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Computer-Assisted Collaborative Learning and Academic Performance

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Abstract - For the continuing search for effective teaching methodology in Maritime English Instruction, this paper examines the effect of the Computer-Assisted Collaborative Learning (CACL) Method on the academic performance of maritime students in terms of their scores in the summative test, pretest and post test, and midterm examination. The study used the experimental design. A series of CACL-based modules covering the midterm topics which were enriched from the existing Instructor's Guide for Maritime English were tested with two experimental groups of students against two other classes who were exposed to the Traditional Method (TM) of instruction. The four groups of students were categorized into academic achievers and non-academic achievers. Findings revealed a significant improvement on the academic performance of all groups after their separate exposure to the two methods. Results from the midterm exam and the summative test further revealed that there is no significant difference on the academic performance of the groups of academically advanced students. For the groups of non-achievers, however, those who

were exposed to the CACL method had significantly scored higher than those who were taught using the Traditional Method.

Keywords - collaborative learning, computer-assisted instruction, academic performance

INTRODUCTION

The present era demands for a high degree of literacy on the diverse roles of the computer even in the field of education. Technological advancement and computer literacy were viewed as impediment to the role of manpower in the workplace and treated as a threat in learning institutions as they may have an adverse effect on the learning process and the study habits of learners. We have arrived at the period of technological evolution where computers are seen as a useful tool for learning and instruction. As we embrace the changes that go with time, so must we welcome new technology as a tool for learning and discover how we can maximize instruction by putting this technology into use.

For many years, teaching Maritime English has been a challenging task for language teachers. Acquiring a high level of expertise in language teaching is not really as difficult as getting adequate knowledge of the complexities of seafaring and the realities in the field. Issues on expertise in language teaching was always with authenticity of the content of instruction. Language teaching is not anymore treated as acquiring language skills in isolation but as a tool for bringing out the best in the learner in his chosen field by using language skills that are relevant to his own needs as a future seafarer. For a Maritime English teacher, it is an added challenge to teach the course with limited resources and instructional materials; more so, because teaching the course requires a high degree of authenticity as students need to be exposed to learning materials and experiences which are very close to realities on board.

FRAMEWORK

Johnson and Smiths (1991) framework of Collaborative Learning as well as those of De Corte's (1996); Lehtinen, Hakkarainen & Lipponen's (1998); Verschaffel, Lowyck, De Corte, Dhert & Vandeput's (1998) framework on Computer-Supported Collaborative Learning provide support to the concept of this paper. Collaborative or cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other's learning. Students in a cooperative or collaborative atmosphere work in teams to accomplish a common goal, under conditions that include the following elements: *positive interdependence*, *individual accountability*, *face-to-face promotive interaction*, *social skills*, and *group processing*.

Positive interdependence is the perception that a student is linked with others in a way so that he/she cannot succeed unless they do (and vice versa), that is, their work benefits him/her and his/her work benefits them. It promotes a situation in which students work together in small groups to maximize the learning of all members, sharing their resources, providing mutual support, and celebrating their joint success. Individual Accountability exists when the performance of each individual student is assessed and the results are given back to the group and the individual. It is important that the group knows who needs more assistance, support, and encouragement in completing the assignment. It is also important that group members know that they cannot "hitch-hike" on the work of others.

The purpose of cooperative learning groups is to make each member a stronger individual in his or her right. Students learn together so that they can subsequently perform better as individuals. Once teachers establish positive interdependence, they need to maximize the opportunity for students to promote each other's success by helping, assisting, supporting, encouraging, and praising each other's efforts to learn through face-to-face promotive interaction. Accountability to peers, ability to influence each other's reasoning and conclusions, social modeling, social support, and interpersonal rewards all increase as the face-to-face interaction among group members increase. Persons must also be taught the social skills for high quality cooperation and be motivated to use them.

Leadership, decision-making, trust-building, communication, and conflict-management skills have to be taught just as purposefully and precisely as academic skills. Group processing exists when group members 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 behaviors to continue or change. Students must also be given the time and procedures for analyzing how well their learning groups are functioning and the extent to which students are employing their social skills to help all group members to achieve and to maintain effective working relationships within the group.

