Journal of Education

Effect of Cooperative Learning on Students' Academic Performance in Mathematics Lesson in Day Secondary School of Rwanda

Niyomugabo Venuste & Dr. Hesbon Opiyo Andala

ISSN: 2616-8383

Stratford Peer Reviewed Journals and Book Publishing
Journal of Education
Volume 6||Issue 3 ||Page 102-117||October|2023|
Email: info@stratfordjournals.org ISSN: 2616-8383

Effect of Cooperative Learning on Students' Academic Performance in Mathematics Lesson in Day Secondary School of Rwanda

[1*]Niyomugabo Venuste & [2]Dr. Hesbon Opiyo Andala
[1]Post graduate student, Mount Kenya University, Rwanda
[2]Program leader and research coordinator, school of education, Mount Kenya University, Rwanda
***Email of the corresponding Author: niyovenuste123@gmail.com**

How to cite this article: **Venuste, N., & Andala, H. O. (2023). Effect of Cooperative Learning on Students' Academic Performance in Mathematics Lesson in Day Secondary School of Rwanda.** ***Journal of Education 6*****(3), 102-117. https://doi.org/10.53819/81018102t5257**

Abstract

Cooperative learning among students is important in promoting students' learning and academic performance. The purpose of this study therefore, was to identify the effect of cooperative learning on students' academic performance in mathematics lesson in day secondary schools in Nyamasheke District, Rwanda. The target population was 513 and a sample size of 224 was obtained by using Solvin formula. Questionnaire and interview guides were used as data collection instruments. The finding revealed that 94.8% of students agreed that Cooperative Learning improve positive interdependence, 94.8% of students agreed that the group processing are strengthened via cooperative learning, 96.7% of students agreed that social skills are improved by Cooperative Learning and 95.7% of students agreed that promotive interaction are occurs during cooperative learning. It was also noted that 75.8% of students agreed that they interested on the subject this improve students' academic performance, 95.3 % of students agreed that the social work improved, 92.4% of students agreed that they improve their grades and 78.2% of students agreed that their promotion rate is high as academic performance. The Pearson coefficient of correlation between positive interdependence as method use in cooperative learning and improved students' grades p-value=0.000 and positive interdependence with promotion rate p-value=0.010. For group processing as method of cooperative learning correlate with improved social work p-value=0.003. For social skills as developed in cooperative learning is correlated with students' interested on subject p-value=0.000. On the promotive interaction as use in cooperative learning correlated with promotion rate p-value=0.002. The study concluded that cooperative learning affects students' academic performance. The study recommends that educational planners should create an effective environment that will improve students' academic performance as well as teaching strategies that will encourage active participation in class. Schools should actively integrate cooperative learning methods into their teaching practices to improve academic performance. Parents should be made aware of the benefits of cooperative learning and encouraged to support group activities or homework projects. The curriculum should be flexible enough to allow teachers to incorporate various cooperative learning methods, as the study found that different aspects had different impacts.

Keywords: *Cooperative learning, Academic performance and Students' academic performance*

Stratford Peer Reviewed Journals and Book Publishing
Journal of Education
Volume 6||Issue 3 ||Page 102-117||October|2023|
Email: info@stratfordjournals.org ISSN: 2616-8383

1.0 Introduction

The foundation of social-economic, scientific, and technological progress globally is education (Olufunke, 2012). According to Shannon (2013), a country's ability to modify its economic and social development depends on the quality of its educational system and its access to adequate facilities. According to Freemen et al. (2014), students in active classrooms had a higher chance of succeeding than those in passive classes. Many efforts have been made to support teachers as they transition from teacher-centered pedagogy to learner-centered pedagogy such as during the teaching and learning process, teachers might employ active teaching and learning methods. This is done in response to the issue of failure and to facilitate learning of science, including mathematics. The majority of students choose a teaching strategy before the lesson, which is used by the teachers (Kousa, Kavonius, & Aksela, 2018).

