

**COOPERATIVE LEARNING AND CLASSROOM PARTICIPATION AMONG
ELECTRICAL ENGINEERING STUDENTS OF TAKORADI TECHNICAL
UNIVERSITY**

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ABSTRACT: *In-class participation has become increasingly important with millennial generation students who demand more interaction from their classroom experience. An experimental model was carried out by this research which used a control and experimental group in which cooperative learning was used as an intervention. A total of 24 level 100 students were sampled. The random sampling was used to give a fair and equal chance to all members of the electrical level 100 students of 2020/2021 academic year. Data collection was by participant observation with the help of the observation rubric, and recorded intervention. The findings revealed an atmosphere in the classroom during the implementation of the cooperative learning was full of enthusiasm and for the first time the researchers saw that almost all students were active and none of them was dull. The study recommended that administrators of higher Educational institutions should encourage the teaching community to vary the teaching styles to be able to engage students in their courses of study for higher academic achievement.*

KEYWORDS: Academic, classroom participation, cooperative learning, electrical engineering, students

INTRODUCTION

An important issue in education in this technological era is about how educators must continue to help students succeed both in their academic work and how to enhance students' involvement in

the classroom. In order to enhance the interest of students in any subject taught, students' involvement is necessary. According to Abuid, (2014), dramatic differences between higher and lower participation classes arise based on students' confidence levels. Because students' participation has become an important issue in the classroom setting, there is a need to evaluate the teaching style and methods employed by teachers. Teaching may be explained as an activity of imparting knowledge, skills, competencies and values to learners (Mensah, 2020). In-class participation has become increasingly important with millennial generation students who demand more interaction from their classroom experience (Allred & Swenson, 2006). It must be emphasized that practically it is impossible for every student to participate in class all the time especially, classes with large number of students. However, a favourable classroom atmosphere must be created continually to help students get involved in the teaching and learning process.

University of Washington [UoW] (n.d.) stated that engaging students in the learning process increases involvement and allows students to understand how subject material relates to life experiences. The traditional lecture in higher education should no longer be the primary method of instruction, but it should be supplemented as much as possible with active learning methods (Beran, 1999). Today's dynamic society demands that students must be intelligent, assertive, analytical, dependable, smart, have good communication skills and above all develop good attitudes. According to Maher, (2006) group work leads to higher group and individual achievement, higher-quality reasoning strategies, more frequent transfer of information from the group to individual members, greater metacognitive skills, and more new ideas and solutions to problems. Group work among students should be encouraged and teachers need to place students into groups often especially when teaching a course like research methods in Electrical Engineering that seeks to impact organizational values like teamwork and cooperation among students. By using this cooperative work style, we create the desire for students to work in groups to enable them to be analytical and evaluate information rather than being feed with mere facts. Group work has proven to be an important method which enhances academic work, and also increases communication among students and also between learners and teachers. One effective group work strategy is cooperative learning.

Problem statement

It appeared first year students of Electrical Engineering were always not interested in the research methods class. The volume of facts and details contained within Engineering course materials often takes priority over student learning activities. This was the exact situation in the researcher's lecture class. Moreover, the researcher had observed from other lecturers' class that students did not get enough opportunity to express themselves adequately during lectures because the lessons were mainly lecture method. In some classrooms, teachers had a challenge of adapting texts to their students' needs and deciding which instructional methods will maximize students' learning and success. This situation created a lot of distractions among the students during lectures and students prefer to talk to each other rather than listen to the lecturer. This observation and feedback

from students made it necessary to implement cooperative learning as an intervention to find out if it will stimulate students participate in research methods lesson contents in the electrical class.