Computer-assisted instruction, on the other hand, refers to the form of instruction where a wide extent of computer-generated materials is used to enhance instruction. According to Slavin (2003), computers are being used to expand the learning experience in different subjects in classrooms. They can be used to teach new skills or to help improve comprehension of subjects that students have difficulty learning.

Using both frameworks as a point of reference, this study proposes an instructional model which illustrates how Computer-Assisted Collaborative Learning can be integrated in the Instructor's Guide of Activities in Maritime English. The proposed format maximizes the use of teacher and student-made computer-generated materials as a tool for instruction. These materials are enriched with computer-generated audio-visual attachments such as pictures, animated diagrams, audio-recorded materials, and other varied graphic aids such as tables/ matrices and different types of graphs and charts referred to by Burton, Moore, and Holmes (2001) as "hypermedia", the term which involves the use of animation, sound, or video which is added to the text. Hypermedia systems are constructed in a way to represent how a human thinks (Kearsley 1998). Burton et al. (2001) found hypermedia systems well suited to support problem-solving efforts. The proposed instructional format comprises the following steps: (1) Warming Up; (2) Introduction of the Topic; (3) Objective Setting; (4) Vocabulary Input; (5) Collaborative Activity; (6) Production Phase; (7) Output Presentation; and (8) Evaluation. The following diagram illustrates the concept of the study:

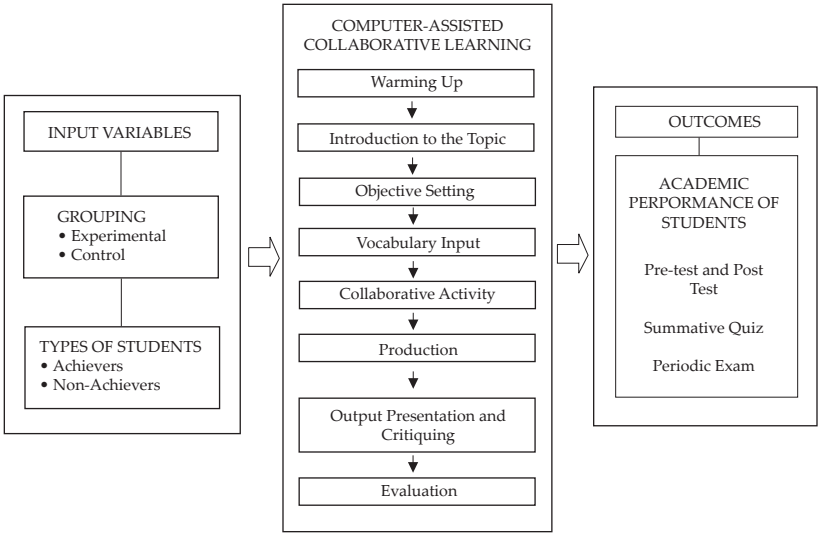


Fig 1. Schematic diagram of the conceptual framework

OBJECTIVES OF THE STUDY

The study aims to look at Computer-Assisted Collaborative Learning Model within the perspective of a classroom in a teaching-learning environment where the teacher and the students perform their respective roles in a collaborative atmosphere. Moreover, the study seeks to offer a possible solution to certain difficulties encountered by the Maritime English teacher in the classroom, specifically on instruction and acquisition of instructional materials. Hence, its main purpose is to propose a format which illustrates how the Computer-Assisted Collaborative Learning Model can be applied in the Instructor's Guide of Activities in the Maritime English Course. This study also aims to find out if, when tested, if this model can be a useful method in teaching Maritime English.

MATERIALS AND METHODS

The quasi-experimental method was used in this study. Specifically, this study used the nonequivalent control group design which involves two groups: control group and experimental group. For the purpose of this study, two experimental groups who were exposed to the Computer-Assisted Collaborative Learning (CACL) Model and two control groups who were taught using the Traditional Method of Instruction (TM) were selected. All groups were given a pretest and a posttest. Since the study is classroom-based, the groups were not randomly assigned. The main objective of the experiment was to find out whether or not the CACL model will make a significant improvement in the performance of students and whether or not there would be a significant difference between the academic performances of those who were exposed to the model and those who remain to be taught using the traditional method of instruction.