The following are some of the contributing variables for subpar mathematics performance in Africa, as identified by the UNESCO research undertaking from 2008, South and Central African Monitoring of Education Quality (SACMEQ): inadequate resources for teaching and learning, learning environments that include class size, the teacher-student interaction in mathematics, bad administration, the teacher's and students' attitudes about the topic, and poor teaching techniques. In research of the impact of students' attitudes toward mathematics. Casey, A., & Fernandez-Rio, J. (2019) discovered that the teachers' personality and manner of mathematics instruction greatly contributed to the students' favorable attitudes about mathematics. Cooperative learning (CL) in the classroom makes use of small groups to encourage student collaboration and maximize learning. When the performance of students' goals is positively connected with one another in CL situations, students believe they can only succeed academically if the other learners in their learning activities also succeed. (Tucker, 2021).

In different countries of the world, students are actively involved throughout the entire homework, project, and examination life cycle when using Cooperative Learning. The country's educational institutions, including schools, are designed to accommodate teaching and learning philosophies that are at odds with conventional values and modes of instruction. There is a theory that suggests Indian children are more likely to learn cooperatively than competitively, especially when competitive techniques are used, vying with other students for the teacher's attention, either to receive a reward that is less visible, such as a grade on a study or report card, or to be recognized publicly for an answer. As opposed to learning independently or competitively, pupils are more likely to learn collaboratively in groups (Yeh & She, 2010). According to Slavin (1989), group goals and individual accountability must be incorporated into the cooperative learning technique in order to optimize learning opportunities. While cooperative learning may be a successful strategy for raising student accomplishment.

According to Abrami, Poulsen, and Chambers (2004), Students cooperate in a collaborative learning setting, also known as cooperative learning, to complete a learning objective. This teaching approach incorporates students in the learning process so that they can comprehend and assimilate the subject's knowledge. (Slavin, 2011). Additionally, to promoting high levels of self-esteem and group cohesiveness, CL fosters a positive outlook on education and interpersonal interactions (Sahin, 2010). The CL technique has also been shown to improve students' motivation, class participation, and academic accomplishment, according to Polloway, Patton, and Serna (2001).

https://doi.org/10.53819/81018102t5257

Learners' self- perceptions of their skills (self-efficacy), according to learners' self-perceptions of their own skills, according to Ali et al. (2009), boost group achievement in cooperative group activities. Furthermore, according to Bandura (1986), enjoying the intrinsic benefits of an activity is strongly connected with one's self-efficacy for the task, and intrinsic worth and self-efficacy were positively connected with cognitive engagement and performance (Rabgay, T. (2018). CL has been employed as an instructional approach by numerous researchers with positive and enhanced results. A small number of students have also been investigated locally. For instance, Iqbal (2004) looked into how CL affected secondary school students' academic success in mathematics. He discovered a considerable differ of the accomplishment levels of the learners who get cooperative instruction even those who received standard instruction. In a similar way, CL was used in study by Kartal and Özbek (2016) to improve ESL learners' performance, and the outcomes were encouraging. High test results can be shown in students who received cooperative learning instruction.

Many pupils view mathematics as a challenging subject. Teachers use a variety of learning tactics instead of the traditional approach to help students perform better. This research concentrated to CL as a way to raise the level performance of successful in mathematics students. It examined methodology and how it affected the academic achievement of the students (Analyn D. Gamit, 2017). In South Africa, on the basis of Hansen Dan Zweng, 1984, two key ideas must be taken into account when developing a plan of teaching and learning mathematics. The learner should be at the heart of the educational process, according to the first principle (Lambert et al., 2013; Millis, 2012; William et al., 2007; Zakaria & Iksan, 2007). The second principle is that learning mathematics should be enjoyable. Through his research, Oluwasanmi (2012) demonstrated that Cooperative learning activities increase students' motivation to learn.

Additionally, they typically have higher levels of self-esteem and experience less anxiety when learning math. According to Prabowo and Sunaryo's (2015) research, using the STAD model for cooperative learning in a course on curriculum analysis and mathematics improves students' participation in class and their propensity to become more involved in group activities. According to Lasvani and Khandan (2011), successful teaching methods need to be reevaluated so that to design an efficient teaching &learning session in mathematics. The Ministry of Education of Malaysia (2002) emphasized educators must develop activities for teaching and learning that promote student engagement, stimulates the students' thinking, take into account their preferred learning style, and take into account the students' varied levels of intellect.