Consequently, the study aims to use cooperative learning as an intervention to increase class participation and improve learning among students of Takoradi Technical University in the electrical engineering class. Specifically, the study evaluates how cooperative learning techniques could be used to solve the problem of lack of students' participation in electrical engineering class, assess ways by which cooperative learning techniques could improve students' learning in electrical engineering class. Through this study, it is the hope that this research would help to find how to arouse students' interest in research methods in electrical engineering which will help create a lively class, that the role of cooperative learning in increasing students' participation in electrical engineering will help teachers in the field when choosing their teaching methods and lastly, the study would increase the knowledge of the teacher in using the cooperative learning method which can also serve as a reference point for other teachers.

LITERATURE REVIEW

For effective learning to take place the learner and the teacher must play active roles in the teaching and learning process. The attitudes of students towards the concept of teaching and learning are related to the kind of environment in which they find themselves. Several studies support the view that the factor most likely to affect positively students' attitudes towards the teaching and learning of concepts is an open classroom climate (Angell, 1992 & Ochoa, 1991 as cited in Mensah & Frimpong, 2020). When either the teacher or learner becomes passive, it stalls the learning process and this view is strongly supported by Vygotsky's theory of social constructivism. Theoretical framework is based on an existing theory in a field of inquiry that is related and/or reflects the hypothesis of a study (Mensah et al, 2020). This theory was developed by Lev Vygotsky. He indicated that child development is the result of interactions between children and their social environment. These interactions involve people, parents, teachers, playmates, schoolmates, and siblings (Alhabeedi, 2015). The major theme of Vygotsky's theoretical framework is that social interaction plays a fundamental role in the development of cognition and learning. Furthermore, the constructivism theory of learning and knowledge place emphasis on the learner's active participation in constructing his own knowledge (Jonassen, 1995). Constructivists also assert that knowledge is gained when a learner uses his already acquired knowledge to make meaning of new information. Therefore, knowledge can be enhanced by instruction or guidance of teacher, but it is not necessarily a direct outcome of teacher's instruction hence the need for a more learner centered approach in the classroom. The essence of the achievement of curriculum objectives is a function of its evaluation process during development (Odumah, et al, 2020).

Cooperative learning

Cooperative learning is generally defined as a teaching arrangement that refers to small, heterogeneous group of students working together to achieve a common goal (Dotson, 2001).

Learning is a concept and not a ‘thing’ (Mensah, 2020). An advantage of cooperative learning is that it allows for simultaneous teaching approaches for multiple audiences and student levels (Canan, 2009). Another benefit is that some students can learn from their colleague students and may feel more comfortable asking questions from colleagues rather than a teacher.

Strategies of cooperative learning

According to Babah, Frimpong, Mensah and Sakyi-Darko (2020), the selection of students for placement in various second-cycle institutions is dependent of the students’ knowledge, skills and abilities. There is no doubt that cooperative learning is a good predictor of these competencies. There are various and popular strategies for cooperative learning that can be used whenever the teacher deems it appropriate. Cooperative learning structures are methods of organizing the interaction of individuals in a classroom. Cooperative learning research has identified the jigsaw, learning together, think-pair-share, group investigation, student teams-achievement divisions, teams, games, tournaments are some of the commonly utilized cooperative learning strategies.

The Jigsaw method was developed by Elliot Aronson in 1978. In the Jigsaw method, students are assigned to multi-member teams to work on academic material that has been divided into sections. Each member of the group is assigned a section of study on which he or she becomes an expert. Experts are then assigned to expert groups in which the members of the group discuss the information and decide on the best way to present the material to members of their home teams. After the students have mastered the material, group members return to their home teams. Jigsaw teaching is an appropriate strategy for research methods in Electrical Engineering because there is often not always one answer to a question. Learning together is a cooperative learning strategy created by David W. Johnson and Roger T. Johnson. Learning together was originally designed to help train teachers on how to use cooperative learning groups in the classroom at the University of Minnesota in 1966. During the learning together process, students complete worksheets in groups of four or five. An emphasis is placed on team building and group self-reflection, providing mutual support to ensure that everyone in the group is involved and understands and eventually, team grades are determined by the teacher. (Adams, 2013).

