developing social skills and teamwork (Clark, 1999).

Another benefit in cooperative learning is that as students are given an opportunity to express their thoughts openly, they improve their communication skills. Most study groups take the shape of a general meeting which provides the students with real life experiences which could be utilized in their upcoming career (Gupta, 2004). CL results in process gain such as higher level reasoning, more frequent generation of new ideas and solutions and greater transfer of what is learned within one situation to another (Johnson & Johnson, 1999).

### **3.2. Elements of the Cooperative Learning Model**

Putting students together to work on an assignment does not guarantee that CL will occur. In this situation workload will not be distributed equally and while one or two dominant or hardworking students are doing the work, the others will have the rewards. In order to avoid this, CL should be well structured. There should be five essential components or principles for small-group learning to be truly cooperative. The difference between well-structured cooperative learning groups and poorly structured ones are the existence of these five essential elements. These essential elements should be carefully structured within all levels of cooperative efforts. The five essential elements are as follows (Johnson, Johnson & Smith, 1991):

**-Positive Interdependence:** CL is based on interdependence, the ability to work well together, using each other's strengths and weaknesses in a complementary manner in order to accomplish the task (Ventimiglia, 1995). The heart of cooperative learning is positive interdependence. Students must believe that they are linked with others in a way that one cannot succeed unless the other members of the group succeed.

**-Face-to-Face Promotive Interaction:** Students should interact to help each other accomplish the task and promote each other's success.

**-Individual Accountability/Personal Responsibility:** The purpose of cooperative learning groups is to make each member a stronger individual in his or her own right. Students learn together so that they can subsequently perform better as individuals. To ensure that each member is strengthened, students are held individually accountable to do their share of the work.

**-Teamwork Skills:** Contributing to the success of a cooperative effort requires teamwork skills. Students must have and use the needed leadership, decision-making, trust-building, communication, and conflict-management skills.

**-Group Processing:** Professors need to ensure that members of each cooperative learning group discuss how well they are achieving their goals and maintaining effective working relationships. Groups need to describe what member actions are helpful and unhelpful and make decisions about what to continue or change.

#### **4. PBL AND CL IN MARITIME EDUCATION: SMBM APPLICATION**

Education methodologies that support the characteristics which encourage teamwork and cooperation are widely applied in maritime education. PBL has been successfully applied in a number of disciplines and various academic institutions internationally. The problems which students tackle in small groups under the supervision of a tutor consist of description of a set of phenomena or events that can be perceived in reality and these phenomena have to be examined by the tutorial group in terms of their underlying principles, mechanisms or processes. This style of learning increases retention of knowledge, improves problem-solving skills, enhances integration of basic science concepts, develops self directed learning skills, strengthens intrinsic motivation and develops teamwork skills (Asyali, 2004, Cerit, 2004).

The use of active learning strategies, such as cooperative learning, is growing at a remarkable rate in many higher education institutions. Dokuz Eylul University School of Maritime Business and Management (SMBM) has responded to the need of people who can work and learn effectively in a workplace team and applied Problem Based Learning (PBL) method which was mainly structured on CL principles. SMBM has applied PBL since 2000 in the Department of Nautical Science and the Department of Maritime Business Administration where cooperative learning strategy is an important tool. Department of Nautical Science offers studies in practical and theoretical subjects of vessel operation and navigation. Graduates will be licensed oceangoing deck officers (mate) that require high level of teamwork skills on board vessels. The Department of Maritime Business Administration aims to prepare students to the continuously changing shipping environments where the main requirements for the human resources lie in cooperative teamwork skills. The interdisciplinary nature of the industry forces the maritime business experts to be highly cooperative.

## 4.1. Categories of Cooperative Learning Groups and Application in SMBM

Cooperative learning can be structured in many different ways. Informal cooperative learning groups, formal cooperative learning groups, and cooperative base groups are the most common CL strategies and they provide an overall structure to teamwork in PBL system. Application of CL group strategies in SMBM is mentioned below.

### 4.1.1. Formal Learning Groups

Formal CL groups, are probably the most difficult to implement and they have the greatest potential for affecting positive change (Smith, 1995). Formal Cooperative Learning (FCL) groups can be used to teach specific content and problem-solving skills. In SMBM in both departments FCL groups last for one semester to complete a specific task or assignment.

In the Department of Maritime Business Administration FCL groups are established for specific logistics and shipping practices. FCL groups are widely used in Nautical Science Department in Bridge Team Management (BTM) Courses. Having modern equipment on the bridge does not prevent maritime accidents. As the human factor is the center of all maritime operations, poor bridge teamwork has often been cited as the main reason for the maritime accidents causing loss of life, loss and damage to assets and marine pollution. Bridge Team Management course complies with International Convention on STCW (Standards of Training, Certification and Watchkeeping for Seafarers) 1995 amendments Section B-VIII/2 and is designed to increase teamwork and the effective use of the Bridge Resources by the bridge personnel. Leadership in emergencies, effective internal and external communication, situational awareness, voyage planning, teamwork, error trapping and relationship with pilots are the main subjects that are covered.