A series of modules was designed based on the existing Instructor's Guide on Maritime English prepared prior to the conduct of the study. The strategies/instructor's guide of these modules were patterned based on the proposed Computer-Assisted Collaborative Learning Model which is composed of the following steps: 1) Warming up, 2) Introduction of the Topic, 3) Objective Setting, 4) Vocabulary Input, 5) Collaborative Activity, 6) Production, 7) Output Presentation and Critiquing, and 8) Evaluation. A total of five modules were prepared and used in the study.

To determine the students' scores in the pretest and post test,a 50-item multiple choice test was used. The instrument covered the following topics: ship movements, types of marine engines, ship's maintenance, auxiliary machinery, and maritime safety. Also included in the questionnaire were certain language topics like causal verbs, compound nouns, infinitives, and gerunds.

Another instrument used in the study was the summative test. It is a compilation of tests given at the end of every week. These tests were taken from the Manual of Exercises for Maritime English, a compiled set of exercises authored by the teachers in the Languages Area of JBLCF-Bacolod. These tests had been critiqued and validated by experts teaching the same subject. The entire test was equivalent to 80 points.

The last instrument used in gathering the data for this study was the Mid-term Exam questionnaire. This was a 50-item multiple-choice test on the topics covered for the Mid-term. Like the other instruments, this questionnaire was also edited, validated, and approved by the Subject Area Head for Languages prior to its administration.

To find out if there had been a significant improvement on the academic performance of the control groups who were exposed to the Traditional Method (TM) and the experimental groups who were exposed to the Computer-Assisted Collaborative Learning (CACL) after the experiment, the t-test for dependent means was used. To test if there had been a significant difference on the academic performance of the two groups after their separate exposure to the two methods, the t-test for independent meanswas applied. Both statistical analyses were done with the help of a statistician through the computer-based SPSS program.

The Computer-Assisted Collaborative Learning Model

The Computer-Assisted Collaborative Learning (CACL) Model can be applied as a useful method of instruction in Maritime English. This model has been designed based on an intensive review of related studies and literature. The prepared design was then integrated into the column for Strategies/Instructor's Guide for Maritime English and was tested with two classes which were assigned as the Experimental Groups of this study. The proposed format is composed of the following:

Step 1: ***Warming Up***. The first step allows the students to tune themselves in to the activities that are set ahead. A warm-up activity may include a game, a discussion of a related past or recent incident or report, a picture description, or a provoking question for a brainstorming exercise which is appropriate to or which could create a smooth connection to the topic that will be presented next. The materials needed as "warmers" are all prepared in advance and presented as computer-generated audio-visual materials. This part of the format may take 5-10 minutes. To illustrate this point, a vocabulary game is shown on the following pages:

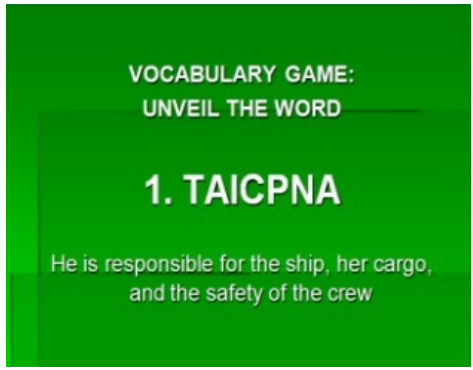


Fig 2. Example Step 1: Warming-up Activity

Step 2: ***Introduction of the Topic***. This is the second step in the procedure. Here the teacher spells out the target language lesson in relation to a content topic. For example, the use of Personal Pronouns in relation to Ship's Organization. A smooth transition from the "warmer" used in the first step to this step must be ensured by the teacher.

Step 3: ***Objective Setting***. In the third step, the teacher introduces the objectives of the lesson. It is to be remembered that these objectives coordinate with the objectives specified in the Instructor's Guide for Maritime English. The next slide (Figure 3) shows how Step 2 and Step 3 can be done.

