

The Utility of the Cooperative Learning Method in the Teaching of Mathematics at Secondary School in Uzumba Maramba Pfungwe District in Zimbabwe

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Abstract: Cooperative learning is one of the student centred methods of teaching in the schools. Worldwide, educationalists are advocating for a transformation of classroom activities from a traditional essentialist style, in which the teacher is the main think tank which dishes out knowledge, with pupils passively receiving this knowledge; to learner centred styles. The study employed the quantitative methodology and adopted the descriptive and experimental designs. Questionnaires and observations were used to collect. The findings revealed that students performed better in cooperative learning and failure it over the teacher centred method, yet teachers are using the latter most of the time. The study recommends that schools should emphasize the use of cooperative learning as it improves academic performance of learners and enhances learner participation.

Keywords: Cooperative learning, individual learning, utility, teaching, district.

INTRODUCTION

The idea of cooperative learning has been around for decades, but it never got the same prominence as blended learning or differentiated instruction. While it is debatable as to why cooperative learning flew under the radar for so long, it is undeniably a powerful and effective teaching strategy [1]. Cooperative learning is an organised and structured way to use small groups to enhance student learning and interdependence. Learners are given a task better known as an assignment, and they work together to accomplish this task. Each individual has responsibilities and held accountable for aiding in the completion of the assignment [2]. Therefore, success is dependent on the work of everyone in the group. In addition to learning from each other students also learn to work as part of a team and have others depend on them [3]. The high failure rates of learners in Mathematics in Secondary schools in Zimbabwe calls for a paradigm shift in terms of teaching methods. As Kosar [4] observes the use of teacher-centred approaches has contributed to the poor performance of learners leading to low pass rates in schools, especially in mathematics and this phenomenon is unsustainable. Against this background, this researcher sought to investigate the utility of the cooperative learning method in the teaching of mathematics in secondary

schools. Thus, the study set out to discover the merits and demerits of cooperative learning in the teaching and learning of mathematics.

Statement of the Problem

The continued use of the individual teaching method where the teacher stands in front of individual learners and dishes out information is the most common method of delivering lessons in secondary schools in Zimbabwe. In spite of its popular use, the results of learners in mathematics show that this method does not help to improve the performance of the learners. This therefore calls for a paradigm shift in terms of delivery lessons by teachers. The use of the cooperative learning methods becomes the obvious alternative.

Purpose of the Study

The study sought to compare the performance of students using the cooperative and individual teaching methods to expose the method that would yield better results and thus advocate for the enhanced use of that method in the teaching of mathematics in secondary schools.

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Research Questions

- How do pupils perceive the utilization of cooperative learning in the teaching and learning of mathematics?
- To what extent does cooperative learning improve participation in class activities?
- Do secondary schools utilize cooperative learning strategies?
- How effective is cooperative learning as a teaching method?
- Null hypothesis
- Learners perform better when the teacher uses teacher and centred approaches

What is Cooperative Learning?

Cooperative learning is a teaching strategy that classroom teachers use to help their students process information more quickly by having them work in small groups to accomplish a common goal [5]. Each member that is in the group is responsible for learning the information given, and also for helping their fellow group members learn the information as well. Baloche [6] states that in order for cooperative learning groups to be successful, the teacher and students must all play their part. The teachers' role is to play the part as facilitator and observer while the students must work together to complete the task. McDowell [7] describes cooperative learning as a specific kind of collaborative learning where students work together in small groups on a structured activity. They are individually accountable for their work, and the work of the group as a whole is also assessed [7]. While traditional methods focusing on individualism in schools may contribute to the achievement gap, cooperative learning focuses on interdependence and learning teams.