In formal cooperative groups in BTM courses instructors accomplish the following tasks:

- **Specify the objectives for the lesson.** Students receive instructions and objectives both academic and social skills from their instructor. In every BTM exercise, there is an academic objective specifying the concepts and strategies to be learned and a teamwork objective specifying the interpersonal or small group skill to be used and mastered during the exercise.

-**Make a number of instructional decisions.** The instructor decides on the size of groups, the method of assigning students to groups, how long the groups stay together, the roles the students will be assigned, the materials needed to conduct the lesson.

There are generally 4 students in BTM exercises, they are assigned by the instructor at the beginning of the semester. The same teams continue till the end of the semester. The roles of the students are changing in every exercise such as mate, navigator, helmsman and the observer. Trainees are adequately briefed before hand on the exercise objectives and tasks. Materials used for planning for the next exercise such as scenario description sheet, charts, related publications are distributed to the group at the end of the each exercise. They are informed about their own vessel, environmental conditions, visibility, local conditions as traffic and VTS, etc. Also trainees are given sufficient planning time before the exercise starts.

-**Explain the task and the positive interdependence.** The instructor clearly defines the assignment, explains the required concepts and strategies, specifies the positive interdependence and individual accountability, gives the criteria for success, and explains the expected teamwork skill to be engaged in. This information is given to students both in their scenario description sheets written and also at the briefing phase orally.

**-Monitor students' learning and intervene within the groups to provide task assistance or to increase students' teamwork skills.** The instructor systemically observes and collects data on each group as it works. When it is needed, the instructor intervenes to assist students in completing the task accurately and in working together effectively. An instructor monitors the students by audiovisual means such as CCTV system and also by his computer. He records every detail and fills in an assessment sheet. Also one of the team members called “observer” fills in an evaluation form.

**-Evaluate students' learning and help students assess how well their group functioned.** The instructor evaluates the quality and quantity of each student's learning and ensures that each group assesses how effectively members are working together. Students' learning is carefully assessed and their performances are evaluated. Both self and peer assessments have been used. Self-assessment plays a vital role in the learning process as students can develop a realistic sense of their own strengths and weaknesses (Boud et al., 1989). The instructor provides time and a structure for members of each learning group to process how effectively they have been working together. Also an observer who is in the team prepares a report where documents the strength and weaknesses of the team members and the team as a whole.

#### **4.1.2. Informal Learning Groups**

Problem-solving skills ensure active cognitive processing during a lecture. In PBL modules structured in SMBM this method is widely used at presentations, practices and professional skills.

Informal cooperative learning groups are temporary, ad hoc groups that last for only one discussion or one class period. Their purposes are to focus students' attention on the material to be learned, ensure that students cognitively process the material being taught, and provide closure to an instructional session.

#### **4.1.3. Base Groups**

Base groups provide long-term support and assistance for academic progress. These are applied in both of the departments of SMBM in PBL session groups. PBL sessions are hearts of the PBL method where a group of 7-8 students come together with a tutor and try to solve a problem which is provided to them by a scenario. Each group meets together in three times for a four hour period in a module which lasts normally 2 weeks. With the help of a scenario, they determine their learning objectives together and then they start searching for their learning objective until the next session. When they come together again they share what they had found with each other and try to solve the problem.

Base groups are long-term, heterogeneous cooperative learning groups with stable membership whose primary responsibility is to provide each student the support, encouragement, and assistance needed to progress academically. Team members' relations continue after the school hours.

### **5. OBJECTIVE**

One of the most important expectations from maritime students is to be able to work in teams. Maritime education should be considered as an important tool for developing effective team members in the maritime industry and applications supporting teamwork should be applied in the maritime education.

The main objective of this study is to analyze the cooperative learning dimensions and the attitude towards cooperative learning in the teamwork environment of maritime education. The analysis is accomplished in two different departments of the SMBM

where teamwork is applied extensively through PBL. The objectives of the departments are different and they are aiming to prepare students for two different occupational areas of the maritime industry. This approach provides a comparative analysis of the determinants of CL which are effective for different occupational requirements.

The objectives of the study are included in the following statements:

- 1) To search for the factors related to the cooperative learning dimensions and the outcomes of cooperative learning for the maritime undergraduate education institute.
- 2) To test the cooperative learning dimensions and the outcomes of cooperative learning in two departments of the maritime undergraduate education institute comparatively.
- 3) To test the relation between cooperative learning dimensions and the outcomes of cooperative learning for the maritime undergraduate education institute.
- 4) To measure the level of importance of each specific variable for the student.
- 5) To test the results through a reliability analysis.