Correlation between cooperative learning and student participation

Drakeford (2012) conducted a study on two male secondary students attending the Upward Bound pre-college program. Each student worked in small groups with specific roles, and two observers documented the amount of time each student participated during the cooperative learning activities. The results of this study showed that cooperative learning techniques increased student’s participation. Research supports the view that when students are working with their peers in cooperative learning situations, they are actively engaged. Students have a greater chance to become involved with each other as well (Peterson & Miller, 2004).

Petty (1997) examined a Grade 6 class and two Grade 9 classes in Northern Chicago, Illinois. Prior to the introduction of cooperative learning techniques, children experienced difficulty participating in class lectures and retaining instructional materials, as documented through teacher observations and student surveys. Following the implementation of cooperative learning techniques, students exhibited greater involvement in class lectures/discussion, increased retention and a greater transfer of learning. Over the last quarter century, cooperative learning strategies have arrived as a popular option to traditional instruction due to the positive influence on students' esteem and performance.

Even though the advantages of cooperative learning are obvious, the findings of some other studies are startling. Cooperative learning has also been implemented in lectures, but results are contradictory. Vreven and McFadden (2007) found that students did not benefit from cooperative learning activities in lectures all the time. Similarly, another study by Cavanagh (2011) greatly valued opportunities for engaging in lectures by means of cooperative learning activities. There are two studies that suggest that the way students in higher education perceive of 'good' teaching may conflict with cooperative learning. Students in higher education may have a different opinion about what makes a class interesting and good but may not necessarily appreciate the value of cooperative learning. Herrmann, (2013) reported how students associated the lecture with proper teaching at the university level and perceived their own role to be passive note takers. Indeed, these findings within higher education are quite striking.

METHODS

An experimental model was carried out in this research which needed a control and experimental group during the intervention. A total of 24 level 100 students of Takoradi Technical University were sampled. The random sampling was used to give a fair and equal chance to all members of the electrical level 100 students of 2020/2021 academic year. Data collection was done by participant observation with the help of the observation rubric, and recorded intervention. Afterwards the intervention evaluation questionnaire was given to the experimental group to get information on the effectiveness of the intervention (cooperative learning).

Data analysis

Throughout the study, the researcher implemented and measured the use of different strategies of cooperative learning to increase student participation and improve students learning. The obtained data was translated into tables to provide a comprehensive and easy-to-understand presentation of the data for in-depth analysis.

Implementation of intervention

The researchers then divided the 24 students into two groups of 12 students each. The experimental group had three cooperative groups and each group consisted of four students and were taught

using the cooperative learning strategies while the other 12 students in the control group were taught in a traditional or lecture method of teaching. The researchers gave the students in the experimental group some training to implement the cooperative learning in the classroom in the following areas: developing a classroom climate for cooperative learning, team building techniques, and social skill for team work.

The researchers then divided students into three cooperative groups with each group consisting of four students, taking into account individual differences and needs including learning styles and student personalities. The researchers changed the seating arrangement of the experimental class; students' desks were changed from rows to table groupings which allowed students to sit in a semi-circle facing each other. The intervention was designed to be activity oriented through the cooperative learning method. The intervention took place from the second week in April and ended by the last week in May, six (6) weeks in all. Students worked in cooperative groups and did two class presentations within the period. Students worked in cooperative groups for at least 60 minutes per week for the six (6) week period. Students were guided on learning together where students are placed in groups where team building is emphasized and students learn together while completing worksheets which will be assessed by the teacher and marks allocated to each group.

Another method was Group Investigation where the researchers gave each group a sub-topic in Research Methods to investigate and after that each group presented their findings to their class. Also, there was group discussions where the researcher wrote questions on the whiteboard and then all group members actively engaged in a conversation about the questions.