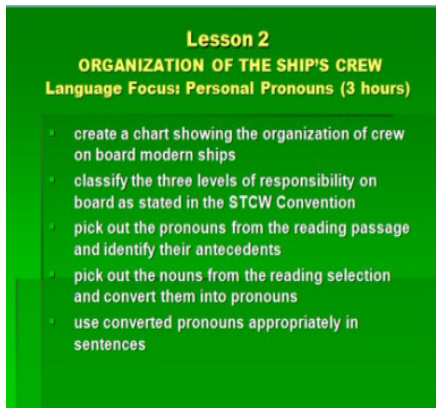


Fig 3. Example of step 2 and 3: introducing the topic

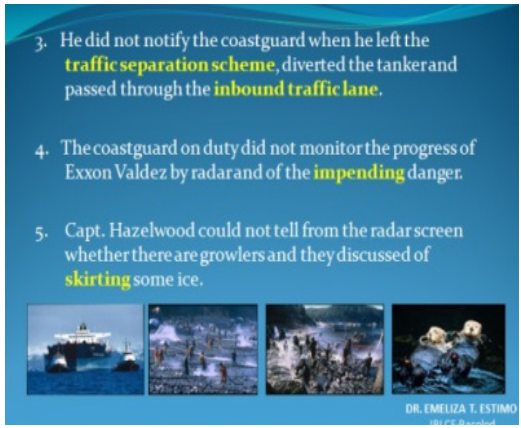


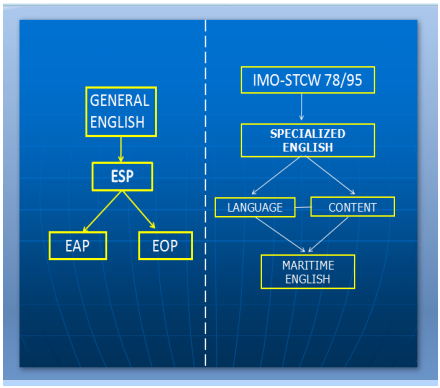
Fig 4. Example of step 4: vocabulary input

Step 4: ***Vocabulary Input***. This step introduces salient terminologies related to the content (maritime) topic. Examples for the language input can be extracted from these terms. This step can be done by using varied vocabulary building strategies such as using context clues, word puzzles, question and answer activity, and many others. The slide on the next page (Figure 4) illustrates how this step could be done. As seen on the example, the terms were unfolded using context clues as a strategy in building up vocabulary.

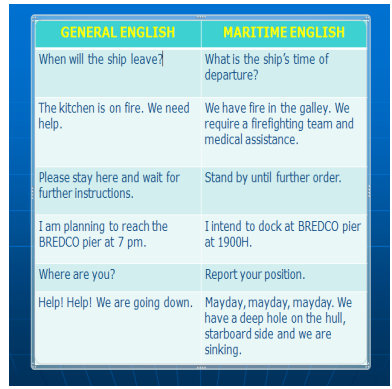
Step 5: ***Collaborative Activity***. This step is the heart of the process. Instead of the usual board-talk and lecture method, the students, having been divided into small groups, are given activities to read and discuss within their groups. The activities given to the groups may be varied based on the topics that need to be covered for a certain period of time. In grouping, students are classified according to their mental capacity and are equally distributed. In each group, a leader and a scribe are assigned. The leader facilitates the discussion and sees to it that every member is given equal chance to share his ideas. The scribe takes note of everything that transpires during the discussion. The following pictures show the students in their collaborative activity:

Fig 5. Pictures of students in their collaborative Activity

Step 6: ***Production***. Prior to the group activity, each group is instructed to bring their own laptops which they should use during the production phase. In this phase, each group was required to produce a computer-generated presentation of the topic/activity assigned to them. A computer-generated presentation, in this context, is a simple output in Power-point form with attachments downloaded from online sources such as pictures, videos, animated diagrams, graphs, charts, or any form of graphic aid which can help "visualize" the concepts covered in their topic assignment. After the actual preparation of the initial work in the classroom, the group may be given two more days to prepare their outputs and to have them ready for presentation the following meeting. It is to be emphasized that in this phase, the students work closely with the subject instructor in case assistance and advice is needed. In the conduct of the group activity, the subject instructor goes around to check on the initial outputs of the different groups. Should more time be needed, s/he should be ready and open to entertain the students for professional advice. She may offer his/her suggestions for a better output. The following pictures show some samples of the students' outputs:

