Effectiveness of Collaborative Learning Approach in Teaching Mathematics

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Abstract: *many scholars have struggled to improve techniques that boost performance of students. Among the techniques is the Collaborative learning. Collaborative learning is an umbrella term for a variety of educational approaches which involves joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. This approach matches with the philosophy of contemporary perspectives on learning and teaching aiming to promote higher achievement, more positive interpersonal relationships and greater psychological health, resulting in graduates being cooperative, caring, reflective, critical and creative (Yanhui Xia,2015). Collaborative learning Style activities vary widely, but most centers on students' exploration or application of the course Module, not simply the teacher's presentation or clarification of it. The students work together for better achievement of their group.*

A Problem Based Project investigation of two equivalent groups was designed one group is the experimental group which will include 30 Skyline University students who are taking the module Business Mathematics and the controlled group consisting of similar 30 Skyline university students who are taking business mathematics Modules using Minitab software besides to the two sample T-test for the two samples was used to analyze the data. After analyzing the results of both groups in this study we found out that collaborative learning approach is more effective than the individual learning style.

Keywords - *Collaborative Learning, business mathematics, Statistical Instrument.*

I. Introduction

Collaborative learning is a learning method that uses social interaction as a means of knowledge building. This concept has been around a long time. It is a student-centered approach that requires students working together to accomplish shared learning goal and to maximize their own and their group members' achievements. This approach matches with the philosophy of contemporary perspectives on learning and teaching aiming to promote higher achievement, more positive interpersonal relationships and greater psychological health, resulting in graduates being cooperative, caring, reflective, critical and creative.

There are some characteristics of collaborative learning are listed briefly as follows;

- Shared knowledge between teachers and students.
- Shared authority between teachers and students.
- Teachers as facilitators.
- Heterogeneous groupings of students.

This approach to learning encourages students to learn content through group activities where they interact with each other, discussing, brainstorming and exchange information and knowledge, and work as a team to achieve the common learning goals. This learning mode is thus constructivist in approach and student-centered (Neo, 2003; Herrington, Oliver, Reeves & Woo, 2007). It engages students in active learning, determine their own learning paths, and encourages them to collaborate with each other as a team to seek knowledge and information to achieve their learning outcomes. Research has found that cooperative learning enables the students to develop critical thinking skills, communication skills, organization skills and others. Thus, more students are made to work with each other to make them ready for the job market. Collaborative learning also fosters interpersonal competencies among the students such as oral communication; active listening; group leadership; the ability to examine assumptions; and the ability to tolerate ambiguities. All of these skills are highly valued in Employment (Tribe, 1994).

Collaborative learning generates conversation, discussion, debate and relationship-building among the students in the group and encouraging them to work well collectively (Neo, 2005). According to Johnson and Johnson (2003), the elements that are found in collaborative learning include positive interdependence, individual accountability, promotive interaction, social skills and group processing. In other words, the members within the group must perceive their goals to be related for them to work together and achieve their common goal. The individual accountability element suggests that individuals within the group must be made to feel that their effort contributes to the common goal. By doing so, the individuals will be more motivated to contribute. As such, if the person within the team is made to feel that he or she is needed, he or she

will be more inclined and motivated to cooperate with the rest of the members (Johnson and Johnson, 2003). Also, increased individual accountability tends to increase the perceived positive interdependence among group members (Archer-Kath, Johnson and Johnson, 1994). Collaborative learning also promotes interaction between group members. The social skills that are needed to have effective cooperation include communication skills, leadership skills, decision making skills, and conflict management. Through discussions and effective group communications, members within the groups are able to sustain the overall inter relationship among the group and therefore, collaborate with one another effectively.

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II. METHODOLOGY

A Problem Based Project investigation of two equivalent groups was designed one group is the experimental group which will include 30 Skyline University students who are taking the module Business Mathematics and the controlled group consisting of similar 30 Skyline university students who are taking business mathematics Modules. The Project was given to the first group where students will be arranged into groups usually mixed group of students with different abilities while the second group the Project will be given individually .both groups were subjected post-Project Evaluation in the Module undertaken. Both groups were treated for a period of 10 weeks.