Lastly, the Jigsaw method was used where students were placed into teams to work on materials that have been divided into sections. Every student was given a role to play in the cooperative work group. Students worked in groups and were provided with information on their roles and responsibilities. Students were also informed that they had the flexibility to assist other members in their group in performing their roles.

Since the lessons were mostly 60-minutes in duration. The first 10 minutes of each lesson was used for the topic orientation and giving of instructions and 50 minutes was used for the cooperative learning activities.

Ethical considerations

Some ethical issues considered in the course of the research included; consent of participants before partaking in the experiment, adherence to confidentiality that is protecting participants' identities and freedom of participant to decline or withdraw participation that is no coercion or intimidation.

RESULTS AND DISCUSSIONS

Table 1. Students' learning and participation rubric data results for the experimental and control groups in lesson 1.

Lesson 1	Experimental group			Control Group		
	N	Number of students	% of students	N	Number of students	% of students
Classroom action						
Speaking in class on topic.	12	11	92 %	12	3	25 %
Taking notes.	12	10	83 %	12	3	25 %
Writing on board.	12	10	83 %	12	3	25 %
Engaging in class activities.	12	10	83 %	12	4	33 %

Source: Field data (Kwegyiriba et al, 2020), N=Total number of students

In Lesson one, in the experimental group, (92%) of the students spoke with their classmates on the lesson's topic, (83.3%) took notes, (83%) volunteered to write on the board, and (83.3%) were actively engaged in the classroom activities, as defined by the researchers' observation rubric. In contrast, the control group showed much fewer observed actions in the classroom. Only (25%) of students spoke with their classmates on the topic, (25%) took notes, (25%) wrote on the board and (33%) were actively engaged in classroom activities.

Table 2. Students' learning and participation rubric data results for the experimental and control groups in lesson 2.

Lesson 2	Experimental group			Control group		
	N	Number of students	% of students	N	Number of Student	% of students
Speaking in class on topic.	12	11	92 %	12	3	25 %
Taking notes.	12	9	75 %	12	4	33 %
Writing on board.	12	9	75 %	12	3	25 %
Engaging in class activities.	12	11	92 %	12	3	25 %

Source: Field data (Kwegyiriba et al, 2020), N=Total number of students

In Lesson 2, the results of the data gathered in the experimental group was, (92%) of the students spoke with their classmates on the lesson's topic during the lesson, (75%) of the students took notes, (75%) volunteered to write on the board, and (92%) were actively engaged in the classroom activities, as defined by the researchers' observation rubric. In contrast, the control group showed far fewer observed actions in the classroom. Only (25%) of students spoke with their classmates on the topic, (33%) of the students took notes, (25%) wrote on the board and (25%) were engaged in classroom activities. The data results for the experimental and control groups in lesson 2, shows that there was still a significant difference between the experimental group and the control group. The overall data from the observation rubric is in congruence with the research conducted by Majoka, Khan and Shah (2011) that concluded students learning in a cooperative classroom enhanced the students' ability to learn as compared to students taught with the traditional method.

FINDINGS

The atmosphere in the classroom during the implementation of the cooperative learning was full of enthusiasm and for the first time the researchers saw that almost all students were active and none of them was dull. Students from other groups were seen clapping and encouraging other group members when their presentation was very good. Another interesting observation was that, students were not ready to end the lesson even when the lesson time was up and these observations were made with the experimental group. There were intermittent conflicts among some group

members especially when a group member seems to be too domineering and in those instances the researcher intervened and the problems were solved amicably with the researcher still educating group members on the need for tolerance in teamwork.

The researcher came up with four survey questions to evaluate the effects of cooperative learning on students learning after the intervention. From their responses, majority of the students (75%) agreed that cooperative learning makes learning easier. However, 25% disagreed. Cooperative learning has proven to facilitate students' learning and this is supported by Dugan et al. (1995), whose research concluded that both the regular education students and the students with autism benefited academically and socially from the use of cooperative learning.