Through the literature survey it is obtained that the main determinants of cooperative learning are *face-to-face promotive interaction, positive interdependence, group processing, group interaction* and *teamwork skills*. However, *attitude towards cooperative learning* and *group interaction* are two other important variables related to individual characteristics and group characteristics. The outcomes of cooperative learning on the other hand can be grouped in two areas, such as, effectiveness of the team member and the individual performance in groups. The model of the study is based on these findings and is developed as in **Figure 1**.

## 6. HYPOTHESES

Three main hypotheses are developed to test the objectives built on the comparative analysis of the populations:

- H<sub>1</sub>:** Cooperative learning dimensions are perceived differently by students of different undergraduate departments of the same maritime education institute.
- H<sub>2</sub>:** Outcomes of cooperative learning dimensions are perceived differently by students of different undergraduate departments of the same maritime education institute.
- H<sub>3</sub>:** Cooperative learning dimensions are related to the outcomes of cooperative learning.

Seven sub hypotheses for **H<sub>1</sub>**, two sub-hypotheses for **H<sub>2</sub>**, and 15 sub- hypotheses for **H<sub>3</sub>** are formulated to analyze the determinants (**Table 4 and Table 5**).

## 7. METHODOLOGY

### 7.1. Questionnaire Development

To test the hypothesis of the research, a questionnaire consisting of 3 different parts is developed. The first part covers 30 Likert-type questions about cooperative learning dimensions. The second part covers 9 Likert-type questions about evaluating the outcomes of cooperative learning, namely the individual performance (see the statements in **Appendix, Table A2**). A Likert-scale is developed as “1=strongly disagree, 5=strongly agree”. In the last part, there are four demographic questions.

The questionnaire made use of some of the scales that were developed and used by other researchers. The cooperative learning scale developed by Johnson and Johnson's (1983) and used by Ghaith (2002) was applied. Ghaith (2002) used a modified version of Johnson and Johnson's (1983) Classroom Life Measure in order to assess the connections of cooperative learning to learner's perceptions of social support, feelings of alienation from school, and academic achievement. The ten statements that were developed in Ghaith's study were used in this research also to measure the *face-to-face promotive interaction* and *positive interdependence* determinants of cooperative learning.

Group interaction and attitudes toward CL scale was adapted from Veenman, Kenter and Post's study (2000). Pupil Perceptions of Cooperative Learning scale for pupils from grades 4 to 8 was developed by Veenman et al to gather information concerning pupils' preferences for learning in groups, the potentially positive and negative outcomes of cooperative learning and other aspects of cooperative learning. On conceptual backgrounds, Veenman et al had developed two scales. The first scale was developed to measure *attitudes towards CL* which included 6 statements. The second subscale was developed to measure *group interaction* which included 8 statements. The scales were developed in three-point Likert scale. In this research the 4 statements from the *attitudes towards CL* scale and the 3 statements from the *group interaction* scale were adapted to maritime undergraduate education, all in five-point Likert scale.

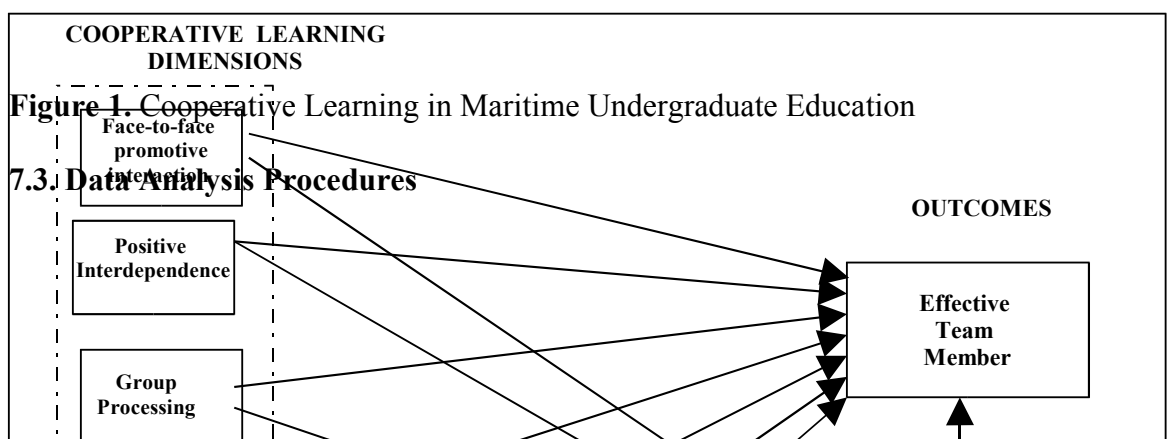
Annett et al (2000) developed a team process model in which three processes namely, behavioral, cognitive and affective processes were defined. Behavioral process consists of communication and coordination. *Coordination in groups* requires initiative in rearranging roles and duties, and interrelation of individual actions by following a prearranged timetable. Annett et al's variables were adapted to maritime undergraduate education and 4 statements were developed for *coordination in groups*.