In Rwanda, students are expected to acquire the knowledge, skills, attitudes, and values outlined in the Common Core for each subject through the use of active teaching and learning techniques, such as projects, practical work, role playing, oral questioning, problem-solving, quizzes, debates, field trips, investigations, paired and group work, individual work, assignments, tests, and presentations including mathematics (REB, 2015). All of these teaching and learning strategies encourage student cooperation so that they are invested in academic performance. The CBC contributes to the Rwandan government's (GoR) effort to build a society that is knowledge-based (Lackamp, 2016). In order to develop the requisite values, skills and knowledge during the execution of the CBC, learners should cooperate and interact (Ndihokubwayo & Habiyaremye, 2018). The active and reciprocal learning support helps the CBC be implemented successfully, advancing the government's stated objective.

1.1 Research Objective

The objective of this study was to identify the effect of cooperative learning on students' academic performance in mathematics lesson in day secondary schools in Nyamasheke District, Rwanda.

2.0 Literature Review

2.1 The concept of cooperative learning

According to Schon (2003), schools should educate all students and teach them appropriate behavior both outside and inside the classroom. Students' capacity to cooperate as a group determines whether they succeed or fail, and they are likely to support one another in doing whatever will make the group successful (Swortzel, 1997). One teaching method is cooperative learning, which divides students into groups based on their learning styles and levels of aptitude. Additionally, it emphasizes collective accomplishment over individual success. Classes in CL are organized in tiny groups that work together in a way that each member's success depends on the overall success of the group. Its goal is to enhance their understanding of the subject being studied as well as their learning process. The cooperative learning (CL) process is a way for people to learn in small groups. CL places an emphasis on cooperation, which contrasts with the competitiveness of our existing educational system. The research's findings imply that the CL approach raises pupils' proficiency in mathematics.

According to Van Wyk, M. (2015), the positive influence of social support on learning's motivation is a potential component contributing to the effectiveness of cooperative group instruction. Students are given the chance to work in small groups to complete learning objectives while supporting one another in tutorials. Kezoui, N. (2015), the social benefits of cooperative group engagement may actually raise students' intrinsic motivation for the learning activity. Cooperative groups might focus on increasing their expertise in their pursuit of the group objective of exhibiting achievement by lessening the competitive element of the usual classroom. Together with the affective objectives, this method of teaching mathematics in a larger context focuses on the connection between learning, goal, and attitude (Sundre et al., 2012).

A teaching strategy called cooperative learning involves a small group of students working together to improve both individual and group member learning. When students collaborate to accomplish shared learning objectives, cooperative learning occurs (Johnson et al., 1992, 1993). Cooperative learning is possible for any curriculum and any age of student. For any course requirement (such as solving problems, reading challenging text material, writing an essay or report, conducting a survey or experiment, learning vocabulary, or responding to questions at the end of a chapter), formal cooperative learning groups may last for one class period to several weeks. The instructor introduces the lesson, divides the class into groups of two to five students, provides the necessary supplies for the activity, and assigns duties to the students. The teacher sets up the students' collaboration by outlining the task, teaching them any concepts or techniques they will need to finish the assignment, and explaining it to them. Students continue working on the assignment until each group member has thoroughly comprehended and finished it. The teacher travels systematically from group to group as the pupils are working, keeping an eye on their interactions. When there are issues with teamwork or when students don't understand the academic task, the teacher will step in. Following completion of the project, the teacher assesses each student's academic progress and asks the groups to reflect on their effectiveness as a team.

Informal cooperative learning groups are impromptu, ad hoc teams that form during a lecture, demonstration, or movie to focus students' attention on the material to be learned, create a learning-friendly environment, help set expectations for what will be covered in class, ensure that students are processing the material being taught, and wrap up a lesson. They can last anywhere from a few minutes to an entire class period. Cooperative base groups are stable, long-term cooperative learning groups (lasting one semester or a year) that provide each member with the support, assistance, and encouragement required to advance academically (attend class, complete all assignments, learn), as well as with healthy cognitive and social development.