Again, 92% of them agreed that cooperative learning had a positive impact on the students in their learning. On the contrary, 8% was undecided. This revelation confirms a study by Canan, (2009) who claims that cooperative learning allows for simultaneous teaching approaches for multiple audiences and student levels and also high achieving students may assist low achieving students, resulting in deeper learning for both and students who teach other students must integrate and verbalize knowledge, which may deepen the learning process and communication skills.

As regards students' responses on whether cooperative learning is a good example for active learning strategies in the educational process, 84% of the students agreed that cooperative learning is a good example for active learning strategies in the educational process, though 8% of them thought otherwise. The finding is similar to the assertion by Gillies (2003) who claimed cooperative learning may also enhance students' self-efficacy, which is the belief in one's self that a student can achieve a certain outcome. Student's self-efficacy is often raised due to the encouragement and support of one's peers throughout the process of cooperative learning. Also, the results are in congruence with the findings of researchers. Ghiath (2003) whose study concluded that the participants in the high cooperation group achieved better than the low cooperation group. This study confirms that students experienced a higher level of academic achievement in a more student-centered group. In terms of cooperative learning, making learning exciting, 84% of the respondents agreed that cooperative learning makes learning exciting, while 16% of them disagreed. It can therefore be deduced that the impact of cooperative learning on students learning is undoubted. This assertion is supported by Anderson (2005) also concluded in his study that students in the cooperative learning environment scored higher than their peers in standardized testing of the curriculum and were more positive about their learning experience.

CONCLUSION

The study showed that cooperative learning increased students' participation in the classroom. This finding was supported by the findings in the literature review. Students' interest and participation in Research Methods in Electrical Engineering also increased when the cooperative

learning method was used by researchers. Upon analysis of the data, the results show that cooperative learning has an overall positive effects of increasing classroom participation and learning of students. Secondly, cooperative learning improves the learning of students and also students' perception about cooperative learning was positive and the survey data shows that. The analyses of the data suggest that there was improvement in the learning of the students when the cooperative learning style was used. Lastly, the findings of the study revealed that cooperative learning method is significantly more effective than the traditional approaches of teaching electrical Engineering students. Students were involved and participated in class when the cooperative method was used which is a more learner centered method as compared to the lecture style which is teacher centered. To improve communication among students' a more student-centered approach is needed. Also, interest of students in a subject can be affected by the teaching strategy and learning activities lesson.

RECOMMENDATIONS

Finally, it can be seen from the students' survey results that student can achieve a lot through group work which can bring satisfaction to both teacher and students. In view of this, administrators of higher Educational institutions should encourage the teaching community to vary the teaching styles to be able to engage students in their courses of study for higher academic achievement.

There is always the need for quality Assurance department of higher Educational institutions to enforce that teacher do put students in groups to help them develop the cooperative attitude and teamwork to enable students appreciate the concepts that are taught by teachers in order to achieve more and reduce the resit rate of university students. Moreover, a favourable classroom atmosphere must be created continually to help students to get involved in the teaching and learning process.

Lecturers and facilitators must encourage students to sit in groups during lectures and also school management must try to acquire to get a seating arrangement which can accommodate about 5-10 students per table which gradually eliminate the single sittings in the classroom that makes students feel individualized.

School management and administrators must sit down to discuss with lecturers and facilitators must make an effort to set aside 50% of students class assessment purposely from cooperative and collaborative work. This initiative will encourage students to participate more in class and lectures.

IMPLICATIONS TO RESEARCH

Although many researches in the education literature recommend how to teach in primary and basic schools, there is little publish research on how students actually learn and grasp concepts in the universities in Ghana. The experience of cooperative learning and classroom participation of

electrical Engineering students of Takoradi Technical University implies that such research should be carried out in different universities' classrooms and the outcomes use to support the teaching community on their methodology for effective teaching models outcomes in higher education landscape in Ghana.

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