A literature review related to cooperative learning was used to develop statements for *group processing*, *teamwork skills* and *individual performance in groups*. As a consequence, 3 statements were developed for *group processing*, 6 statements were developed for *teamwork skills* and 4 statements were developed for *individual performance in groups*.

Sullivan et al (2002) argued team developmental stages namely forming, storming, norming, performing and related these stages with required behaviors of team members. 5 statements were used to develop an *effective team member* scale.

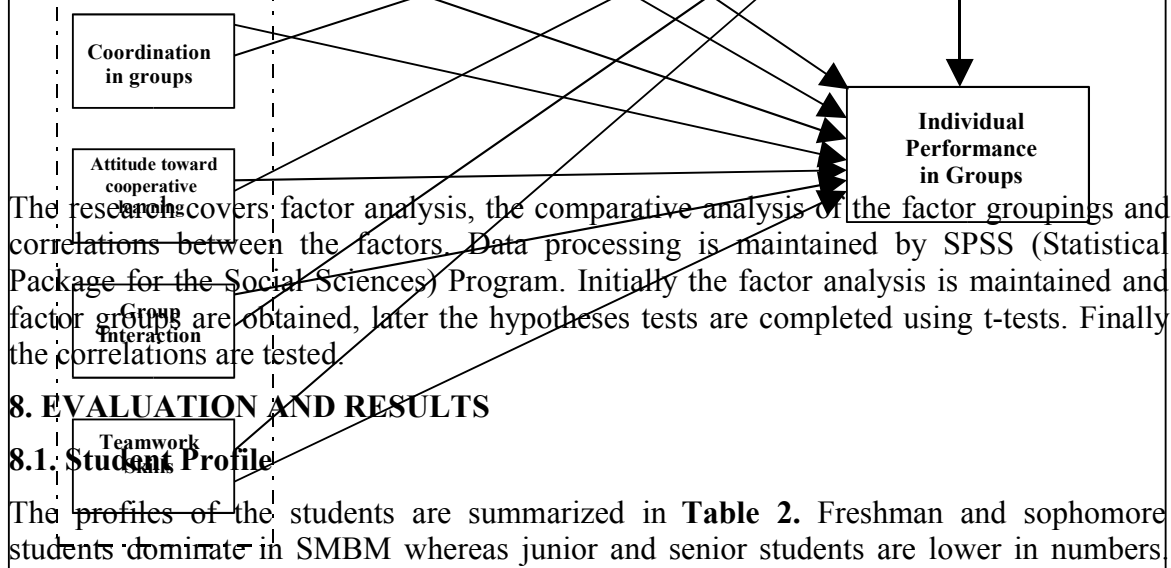
**7.2. Sample**

The research was carried out in SMBM, which has a total of 382 students, during the finals/assessments in January 2005. Although all of the students were included in the population, due to the irregularities of some of the students a total of 281 (73.5% response rate) questionnaires were received, 129 from the Maritime Business Administration Department and 152 from the Department of Nautical Science (see **Table 2**).



**Figure 1. Cooperative Learning in Maritime Undergraduate Education**

**7.3. Data Analysis Procedures**



## 8. EVALUATION AND RESULTS

### 8.1. Student Profile

The profiles of the students are summarized in **Table 2**. Freshman and sophomore students dominate in SMBM whereas junior and senior students are lower in numbers. Males account for three quarters of the population (73.3%).

### 8.2. Factor Analysis

The questionnaire was formed of two parts namely cooperative learning dimensions and outcomes of cooperative learning. After the factor analysis, the first part was explained in seven factors which had a Cronbach  $\alpha = .8696$ . The second part of the questionnaire was explained in two factors which had Cronbach  $\alpha = .7981$ . The total of 39 statements ended in a Cronbach  $\alpha = .9026$  and this means the reliability is acceptable.

**Table 2.** Profile of the Respondents

Variable	Department of Nautical Science		Department of Maritime Business and Management		School of Maritime Business and Management	
	n	Percent (%)	n	Percent (%)	n	Percent (%)
<b>Class</b>						
Freshman	48	31,6	44	34,1	92	32,7
Sophomore	39	25,7	42	32,6	81	28,8
Junior	26	17,1	26	20,2	52	18,5
Senior	39	25,7	17	13,2	56	19,9
Missing	-		-		-	
Total	152	100,0	129	100,0	281	100,0
<b>Gender</b>						
Male	148	97,4	58	45,0	206	73,3
Female	2	1,3	43	33,3	45	16
Missing	2	1,3	28	21,7	30	10,7
Total	152	100	129	100	281	100

**Table 3** analyzes the nine sets of factors obtained for the cooperative learning environment concerning the two departments of maritime undergraduate education. The questionnaire has two parts. The first part concerns dimensions of cooperative learning and the second part deals with outcomes of cooperative learning. The first part ended in seven factor groupings and in the order of their reliability these are; (1) Attitude toward cooperative learning, (2) Teamwork skills, (3) Positive interdependence in groups, (4) Face-to-face promotive interaction in groups, (5) Coordination in groups, (6) Group processing in groups, (7) Group interaction in groups. The second part ended in two factor groupings and these are in the order of their reliability; (1) Individual performance in groups, (2) Effective team member.