2.2 Importance of cooperative learning

It is a gauge of how important a teaching strategy is. The application of learning in daily life, where learning is transferred, determines how important it is. A creative teaching strategy that makes use of small groups to enhance both individual and group learning is called cooperative learning (Patesan et al., 2016). CL is one of the instructional approaches where students achieve and maintain learning objectives by assisting one another in a social context. The term "CL instructional strategy" relates to teaching techniques where students collaborate in small different groups of four, five or six students to help one another comprehend academic material, enhance learning abilities, and enjoy the interaction with other students while being consistently observed by the teacher or facilitator. When studying collaboratively, students can take responsibility of their own learning in addition to the achievement of other members of group learning by making sure that they complete their assigned activities and meet their learning objectives (Slavin, 2014). Additionally, if students do not share and respect their peers' contributions, which show their positive interdependence and can be included into CL groups to enable students to work and learn together, the lesson is not cooperative. Due to members' reciprocal engagement, where people aid and help one other's attempts to meet the group goals, this increases each group member's productivity, achievement, and retention of the taught materials (Johnson & Johnson, 2014).

Various instructional strategies are frequently based on certain learning theories. Constructivism stands out among various educational philosophies of the modern period; it promotes the idea that learning involves the student most of all by enhancing their capacity to comprehend learning materials (Yassin et al., 2018). As a result, effective learning takes place when social engagement among students, and teaching strategies that support students' conceptualization of their subject matter, learner-to-learner interactions, and teacher-student interactions may boost students' academic performance because they allow them to pick up concepts from one another that they might not have learned from the teachers directly (Sibomana, Karegeya et al,. 2021). Lev Vygotsky, who conducted the most of his research in the early 20th century, is typically credited with developing the socio-constructivist perspective on learning. This notion served as the foundation for our study. One of his most significant books, Mind in Society, focused on the function of the ZPD (Zone of Proximal Development), enculturation, communication/social interaction and quickly rose to prominence in the development of constructivism across the globe (Shabani et al., 2010). Students are motivated in these constructivist learning processes, and motivation is a key element of effective mathematics instruction (Tombak & Altun, 2016).

2.3 Student Academic Performance

One of the elements that improve students' academic and social performance is student cooperation, group dynamics, socio-cooperation among students, and teachers' abilities. But participation of students' collaboration and cooperation with teachers and themselves can also have an impact on the educational system as evidenced by students' cooperation as indicated by learning in Nine and Twelve Years Basic Education (9&12YBE). Researchers found that a number of variables, including how well students cooperate with one another, can influence the presentation skills of students. In the past, science education has made an effort to identify the root causes of poor performance. According to Ejidike and Oyelana (2015) and Muhammad (2013), students who receive quality basic education are better equipped to promote for the nation's political, economic social and moral growth by acquiring knowledge, skills, values, and attitudes.

2.4 Factors affecting academic performance

Both internal and external forces inside the school system have the potential to enhance student achievement, thus it is essential for both to collaborate to the benefit of the pupils' educational growth. In order to enhance both the social interactions of pupils and the lives of society's citizens, the two could therefore coexist. On the other hand, a number of variables that can enhance students' academic performance were found to be more important than others since they contribute to the general development of the country and its residents (Ukpepi, 2010). As a result, students' cooperation can significantly impact how well they achieve in mathematics.

2.4 .1 Student-Related Factors

Numerous factors, including family factors, school factors, and learning methods, might have an impact on some students' low performance as demonstrated by their poor performance in the learning process. The performance of the school may suffer from a lack of adequate channels of communication between parents and the school, but students' poor use of modern technologies can also hinder efforts to improve school activities and foster a positive learning environment. Ukpepi (2010) asserts that schools and parents should encourage students who are aware of the need of raising their grade in school to be academically and physically active. The outcomes of students and their attitudes about mathematics are directly linked. Between student attitude and academic achievement was found to be positively correlated in a study of secondary school students.

2.4.2 Teacher-Related Factors

Umoren (2013) asserts that instructors' high levels of certification increase their working conditions, career prospects in their social lives, and opportunities for collaboration with students. In addition, Umoren (2012) noted that teachers' abilities and professional backgrounds significantly contribute to the promotion of students' educational backgrounds, even though the absence of those factors can result in students performing less well in class. When the teacher serves as the students' cooperative learning facilitator, low performance from the students is not possible. Similar to this, Ukpepi (2012) found that poor leadership demonstrated by school leadership may have an impact on teachers' ability to manage classes in a way that undermines the effectiveness of teaching and learning environments. Additionally, since they can alter their cognitive development through CL, this inhibits the pupils' ability to be developed efficiently. According to Ali et al. (2009), when utilizing the CL technique, the function of instructors shifts

from knowledge transmitters to learning mediators. This profession includes coaching, modeling, and facilitation. When taking on this position, teachers must establish a secure, non-threatening, and learner-focused environment. According to Ning (2011), this educational environment will enable students to actively participate in the cooperative tasks allocated to their group.