III. Results

We analysed the Project of the students after treatment for both the experimental and controlled group. We use Minitab software besides to the two sample T-test for the two groups to analyse our data. The data collected was organized using a suitable statistical instrument. The performance on the project of the experimental and the control group is shown in the table below

3.1 Two-Sample T-Test analysis for both groups is as shown below

μ_1: mean of C1

μ_2: mean of C2

Difference: $\mu_1 - \mu_2$

Equal variances are not assumed for this analysis.

3.1.1 Descriptive Statistics

Sample	N	Mean	St Dev	SE Mean
C1	30	33.18	7.78	1.4
C2	30	28.35	6.88	1.3

3.1.2 Estimation for Difference

Difference	95% CI for Difference
4.83	(1.03, 8.63)

3.1.3 Test

Null hypothesis $H_0 : \mu_1 - \mu_2 = 0$

Alternative hypothesis $H_1: \mu_1 - \mu_2 \neq 0$

T-Value	DF	P-Value
2.55	57	0.014

As you can see from the sample T test the average performance of the student who were subjected to the mixed groups where students will be collaborate with each other is 33.18, while the average performance of the students who are subjected for independent performance test is 28.35.clearly there is a deviation among the groups. To justify more on the finding of the study let us see the Graphical analysis using Mini tab.

3.2. Summary Report for C1

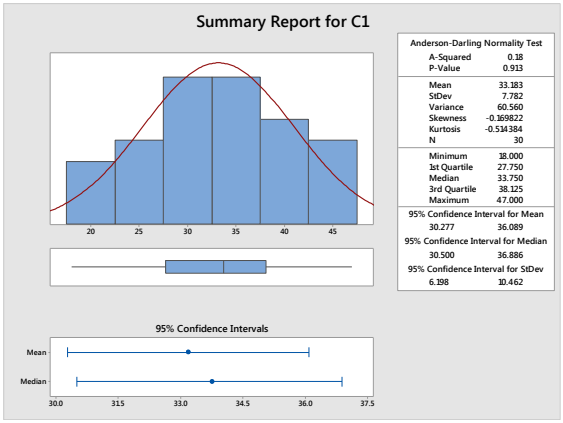

Fig. 1 The graph shown below explains the performance of the students in the experimental group using Minitab.

3.3 Summary Report of C2

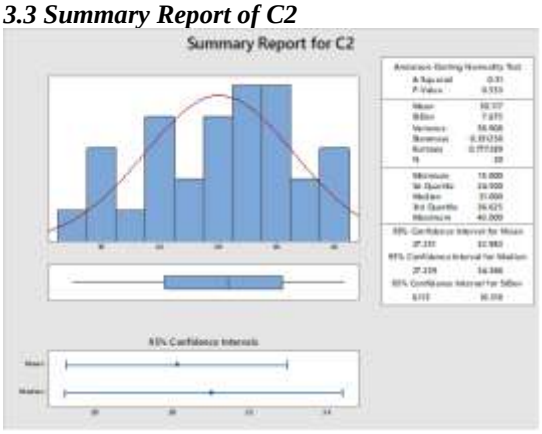

Fig. 2 The graph shown below explains the performance of the students in the controlled group using Minitab

As it can be seen from the fig 2, the maximum score of the students in the controlled group which is the individual performance is 43 and while the

minimum score is 15 which indicates significant amount of difference as compared to the mixed students' performance more over as it can also be seen from the fig 2 The scores of the students are highly variable.

IV. CONCLUSIONS

From this study we can see that those students who are mixed with different ability and background perform well in the project based problem for the module business mathematics as compared to the students who are performing the project individually. Clearly this explains the fact that Collaborative method of teaching is the most effective way of teaching mathematics courses as compared to the individual way of teaching and learning style. More over in subject like mathematics it would be advisable to late students engage into heterogeneous groups so that students will share experience problem solving skills among each other..

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