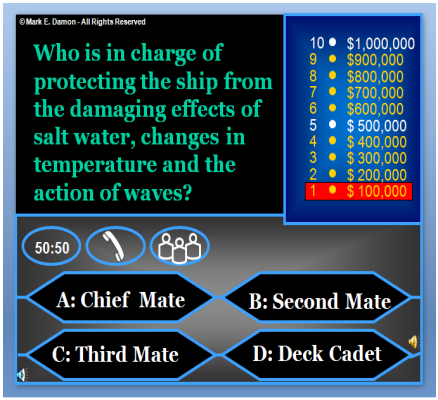


1



GENERAL ENGLISH	MARITIME ENGLISH
When will the ship leave?	What is the ship's time of departure?
The kitchen is on fire. We need help.	We have fire in the galley. We require a firefighting team and medical assistance.
Please stay here and wait for further instructions.	Stand by until further order.
I am planning to reach the BREDCO pier at 7 pm.	I intend to dock at BREDCO pier at 1900H.
Where are you?	Report your position.
Help! Help! We are going down.	Mayday, mayday, mayday. We have a deep hole on the hull, starboard side and we are sinking.

2



3

4

Fig 6. Sample Outputs of Students after the Collaborative Activity

Slide 1 of Figure 6 shows a sample output of one group given this problem: *"Create a graphical presentation showing how Maritime English has evolved. Use the notes provided on page 6 of your handout."* Shown on slide 2 is another group's presentation of the difference in the use of terms and phrases between General English and Maritime English. On Slide 3 was a game created by another group in line with their assigned topic, "Ship's Maintenance". The game, as seen on Slide 3 of Figure 6 is inspired by the famous television game show "Who Wants to be a Millionaire." This output is interesting because it was created complete with sound and visual effects. Finally, Slide 4 is another

group's visualization of the "Steps in Building a Ship". This output presents the steps in the form of a flowchart.

Step 7: ***Output Presentation and Critiquing***. In this step, all groups are tasked to present their group outputs in front of the class using their own laptops. For this purpose, an LCD projector and auxiliary sound device can be set up in advance. These devices will project all added materials the students may have added in their presentation.

A conducive venue and atmosphere must be set for this purpose. Critiquing may be done by the entire class. Comments, questions, and reactions will be facilitated by the subject instructor. Contents of the presentations will also be confirmed based on the handout given out to the entire class prior to the activity. Moreover, the subject teacher as well as the whole class should provide suggestions for the improvement of the outputs presented. All groups will be asked to revise and improve their computer-generated outputs based on the suggestions made and to submit these materials at a specific deadline.

Figure 7. below shows the students in their output presentation. All groups are given a fixed time allotment to present their work.

Fig 7. Pictures of Students in Their Output Presentation

Step 8: ***Evaluation***. The final step of the proposed format is done to test or evaluate the extent of understanding of the entire class on the topics presented. This can be done by giving varied types of evaluative activities such as short quizzes, summative tests, quiz bees, oral recitation, or interactive discussion with the subject instructor.

RESULTS AND DISCUSSION

Academic Performance Before and After the Intervention

The first aim of the study was to find out if there had been a significant improvement on the academic performance of the students after their exposure to the Computer-Assisted Collaborative Learning (CACL) Model in comparison with those classes taught using the traditional approach to teaching. Table 1 below shows the data for the groups of achievers (BSMT 1-Polaris and BSMT 1-NSA) and non-achievers (BSMT 1-Half Hitch and BSMT 1-Marline Spike).

Table 1 Pretest and post test results

Group	N	Mean		SD	Sig. (2-tailed)	Interpretation
BSMT 1-POL (CACL)	38	Pre	39.6053	.73	.000*	Significant
		Post	47.4211	.57		
BSMT-NSA (TM)	19	Pre	43.4211	1.23	.000*	Significant
		Post	51.5263	.86		
BSMT 1-HH (CACL)	40	Pre	34.5263	5.53	.000*	Significant
		Post	42.2105	6.36		
BSMT 1-MS (TM)	42	Pre	31.9250	6.31	.000*	Significant
		Post	38.7250	6.63		

Data shown in Table 1 reveal a significant improvement on the academic performance of the students in terms of their pretest and post test for both control and experimental groups. The mean score of BSMT 1-Polaris in the pretest was 39.6053 which significantly

increased to 47.4211 in the post test. Moreover, the mean score of BSMT 1-Half Hitch which was 34.5263 in the pretest increased to 42.2105 in the post-test. Both groups were exposed to Computer-Assisted Collaborative Learning Model before they were given the post test. Meanwhile, BSMT 1-NSA and BSMT 1-Marline Spike also showed a significant improvement in their mean scores after they were exposed to the Traditional Method of instruction. It can be surmised then that while the CACL Model had significantly improved the academic performance of the experimental groups after the intervention, the traditional method had also significantly improved the academic performance of the control groups in the traditional setting.