2.4.2 School-Related Factors

The number of students attending school in sub-Saharan African nations was high, but the physical facilities and other resources were not adequate, according to Apebende (2010). As a result, there are too many students in the classroom and there aren't enough teachers who are qualified and willing to teach this many classes with the basic minimum of certified teachers to set up cooperative or group activities. Apebende (2010) found that grouping these students into smaller groups reduces the number of students in each classroom, allowing for better organization and arrangement of the CL and the effective management of a school population that, if unchecked, may result in students performing poorly academically. In addition, Apebende (2010) noted that overcrowding in schools which is often a problem in rural areas of African nations may be caused by the school's location. this may cause students work less cooperatively with one another and their teachers due to the limited time available.

2.4.3 Family-Related Factors

Parents can have a favorable impact on their children's mathematics performance through the Parent-Teacher Association (PTA), which was crucial to students' academic success. Family influences on pupils' mathematics performance in line with the discipline and punctuality. Also social community has high importance on the discipline and punctuality through advising the students. The majority of urban households are thought to be at a high risk for their children's educational development since they are constantly preoccupied with several daily activities that also have an impact on their children's school performance and behavior in relation to societal demands (Ndifon, 2011). Despite this, the rise in poverty in some households may also be one of the elements affecting the students' educational backgrounds. In this case parents have high importance on the academic performance of their children so in order to help them they have to be in the way that are the first who have to do everything in order to educate their children.

3.0 Methodology

The study employed descriptive survey research design in order to describe how cooperative learning can aid learning in day secondary schools in Nyamasheke District in Rwanda. The target population consisted of 513 people, including three principals, 27 mathematics teachers, and 483 students. 224 respondents were obtained using Solvin's formula, including two principals, eleven mathematics teachers, and 211 students. Stratified and simple random sampling techniques were used during data collection, which included the use of a questionnaire and an interview guide. SPSS version 21 was used to analyze quantitative data, and thematic analysis was used to analyze qualitative data.

4.0 Findings

The study sought to examine the effect of cooperative learning on students' academic performance in mathematics lesson in day secondary schools in Nyamasheke District, Rwanda. SPSS version 21 was used in data management and presented in form of tables.

4.1 The extent of cooperative learning in day secondary schools.

Table 1 presents the perceptions of students regarding cooperative learning in day secondary schools.

Table 1: Perception of students on cooperative learning in day secondary schools

Statements	SD		D		N		A		SA		Mean	Std
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%		
Positive interdependence	3	1.4	3	1.4	5	2.4	87	41.2	113	53.6	4.44	0.74
Group processing	3	1.4	3	1.4	5	2.4	43	20.4	157	74.4	4.65	0.73
Social skills	0	.0	1	.5	6	2.8	78	37.0	126	59.7	4.56	0.58
Promotive interaction	0	0.0	9	4.3	0	0.0	80	37.9	122	57.8	4.49	0.71

The Table 1 indicates the perception provided by students learning in day secondary schools related to the extent at which cooperative learning applied in mathematics lesson practices in day secondary schools, where 94.8 percent of students agreed that Cooperative Learning improve positive interdependence at mean of 4.44. According to Freemen et al. (2014), students in active classrooms had a higher chance of succeeding than those in passive classes. Also, 94.8 percent of students agreed that the group processing is strengthened via cooperative learning at mean of 4.65. On other hand, 96.7 percent of students agreed that social skills are improved by Cooperative Learning at 4.56 of mean, while 95.7 percent of students agreed that promotive interaction are occurs during cooperative learning at 4.49 of mean. According to the results from teachers and head teachers of day secondary schools found in Nyamasheke district were given guided interview about the extent to which cooperative learning are practiced in day secondary schools were indicated that positive interdependence, group processing, social skills and promotive interaction are cooperative learning which are being practiced day secondary schools.