Empirical studies reveal that student performance is better in a student centred class. One such study was conducted by Belliveau, Du Freita, Giles, Ryan and Ryan [8]. These researchers found that the student centred approach appeared to give students on slight advantage over students in the teacher centred class. Belliveau *et al.*, [8] contends that their study is important because it emphasised the need for balance between student and teacher centred strategies, because individual learners have different abilities and learning styles. The researchers note that the short term nature of the study may have skewed the results towards the teacher centred class which most students are more comfortable with Johnson and Johnson [9] postulate that cooperative learning is more than just asking students to sit and work together. Researcher has identified some key components that mediate the effectiveness of cooperative learning such as: (a) positive interdependence, which allows students to perceive that they are linked with each other in such a way that one cannot succeed unless everyone succeeds; (b) individual accountability which gives each member of the group a sense of personal responsibility toward goal achievement; (c) primitive interaction which takes

place when students facilitate each other's efforts to learn through exchanging resources, help, motivation, and points of views; (d) interpersonal and small group skills, which means that students must be taught social skills for high quality cooperation and (e) group processing, which exists when group members discuss how well they are achieving their goals and maintaining their working relationships [10].

Role of the Teacher in Fostering Cooperative Learning

In order to ensure that groups are working effectively and together to complete the task, the teachers' role is to observe and monitor each group [11]. Baloche [6] provides four specific things that the teacher can do while circulating around the classroom:

- **Give feedback:** If the group is unsure on a specific task and needs help, the teacher should give them his immediate feedback and examples that will help reinforce their learning.
- **Encourage and Praise:** When circulating the room, the teacher should take time to encourage and praise groups for their group skills.
- **Reteach Skills:** If the teacher notices that any group does not understand a particular concept, they should use this as an opportunity to reteach that skill.
- **Learn About the Student:** The teacher should use this time to learn about their students. They may find that one role works for one student and not another. This information should be recorded for future group work.

The Cooperative School Structure

In order for students to focus on the quality of instruction they need to successfully change from this mass production- competitive individualistic organisational structure to a high performance, cooperative, team based organisational structure [10]. Schools need to develop the cooperative culture. Retaining teachers to use cooperative learning while organizing teachers to mass produce educated students is self- defeating [12]. Changing teaching methods is much easier when the changes are congruent with (Not in apposite to) the organisational structure of the school, which, in turn, must be congruent with the overall school system [13]. In a cooperative school structure, students work primarily in cooperative learning groups, and teachers in cooperative teams, as do the school leadership [10]. The organisation of the school and the classroom are thus congruent. Effective teamwork is the very centre of improving the quality of instruction and education with each level of cooperative teams supporting and enhancing the other levels [13]. A congruent organisational structure, one that promotes cooperation at all levels, ensures quality education by creating a constancy of purposes, a commitment to educating every student, a focus on improving the quality of instruction, the elimination of competition of all levels, strong personal relationships, a concern about

reducing waste, and careful attention to successfully implementing cooperative learning to improve students achievement [10].

RESEARCH METHODOLOGY

The study employed the quantitative methodology and made use of an experimental design. The crossover design (also known as repeat measures design) was used. Subjects in the design were exposed to more than one treatment (teacher centred method and cooperative learning) and the subjects were randomly assigned to different orders of the treatment. The groups compared had an equal distribution of characteristics and there was a high level of similarity among the subjects that were exposed to different conditions. The study used quasi- experimental design which is more ethical than true experiments when researching on human subjects [14]. The population consisted of all the mathematics students at Uzumba High School and a purposive sample was used to select the sixty form four mathematics students. While the size of the sample ought to be determined by scientific methods, a general rule of the thumb is that each group ought to be at least 30 participants [15]. In Zimbabwe, form four pupils refer to learners who have completed their first four years of post- primary school education and are ready to write a public examination called Ordinary Level. These form four pupils were selected on the basis of the intellectual maturity that enabled them to exhibit some degree of mastery learning after an exposure to either cooperative or lecturer methods to carry out the study from four levels. First, permission was sought from the Permanent Secretary in the Ministry of Primary and Secondary Education. The researcher then sought permission from the Provincial Education Director, and then the District Education- Officer and finally from the head of the school. Eventually, teachers and from four pupils were requested to take part in the study after reading the informed consent form and listening to the researchers' explanation of the purpose of the study. The Mathematics pupils in both classes were put into their respective rooms and taught by their Mathematics teachers who recorded their findings to enable the researcher to compare the effectiveness of cooperative learning method and the lecturer method. Form four A1 Class and form four AJ were subjected to the two different methods in rotation.