Cooperative learning scale used by Ghaith (2002) ended in a reliability of 0.78 and all of the ten statements took place in one factor grouping. However in this study two factor groupings were obtained, with first group focusing on *face-to-face promotive interaction* in groups consisting of four statements with a reliability of .7332. The second group was *positive interdependence in groups* involving five statements with a reliability of .7523. One statement didn't take part in either of the scales related to cooperative learning.



To be open to points raised by other members of the group.		.55	
		.99	
To share work according to prearranged plan.		.71	
		.89	
To arrange plan to balance work load.		.61	
		.55	
To obey the planned time event/schedule.		.68	
		.83	
<b>Attitude Towards Cooperative Learning</b>	.86		
	.80		
Working on a task with other students.		.82	
		.10	
Explaining things to someone of the group.		.79	
		.53	
Preferring someone from the group to explain something.		.78	
		.74	
Listening to other members' ideas.		.84	
		.40	
<b>Group Interaction</b>	.59		
	.39		
The other members listening.			.54
			.22
Tell other students that they do better working in groups.			.70
			.05
Do the best working in groups.			.68
			.92
<b>Teamwork skills</b>	.83		
	.16		
Satisfaction with the leadership skills.			.77
			.82
Satisfaction with the decision-making skills.			.79
			.04
Satisfaction with the communication skills.			.73
			.27
Satisfaction with the conflict-management skills.			.69
			.62
Satisfaction with the problem-solving skills.			.69
			.17
Satisfaction with the brainstorming skills.			.65
			.67
<b>OUTCOMES OF COOPERATIVE LEARNING</b>	.79		
	.81		
<b>Individual Performance in Groups</b>	.79		
	.97		
Feeling stronger.			.6941
Having high motivation.			.7733
Achieving better success.			.8303
Being more productive.			.8507
<b>Effective team member</b>	.79		
	.08		
Being familiar with personal strengths and weaknesses in a group study.			.6337
Understanding the different roles played by group members.			.7243
Understanding how to work with people who have a personal style of work.			.7535
Working cohesively with a group of people toward a common goal.			.7635
Carrying on multiple responsibilities for a project.			.7717

\* 5-point Likert scale- 1: Completely Disagree, 5: Completely Agree

The factors extracted in the second part explain 59.07 % of the variation in the data. Although it is lower than the 60 percent limit it is very close. In each of the two factor groupings the highest loadings were found respectively for (1) being more productive. (.8507) and (2) carrying on multiple responsibilities for a project (.7717).

In terms of the frequencies of the responses given to the Likert-type statements, the highest scores were obtained for the Department of Nautical Science (Appendix Table A2). When the whole School is considered, the highest frequencies were obtained in the following statements: Needing everyone's ideas in order to reach success (4.0254), like to listen to other members' ideas (3.9853), being open to points raised by other members of the group (3.9818), satisfaction with the problem-solving skills (3.9706) and like someone from the group to explain something (3.8967).

However the frequencies were different for the two departments. For the Department of Nautical Science, the highest scores were obtained for needing everyone's ideas in order to reach success (4.1656), being open to points raised by other members of the group (4.1149), like to listen to other members' ideas (4.0816), like someone from the group to explain something (4.0552), like to explain things to another member of the group (3.9796) and satisfaction with the problem-solving skills (3.9388).

It is noted that although the frequencies were lower and the ranking was different, similar statements received highest frequencies at the Department of Maritime Business Administration. These can be given as follows: Satisfaction with the problem-solving skills (3.9762), satisfaction with the communication skills (3.9040), like to listen to other members' ideas (3.8720), needing everyone's ideas in order to reach success (3.8560), being open to points raised by other members of the group (3.8268).

### 8.3. Hypothesis Tests

The results for  $H_1$  and  $H_2$  are given in **Table 4**.

**Table 4.** Comparative Analysis of Cooperative Learning Dimensions and their Outcomes in Two Separate Departments: Hypotheses Tests for  $H_1$  and  $H_2$

Sub-Hypotheses for $H_1$ and $H_2$	Support*
$H_{11}$ : Face-to-face promotive interaction in groups	Supported* $t=3.514$
$H_{12}$ : Positive interdependence in groups	Supported* $t=4.092$
$H_{13}$ : Group Processing	Not Supported
$H_{14}$ : Coordination in Groups	Not Supported
$H_{15}$ : Attitude Towards Cooperative Learning	Supported* $t=2.940$
$H_{16}$ : Group Interaction	Not Supported
$H_{17}$ : Teamwork skills	Not Supported
$H_{21}$ : Individual performance in groups	Not Supported
$H_{22}$ : Effective team member	Not Supported

\* $p < 0.05$

*Tests for  $H_1$  and  $H_2$ :*

For the whole School,  $H_{11}$ ,  $H_{12}$ ,  $H_{15}$  are confirmed. This means that Department of Maritime Business Administration students and Nautical Science Departments consider the following determinants different: (1) Face-to-face promotive interaction (2) Positive Interdependence (3) Attitude towards cooperative learning.