Basing on the perceptions of different respondents related to extent at which cooperative learning practiced in day secondary schools, the researcher made comparative interpretation where it was shown that respondents have the same perception on the effect of cooperative learning but different magnitude. According to Bay and Pacham's (2017) research, if a group was assigned a sizable portion of the final course grade, students on average performed better in group tests compared to individual exams. Therefore, this bring high chance for students to cooperate one another and this increase the success of the students and the students become motivated and enjoy the subject through learning with others.

4.2 The level of students' academic performance in day secondary schools

Table 2 shows the level of students' academic performance in day secondary schools.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Education
Volume 6||Issue 3 ||Page 102-117||October|2023|
Email: info@stratfordjournals.org ISSN: 2616-8383

Table 2: Level of students' academic performance in day secondary schools

Statements	SD		D		N		A		SA		Mean	Std
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%		
Students are interested on the subject	14	6.6	17	8.1	20	9.5	48	22.7	112	53.1	4.08	1.24
Social work are improved on students	1	.5	2	.9	7	3.3	32	15.2	169	80.1	4.73	0.61
Improved students' grades	10	4.7	6	2.8	0	0.0	88	41.7	107	50.7	4.31	0.98
Promotion rate are high	3	1.4	7	3.3	36	17.1	75	35.5	90	42.7	4.15	0.92

The Table 2, shows how day secondary school students perceive their academic achievement in certain institutions in relation to the level of academic performance, so that 75.8 percent of students agreed that they interested on the subject at 4.08 of mean, 95.3 percent of students agreed that there social work are improved at 4.78 of mean, 92.4 percent of students agreed that they improve their grades at 4.32 of mean and 78.2 percent of students agreed that their promotion rate are high at 4.15 of mean. The academic performance of pupils in day secondary schools was also examined through interviews with mathematics teachers and head teachers, who stated the poor performance of the students. By making comparative interpretation basing on views from different respondents related to students' academic performance, it was shown that student's performance is low in day secondary schools due to lack of time for students group work because of big content that occupy all time for studying and indicate that once to overcome these challenges the students will be improve effectively academic performance. The majority of students choose a teaching strategy before the lesson, which is used by the teachers (Kousa, Kavonius, & Aksela, 2018).

4.3 The effect of cooperative learning on students' academic performance

The third specific goal of this study was to determine the impact of cooperative learning on students' academic performance in day secondary schools in the Nyamasheke district. According to academic performance research, cooperative learning can improve students' academic achievement through group processing, social skills, and learning-friendly engagement. Table 3 presents the regression coefficient between the independent variable and student interest in the subject.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Education
Volume 6||Issue 3 ||Page 102-117||October|2023|
Email: info@stratfordjournals.org ISSN: 2616-8383

Table 3: Regression coefficient between independent variable and student interested on the subject

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.819	.062		6.223	.223	.615	.932
	Positive interdependence	.115	.110	.069	1.048	.296	-.101	.332
	Group processing	.087	.112	.051	.774	.440	-.134	.307
	Social skills	.685	.142	.318	4.818	.000	.405	.965
	Promotive interaction	-.280	.115	-.161	-2.436	.016	.507	-.053

a. Dependent Variable: Students are interested on the subject
b. Predictors: (Constant), Positive interdependence, Group processing, Social skills, Promotive interaction

Findings in Table 3 from respondents of this study presented that the regression equation is $y = ax + b + \varepsilon$, thus y is dependent variable as student interested on the subject, x is independent variable as positive interdependence, group processing, social skills and promotive interaction, then y=(Beta)x+0.819+ε. Despite, there is 95% confidence that cooperative learning makes students to be interested on the subject. So, it was between 61.5% and 93.2%. Table 4 presents the regression coefficient between the independent variable and improvements in social work.

Table 4: Regression coefficient between independent variable and improved social work

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.704	.539		6.866	.000	.631	.747
	Positive interdependence	-.054	.056	-.065	-.961	.338	-.164	.056
	Group processing	.176	.057	.209	3.097	.002	.064	.288
	Social skills	.154	.072	.145	2.131	.034	.012	.296
	Promotive interaction	-.056	.058	-.065	-.956	.340	-.171	.059

a. Dependent Variable: Social work are improved on students

b. Predictors: (Constant), Promotive interaction, Positive interdependence, Group processing, Social skills

https://doi.org/10.53819/81018102t5257

Findings in Table 4 from respondents of this study presented that the regression equation is $y = ax + b + \varepsilon$, thus y is dependent variable as social work improved on students, x is independent variable as positive interdependence, group processing, social skills and promotive interaction, then y=(Beta)x+.704+ε. Despite, there is 95% confidence that cooperative learning improves students' social work. So it was between 63.1% and 74.7%. Table 5 presents the regression coefficient between the independent variable and improved students' grades.