Form four A1 was subjected to a well planned lecturer with the question with the question- answer or Socratic Method for a week (5 lessons) on the topic "Algebra; without any cooperative or collaborative discussion between 8 and 12 October 2018. During the same week, the other class, Form four AJ was divided into discussions or cooperative groups of four learners per group on the same topic (algebra) being covered by Form Four A1, with the teacher only facilitating. In the

second step, those students in the class which previously did group discussion were changed to the lecturer method (teacher centred method) and the other group, used the cooperative (group discussions) method; again for a week for both classes. At the end of each week the classes were given the same test on the same day and the scores were recorded. The questionnaire was used to complement data from the experiment because as Bell [14] postulated, it makes it possible to measure what a person knows (knowledge), what a person likes (values and preferences) and what a person thinks (attitudes and beliefs). Both classes were given the questionnaire during lessons after the experiment so that the return rate was maximized. The questionnaires were collected at the end of each lesson.

The researcher collected three forms of data namely, descriptive information, data on fidelity of the study and data on the dosage of the intervention [16]. Descriptive informative allowed the researcher to confirm that the study was planned, hence the use of the quasi- experimental research design to carry out the study. Means, modes, standard deviations and other statistical analysis were carried out on the scores to establish changes and establish causality. Data were tabulated in graphs and tables for easier interpretation.

FINDINGS AND DISCUSSION

This section is presented in two parts namely, presentation of data and subsequent discussion of the presented data.

Presentation of Data

Interpretation and Analysis of Data

Using class Form Four A1 as presented in Table 1 below, the teacher centred (lecture) method has a mean of 47.46 less than that of the cooperative method; which is 63.8. Using class Form Four AJ as presented in Table-2, the mean score of the teacher centred (lecture) is 30.625, which is less than the mean score of the cooperative method, standing at 49.2. From the difference of the scores of the two methods using the two classes, the cooperative learning method had a higher mean and it can therefore be concluded that students scored relatively higher after exposure to the cooperative learning method than the teacher- centred (lecture) method of instruction. We can further investigate the hypothesis using the t- distribution. For Form Four A1 class in Figure-1, the mean for the cooperative learning method is 63.8. After computing, the t-value is 0,06429. The value calculated is falling in the rejective region and the null hypothesis is rejected and the alternative hypothesis accepted. The conclusion is that there is a difference between using the two methods, teacher centred (lecture) method and the cooperative learning method.

Table-1: Test Scores for Form Four A1 Class

Scores	Cooperative Learning Method	Teacher- Centred Method (Lecture)
0-10	0	0
11-20	0	1
21-30	1	4
31-40	0	4
41-50	5	8
51-60	6	2
61-70	6	3
71-80	4	4
81-90	3	0
91-100	1	0