Traditional Method (TM) vs. Computer-Assisted Collaborative Learning (CACL)

The second concern of this paper was to determine if there had been a significant difference between the academic performance of the experimental groups and the control groups of students classified as achievers and non-achievers after their separate exposure to the two methods. To find out which method has more significantly improved the academic performance of students, data from the results of the Mid-term Examination, the summative test, and the post test were further analyzed using the t-test for independent means. Results of these analyses are shown in Table 2, 3, and 4 respectively.

Table 2. Examination results of the control and experimental groups

Group	N	Mean	SD	Sig. (2-tailed)	Interpretation
BSMT 1-POL (CACL)	38	39.9211	4.78952	.194	Not Significant
BSMT 1-NSA (TM)	19	41.3158	3.14559		
BSMT 1-HH (CACL)	40	36.7632	4.98882	.000*	Significant
BSMT 1-MS (TM)	42	32.4500	4.83550		

Data from Table 2 reveals that the difference in the scores of the academic achievers (BSMT 1-NSA and BSMT 1-Polaris) in the control and experimental groups was not significant. The data indicates that BSMT 1-Polaris had performed as better as the BSMT 1-NSA group in terms of their scores in the mid-term exam.

Table 2 further reveals a significant difference on the academic performance between the groups of non-academic achievers (BSMT 1-Half Hitch and BSMT 1-Marline Spike) in terms of their mid-term examination results. Students from BSMT 1-Half Hitch who were exposed to the CACL method showed a significant advantage in terms of their mean score over those from BSMT 1-Marline Spike who were exposed to the Traditional Method of instruction. Based on this evidence, we can then say that the CACL method has been found more effective than the TM method in terms of the students' academic performance of the groups of non-achievers as measured by their examination results. This could mean that exposing the students who are not academically advanced to computer-generated materials and providing them opportunity to work collaboratively with their classmates and their teacher could significantly improve their ability to score in the exam. The same case can be observed in Table 3 below on the basis of the students' summative test results.

Table 3 Summative test results of the control and experimental groups

Group	N	Mean	SD	Sig. (2-tailed)	Interpretation
BSMT 1-POL (CACL)	38	66.8158	5.20839	.983	Not Significant
BSMT 1-NSA (TM)	19	66.8421	4.03131		
BSMT 1-HH (CACL)	40	58.0526	6.97465	.000*	Significant
BSMT 1-MS (TM)	42	51.2500	7.63847		

An extended analysis of the post test results revealed a significant difference between the academic performance of the experimental group and the control group of students classified as achievers and non-

achievers. Between the groups of academic achievers (BSMT 1-Polaris and BSMT 1-NSA), students who were exposed to the Traditional Method (BSMT 1-NSA) significantly performed better than those who were exposed to the Computer-Assisted Collaborative learning (BSMT 1-Polaris). A possible explanation for this was the disadvantage on the latter in terms of number of students in the class. BSMT 1-Polaris was composed of 38 students while BSMT 1-NSA only had 19 cadets. The lesser number of students in the BSMT 1-NSA group could have favored them to focus more on the lesson and to be given adequate time to individually interact with the teacher who provided most of the instruction. Data for this are shown in the following table.

Table 4. Post test results of the control and experimental groups

Group	N	Mean	SD	Sig. (2-tailed)	Interpretation
BSMT 1-POL (CACL)	38	47.4211	3.533080	.000	Significant
BSMT 1-NSA (TM)	19	51.5263	3.74712		
BSMT 1-HH (CACL)	40	42.2105	6.35507	.020	Significant
BSMT 1-MS (TM)	42	38.7250	6.62933		

This was not the case, however with the two other groups of non-academic achievers (BSMT 1-Half Hitch and BSMT 1-Marline Spike). Although the difference in their academic performance as measured by their post test results was found to be significant, this significant difference worked in favor of BSMT 1-Half Hitch who were exposed to the CACL Model of instruction. It seems to tell that the CACL method appeared to be more effective to classes composed of non-achievers rather than those who are already academically advanced.