The variables that were considered different by the two departments are given below (**Appendix, Table A2**): Being sure that everyone in the group learns, grade depending on how much members learn, not to be able to complete an assignment unless everyone contributes, sharing all materials in order to complete the assignment, needing everyone's

ideas for success, finding out what everyone else knows to be able to do the assignment, assessing each member's performance and giving back the results to the member, having high motivation, work on a task with other students, explaining things to a member of the group, someone from the group explaining, satisfaction with the leadership skills.

For the whole institution, none of the sub hypotheses of **H<sub>2</sub>** are confirmed. This means that Department of Department of Maritime Business Administration students and Department of Nautical Science students do not consider the outcomes of cooperative learning dimensions differently.

*Tests for H<sub>3</sub>:*

The results for **H<sub>3</sub>** are given in **Table 5** which presents the correlation coefficients for the variables in the study. The data show weak correlations between *individual performance in groups* and *teamwork skills* ( $r=.227, p<0.01$ ). The data show positive moderate correlations between *individual performance in groups* and *face-to-face promotive interaction in groups* ( $r=.343, p<0.01$ ); *group interaction* ( $r=.376, p<0.01$ ), *attitude toward cooperative learning* ( $r=.383, p<0.01$ ); *positive interdependence* ( $r=.384, p<0.01$ ) and *group processing* ( $r=.425, p<0.01$ ). There is a strong correlation between *individual performance in groups* and *coordination in groups* ( $r=.526, p<0.01$ ).

**Table 5.** Correlation Matrix for the Cooperative Learning Dimensions and the Outcomes

<b>Cooperative Learning Dimensions and Outcomes of Cooperative Learning</b>	<b>Mean</b>	<b>SD</b>	<b>Individual Performance in Groups</b>	<b>Effective Team Member</b>
Face-to-face promotive interaction in groups	3.683 7	.8490	.343**	.223**
Positive Interdependence	3.192 9	.8570	.384**	.317**
Group Processing in Groups	3.363 2	.8515	.425**	.314**
Coordination in Groups	3.657 2	.7660	.526**	.433**
Attitude Toward Cooperative Learning	3.861 5	.8601	.383**	.417**
Group Interaction	3.543 2	.7403	.376**	.478**
Teamwork Skills	3.858 6	.7331	.227**	.382**
Individual Performance in Groups	3.494 4	.8656	1	.304**

\*\* Correlation is significant at the 0.01 level.

The data in **Table 5** also show the correlations between *attitude toward cooperative learning*, *coordination in groups* and *effective team member*. The data show weak correlations between *effective team members* and *face-to-face promotive interaction in groups* ( $r=.223, p<0.01$ ); *individual performance in groups* ( $r=.304, p<0.01$ ); *group processing in groups* ( $r=.314, p<0.01$ ); *positive interdependence in groups* ( $r=.317,$

$p < 0.01$ ). The data show positive moderate correlations between *effective team members* and *teamwork skills* ( $r = .382$ ,  $p < 0.01$ ); *attitude toward cooperative learning* ( $r = .417$ ,  $p < 0.01$ ); *coordination in groups* ( $r = .433$ ,  $p < 0.01$ ) and *group interaction* ( $r = .478$ ,  $p < 0.01$ ).

In summary *individual performance in groups* is affected by *coordination in groups* in the highest level. On the other hand being an *effective team member* is highly related to *group interaction*.

## CONCLUSION

It's inevitable that people must work in teams to solve complex problems in the workplace. As organisations have been moving toward a form of work that organizes employees into teams, educational institutions must adapt themselves for these new requirements. Cooperative learning is an effective tool to fulfill these needs. Effective implementation of CL has dimensions that must be addressed in order to have successful outcomes. This study aims to determine cooperative learning dimensions and the effect of these dimensions on developing effective team members and performance of individuals in groups in a maritime undergraduate institute which has two departments, namely Maritime Business Administration and Nautical Science.

The factor groupings obtained in the study were consistent with the scales used in the literature. The factors ended in two main groupings as *cooperative learning dimensions* and *outcomes of cooperative learning dimensions*. CL dimensions were compared with respect to the departments. The results show that two departments differ in the perception of *face-to-face promotive interaction*, *positive interdependence* and *attitude toward cooperative learning*. Especially *positive interdependence* is very important for the students of Department of Nautical Science, as students perceive that they "sink or swim together" during the maritime operations. This motivation triggers them to improve their teamwork skills and be an effective team member. *Face-to-face promotive interaction* in groups is another important dimension as the effective communication on board is the vital element. As a result *attitude toward cooperative learning* is higher among nautical students. Tests for the perceptions in the *outcomes of cooperative learning dimensions* show that there is no difference with respect to the departments.