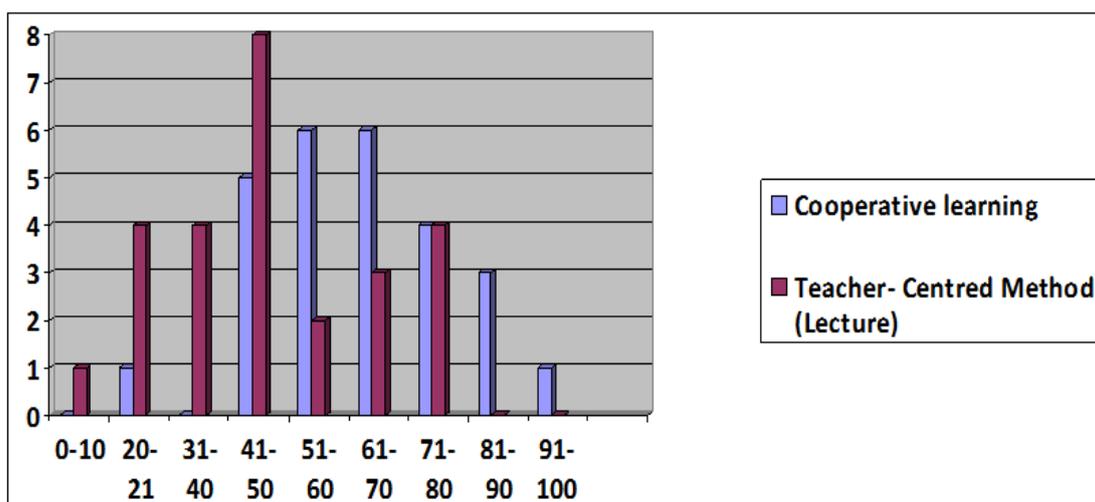


Fig-1: Bar graph showing scores for Form Four A1 Class

Table-2: Questionnaire responses towards the teacher- centred (Lecture) Method (N=60)

Statement	Category of responses				
	SA	A	D	SD	NS
Learners a lot during lecture method	3	10	2	38	7
Wish lecture method is used mostly	5	6	9	36	4
Pure lecture format better for me to learn Mathematics	6	2	5	41	6

Table-3: Test Scores for Form Four AJ class

Scores	Cooperative Learning Method	Teacher- Centred Method (Lecture)
0-10	0	0
11-20	8	1
21-30	7	2
31-40	2	4
41-50	4	6
51-60	2	5
61-70	1	4
71-80	0	2
81-90	0	0
91-100	0	0

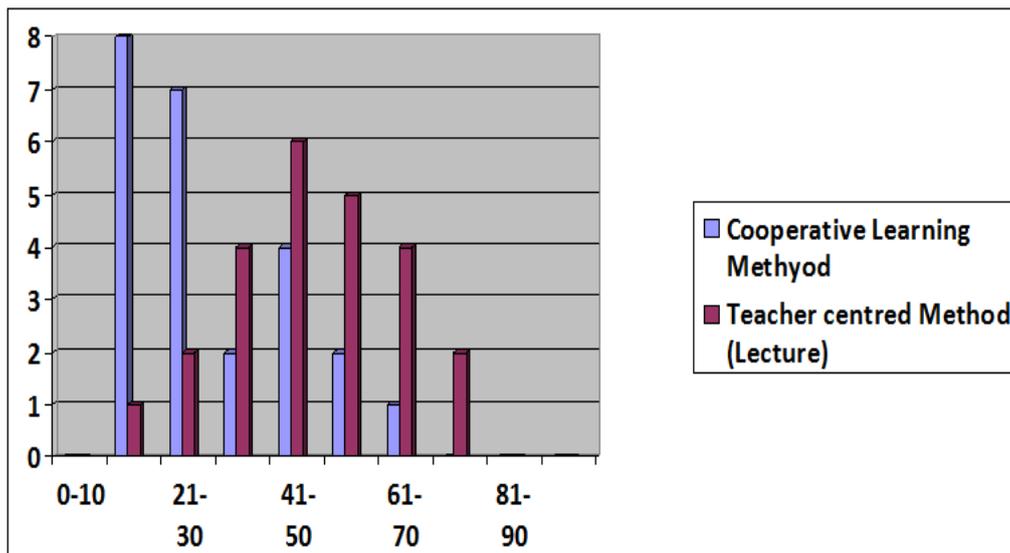


Fig-2: Bar graph showing scores for Form Four AJ Class

Table-4: Questionnaire responses towards the cooperative learning method (N=60)