To sum up, findings from the study revealed that the control groups for both academic achievers and non-achievers have significantly benefited from the Traditional Method. Moreover, both classes of achievers and non-achievers who were exposed to the CACL method have also significantly improved in their academic performance.

Results from the mid-term examination and the summative test revealed a non-significant difference on the academic performance of academically advanced students after their separate exposure to the Traditional Method and the Computer-Assisted Collaborative Learning Method. For the groups of non-achievers, however, it was revealed that the students who were exposed to the CACL method have significantly scored higher than those who were taught using the Traditional Method.

Data from the post test, on the other hand, revealed a significant difference on the academic performance between the groups of academic achievers and between the groups of non-achievers after their separate exposure to the Traditional Method and the Computer-Assisted Collaborative Learning method. The significant difference on the ability to score in the post test between the groups of academic achievers worked in favor of those in the control group who were exposed to the Traditional Method. This finding was attributed to the lesser number of students in the control group which made the instruction more accessible and interactive. The ideal number of students in the control group also favored the students in that they could discuss more closely with the teacher who provided most of the clarifications through the prevailing use of the lecture-discussion method which characterizes the traditional method of instruction.

On the contrary, the significant difference on the ability to score in the post test between the groups of non-achievers worked in favor of those who were exposed to the Computer-Assisted Collaborative Learning Model (Experimental Group). From this finding, it could be derived that less proficient students in terms of their academic performance could benefit more from instruction if they are made to work and learn cooperatively with their classmates through a computer-assisted form of instruction. The use of graphically presented materials could also improve their ability to understand the lessons well rather than when these materials are presented to them in pure textual form.

CONCLUSIONS

Teaching is a continuous journey for discovering new methods or a combination of methods that could work best with the kind of learners

that we have in class. As there is no exact prescription for what could work best with our students, teachers should continuously find ways to make learning as effective as possible. As Landow (1999) has put it, "educators are required to incorporate new methods of teaching in the classroom in order to properly challenge and stimulate students".

Technology has been widely accepted as a useful tool in the teaching and learning process. There has been a growing need for customizing learning in a specific area, enriching learning with communication and connections with others beyond the classroom, offering new learning opportunities, and helping students experience the main value of learning by using knowledge and abilities in real-world situations to improve the future of technology in the classroom. Computer-based or computer-assisted instruction plays an extremely important role in the students' lives. It may not be able to solve all learning problems, but it could make learning more interactive, it could improve the learning atmosphere, and it could develop social roles as the learners are made to work and learn collaboratively with the rest of the students in class and with the teacher.

McGrath, et al. (2007) pointed out that introducing hypermedia into the collaborative learning environment may lead to improve attitudes, motivation, understanding, and responsibility for one's own learning. It could also enhance their awareness of the realities of life in which they will find themselves later. Computer-based education has clearly enhanced the classroom environment through extensive technological opportunities that provide students with a wealth of information on particular topics, while instantly examining students' feedback and establishing areas requiring improvement.

Computer-Assisted Collaborative Learning is not something that we should refuse because it is expensive for the administration and requires a higher level of computer literacy among the teachers. Even with limited resources, teachers could make a difference in their students' academic performance if they could devote extra time to "befriend the net" and look for interesting materials which could be useful for him/her. We have come to an era when everything is so advanced and where information can be accessed with just a push of a button or by just pressing a few keys on the keyboard. It would be a lot of waste if we allow ourselves to be held back just because we refuse

to embrace technology with an open mind or just because we think it entails a lot of work and we are constrained with time. Landow (1997) points out a good argument for this: "The way teachers are taught to use computer to facilitate learning determines if technology will be a success in the students' achievements." Quality instruction always entails a lot of hard work. We cannot just sit comfortably and let the usual routine take its course and expect for a miracle to work overnight with our students because it really does not work that way. As teachers, we need to advance as the world around us rapidly progresses with our students keeping pace with it.

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