It is also noted that the frequencies and rankings were different between the departments for the following statements: 1) Satisfaction with the problem-solving skills, 2) satisfaction with the communication skills, 3) preference to listen to other members' ideas, 4) needing everyone's ideas in order to reach success, 5) being open to points raised by other members of the group. It is interesting that problem-solving skills are considered among the most satisfactory skills by the students of both of the departments. The Problem Based Learning methodology applied in the school is reflected in this result and proves the effective application and communication of the methodology.

It's concluded that occupational differences play an important role in perception and application of cooperative learning among students. Another important point is that the most important skill is problem-solving skill in both departments.

*Limitations and further study.* The study has been accomplished in only one institute so the number of students are limited. The study is performed only in the maritime education area. In this study, only the perceptions of students are taken into consideration. This study also tested the effects of CL dimensions on outcomes of CL. The analysis could be extended for other variables such as academic achievement, performance of teams and other organizational variables. Further research can be projected to eliminate these limitations.

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## APPENDIX

**Table A1.** Comparative Results with respect to the Departments

Statements	Support
<b>COOPERATIVE LEARNING DIMENSIONS</b>	
1. In groups, we try to make sure that everyone in the group learns.	Supported t= 3.406
2. In groups, our job is not done until everyone in the group has completed the assignment.	Supported t=2.906
3. In groups, we all receive the same grade.	Supported t=3.148
4. In groups, our grade depends on how much members learn.	Supported t=2.624
5. In groups, I have to make sure that the other members learn if I want to do well on the assignment.	Not supported
6. In groups, we cannot complete an assignment unless everyone contributes.	Supported t=3.120
7. In groups, the lecturer divides up the material so that everyone has a part and everyone has to share.	Not supported
8. In groups, we have to share all materials in order to complete the assignment.	Supported t=3.209
9. In groups, everyone's ideas are needed if we are going to be successful.	Supported t=2.363
10. In groups, I have to find out what everyone else knows if I am going to be able to do the assignment.	Supported t=1.994
11. In groups, performance of each member is assessed and the results are given back to the member.	Supported t=3.544
12. In groups, performance of each group is assessed and the results are given back to the group.	Not supported
13. In groups, we identify helpful and unhelpful member actions.	Not supported
14. In groups, I am open to points raised by other members of the group.	Not supported
15. In groups, I share work according to prearranged plan.	Not supported
16. In groups, we rearrange plan to balance work load.	Not supported
17. In groups, we keep to planned time / event schedule.	Not supported
18. I like to work on a task with other students.	Supported t=1.970
19. I like to explain things to a member of my group.	Supported t=2.752
20. I like someone from my group explain something to me.	Supported t=2.939
21. I like to listen to the other members' ideas.	Not supported
22. The other members in the group always listen to me.	Not supported
23. I always tell other students when they do something good.	Not supported
24. I always do my best when working in groups.	Not supported
25. I am satisfied with my leadership skills.	Supported t=2.279
26. I am satisfied with my decision-making skills.	Not supported
27. I am satisfied with my communication skills.	Not supported
28. I am satisfied with my conflict-management skills.	Not supported
29. I am satisfied with my problem-solving skills.	Not supported
30. I am satisfied with my brainstorming skills.	Not supported
<b>OUTCOMES OF COOPERATIVE LEARNING</b>	
31. I am familiar with my strength and weakness in a group study.	Not supported
32. I understand the different roles played by group members.	Not supported
33. I understand how to work with people who have a style of work different from my own.	Not supported
34. I know how to work cohesively with a group of people toward a common goal.	Not supported
35. I know how to carry on multiple responsibilities for a project.	Not supported
36. In groups, I feel myself stronger.	Not supported
37. In groups, I have high motivation.	Supported t=2.306
38. In groups, I achieve better success.	Not supported
39. In groups, I am more productive.	Not supported