Statement	Category of responses				
	SA	A	D	SD	NS
Learners a lot during lecture method	54	0	3	0	3
Wish lecture method is used mostly used	53	5	2	0	0
Cooperative method is the best format for me to learn Mathematics	42	3	10	0	0
Compared to teacher centered (lecture) method improves student communication skills	57	0	0	3	0
Student- student communication is important during lessons	58	0	0	0	2
Cooperative learning improves critical thinking	58	0	0	0	2

Information gathered from the questionnaire as presented in Table shows that only 5% of the students completely agreed that they learners much during the teacher- centred (lecture) method and were increased in their numbers by 38% who can somewhat agreed giving a total of 38% who favoured the teacher centred approach. On the other hand, 62% disagreed that they had learners much during the period of the lecture method usage. For the cooperative learning method, 90% of the students in Table-4 stated that they believed that they had learned a lot during the cooperative learning method. On the second question where students were asked whether they thought it is better to have the lecture method used in most Mathematics lessons, 75% of the students disagreed. On the other hand, 97% of the respondents in Table-4, concurred that the cooperative learning method should be the teaching / learning method mostly used for teaching Mathematics. Only 3% disagreed Students believed that compared to the teacher centred / lecture method, the cooperative learning method increased their communication with other students (95%). 97% of the students agreed that the cooperative learning method improved their ability to communicate with other students and 97% agreed that student to student communication was vital in successful learning. Another 97% also believed that the cooperative learning method involved more critical thinking than the teacher centred method.

DISCUSSION

Data from the study reveal that students scored higher marks after being exposed to the cooperative learning model of learning compared to the teacher centred (lecture method). These talkies with observations by Johnson and Johnson [10] who argue that there is very little interaction and feedback from pupils during the lecture method, as the teacher does most of the taking, making it very difficult to benefit from the teacher- centred approach. Baloch [6] also castigates the teacher- centred approach method for its insensitivity to student individuality as it is difficult to adapt to individual learning differences. Vaughan [3] states that, in addition to learning from each other, students also learn to work as part of a team, and have others depend on them. Informative from the study also reveal that learners indicated that they learned very little during the teacher- centred/ lecturer method and they wished it was not used during Mathematics lessons.

Students indicated that they gained more on various Mathematics concepts during the cooperative learning method and would prefer it to be used most of the time during their Mathematics lessons. These findings are congruent with observations by Lesley and Orstein [11] who argue that the cooperative learning method can be a powerful means of enabling students to engage actively with course material and develop

their own views based on sound critical thinking since students will think originally and not to be led by the teacher every time.

CONCLUSIONS

From the findings of the experiment, it was concluded that students who learn using the cooperative learning technique are capable of getting higher scores in Mathematics than when the teacher was the teacher centred lecture method:

- It is evident that whenever students are a part of cooperative learning activities or assignments whether within or outside the classroom, there is an improvement in their level of class participation and academic performance.
- The findings suggest that students believe that cooperative learning facilitates good working relationships, and enhances socialization and creativity
- Students also indicated that they preferred to learn using the cooperative learning method than the teacher centred method (lecture). From this conclusion it becomes evident that teachers are using a method that pupils detest.

RECOMMENDATIONS

In light of the findings and conclusions of this study, the researcher would like to put forward the following recommendations:

- Since cooperative learning has been proven to have numerous benefits such as improvement in academic performance and enhanced class participations, more emphasis should be placed by the schools on promoting this alternative technique. However, students have individual differences and thus teachers should monopolise the use of the cooperative model at the total abandonment of other models.
- Students should be allowed to communicate with each other in class more often and that the teacher facilitates learning only and desist from viewing students discussions as noise, but as constructive engagement that can be manipulated for learning purposes.
- Schools should strive to change their organisational structures from the competitive individualistic structure to a high performance, cooperative, team based organisational structure.
- Teachers should be democratic and proactive and allow students direction, and this should be inculcated in the teachers by the school leadership through staff development sessions and allowing them to attend workshops on the use of cooperative learning.

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