**Table A2.** Frequencies for the Statements with Respect to the Departments

Statements	Departments*			
		n	Mean	SD
<b>COOPERATIVE LEARNING DIMENSIONS</b>				
1. In groups, we try to make sure that everyone in the group learns.	1	12 9	3.178 3	1.302
	2	15 2	3.651 3	1.0246
2. In groups, our job is not done until everyone in the group has completed the assignment.	1	12 8	3.109 4	1.1517
	2	15 1	3.509 9	1.1423
3. In groups, we all receive the same grade.	1	12 6	2.428 6	1.2549
	2	15 1	2.907 3	1.2668
4. In groups, our grade depends on how much members learn.	1	12 3	3.000 0	1.2214
	2	14 3	3.384 6	1.1563
5. In groups, I have to make sure that the other members learn if I want to do well on the assignment.	1	12 9	3.209 3	1.1570
	2	14 8	3.479 7	1.1456
6. In groups, we can't complete an assignment unless everyone contributes.	1	12 7	3.189 0	1.2455
	2	14 9	3.644 3	1.1629
7. In groups, the lecturer divides up the material so that everyone has a part and everyone has to share.	1	12 9	3.209 3	1.1637
	2	14 8	3.121 6	1.2666
8. In groups, we have to share all materials in order to complete the assignment.	1	12 9	3.550 4	1.1317
	2	14 9	3.973 2	1.0523
9. In groups, everyone's ideas are needed if we are going to be successful.	1	12 5	3.856 0	1.1550
	2	15 1	4.165 6	0.9895
10. In groups, I have to find out what everyone else knows if I am going to be able to do the assignment.	1	12 6	3.341 3	1.1741
	2	15 1	3.615 9	1.1007
11. In groups, performance of each member is assessed and the results are given back to the member.	1	12 7	3.669 3	1.1131
	2	14 7	3.163 3	1.2499
12. In groups, performance of each group is assessed and the results are given back to the group.	1	12 8	3.515 6	1.1153
	2	15 0	3.363 7	1.2063
13. In groups, we identify helpful and unhelpful member actions.	1	12 9	3.403 1	1.1627
	2	15 0	3.486 7	1.1097
14. In groups, I am open to points raised by other members of the group.	1	12 7	3.826 8	1.1062
	2	14 8	4.114 9	0.9656
15. In groups, I share work according to prearranged plan.	1	12 9	3.798 4	1.0337
	2	15 0	3.833 3	1.0894

16. In groups, we arrange a plan to balance work load.	1	12 9	3.496 1	1.0616
	2	14 9	3.563 8	1.1987
17. In groups, we keep to the planned time/event schedule.	1	12 6	3.484 1	1.0098
	2	14 8	3.473 0	1.1336
18. I like to work on a task with other students.	1	12 5	3.536 0	1.1950
	2	14 7	3.809 5	1.0938
19. I like to explain things to someone of my group.	1	12 5	3.640 0	1.0349
	2	14 7	3.979 6	0.9895
20. I like someone from my group to explain something to me.	1	12 6	3.714 3	0.9868
	2	14 5	4.055 2	0.9112
21. I like to hear other members' ideas.	1	12 5	3.872 0	0.9586
	2	14 7	4.081 6	0.9545
22. The other members in the group always listen to me.	1	12 4	3.669 4	0.9259
	2	14 7	3.523 8	1.0091
23. I always tell other students that they did something well.	1	12 4	3.693 5	0.9299
	2	14 7	3.653 1	1.0958
24. I always do my best when working in groups.	1	12 6	3.412 7	0.9489
	2	14 7	3.319 7	1.0269
25. I am satisfied with my leadership skills.	1	12 6	3.531 7	1.1777
	2	14 7	3.843 5	1.0644
26. I am satisfied with my decision-making skills.	1	12 6	3.833 3	0.9274
	2	14 7	3.945 6	0.9916
27. I am satisfied with my communication skills.	1	12 5	3.904 0	0.9707
	2	14 7	3.898 0	0.9561
28. I am satisfied with my conflict-management skills.	1	12 4	3.903 2	0.8594
	2	14 7	3.707 5	0.9877
29. I am satisfied with my problem-solving skills.	1	12 6	3.976 2	0.8339
	2	14 7	3.938 8	1.0483
30. I am satisfied with my brainstorming skills.	1	12 5	3.808 0	0.9043
	2	14 7	3.9252	1.1292

**Table A2. Continued**

<b>OUTCOMES OF COOPERATIVE LEARNING</b>				
31. I am familiar with my strengths and weakness in a group study.	1	12 6	3.627 0	0.9443
	2	14 7	3.707 5	0.8775

32. I understand the different roles played by group members.	1	12 4	3.669 4	0.9259
	2	14 3	3.559 4	0.9540
33. I understand how to work with people who have a style of work different from my own.	1	12 4	3.556 5	1.0917
	2	14 7	3.564 6	1.0473
34. I know how to work cohesively with a group of people toward a common goal.	1	12 6	3.587 3	1.0451
	2	14 7	3.721 1	1.0053
35. I know how to carry on multiple responsibilities for a project.	1	12 6	3.777 8	0.9870
	2	14 6	3.815 1	0.9966
36. In groups, I feel myself stronger.	1	12 9	3.426 4	1.0664
	2	15 2	3.546 1	1.1267
37. In groups, I have high motivation.	1	12 8	3.562 5	0.9700
	2	14 9	3.443 0	1.1530
38. In groups, I achieve greater success.	1	12 6	3.531 7	1.0252
	2	15 1	3.410 6	1.0725
39. In groups, I am more productive.	1	12 8	3.570 3	1.0324
	2	15 0	3.446 7	1.2126

1: Department of Maritime Business Administration

2: Department of Nautical Science