Table 5: Regression coefficient between independent variable and improved students' grades

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.664	.848		5.961	.051	.479	.887
	Positive interdependence	.357	.088	.271	4.067	.000	.184	.530
	Group processing	-.013	.089	-.010	-.143	.886	-.189	.163
	Social skills	.195	.114	.115	1.713	.088	-.029	.418
	Promotive interaction	.052	.092	.038	.561	.575	-.130	.233

a. Dependent Variable: Improved students' grades

b. Predictors: (Constant), Promotive interaction, Positive interdependence, Group processing, Social skills

Findings in Table 5 from respondents of this study presented that the regression equation is $y = ax + b + \varepsilon$, thus y is dependent variable as improved students' grades, x is independent variable as positive interdependence, group processing, social skills and promotive interaction, then y=(Beta)x+.664+ε. Despite, there is 95% confidence that cooperative learning makes students to improve the grades. So it was between 47.9% and 88.7%. The study findings were relevant since it did not contradict previous studies as shown in the following section. Table 6 presents the regression coefficient between the independent variable and the students' promotion rate.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Education
Volume 6||Issue 3 ||Page 102-117||October|2023|
Email: info@stratfordjournals.org ISSN: 2616-8383

Table 6: Regression coefficient between independent variable and students' promotion rate

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.793	.799		2.243	.026	.517	.698
	Positive interdependence	.209	.083	.169	2.524	.012	.046	.372
	Group processing	-.047	.084	-.038	-.561	.575	-.213	.119
	Social skills	.096	.107	.061	.901	.369	-.115	.307
	Promotive interaction	.269	.087	.209	3.103	.002	.098	.440

a. Dependent Variable: Promotion rate are high

b. Predictors: (Constant), Promotive interaction, Positive interdependence, Group processing, Social skills

Findings in Table 5 from respondents of this study presented that the regression equation is $y = ax + b + \varepsilon$, thus y is dependent variable as students' promotion rate, x is independent variable as positive interdependence, group processing, social skills and promotive interaction, then y=(Beta)x+.664+ε. Despite, there is 95% confidence that cooperative learning helps students to be promoted. So it was between 51.7% and 69.8%. The Findings from this study was supported by the interview with mathematics teachers and head teachers who confirmed that cooperative learning greatly affect the students' academic performance in day secondary schools because the majority of students and teachers were not learn through positive interdependence, group processing, social and promotive interaction. If these indicators cannot be used in teaching and learning process, it can be challenge for students' academic performance especially in day secondary schools.

5.0 Summary of findings

The objective of this study focused on identifying the effect of cooperative learning on students' academic performance in mathematics lesson in day secondary schools in Nyamasheke District, Rwanda. It was noted that there is a positive correlation between cooperative learning and students' academic performance in day secondary schools in the Nyamasheke district of Rwanda. The Pearson coefficient of correlation shows the correlation p-value were less than 0.05. The research findings indicated that there is a significant high degree of positive correlation between cooperative learning and students' academic performance. Therefore, cooperative learning has a good impact on students' academic achievement.

6.0 Conclusion

The study concluded that cooperative learning has a significant positive impact on students' academic performance in day secondary schools in the Nyamasheke district of Rwanda.

Regression analysis revealed varying degrees of influence of cooperative learning factors such as positive interdependence, group processing, social skills, and promotive interaction on different aspects of students' academic performance. For instance, social skills had a strong positive effect on students' interest in the subject with a 95% confidence level, while promotive interaction showed a negative impact on the same. On the other hand, positive interdependence significantly contributed to improved grades and promotion rates. Overall, the study affirmed that cooperative learning is beneficial for academic achievement, though the specific impact of each factor may differ. Therefore, the study suggests that effective implementation of these cooperative learning elements could enhance students' academic performance in day secondary schools.

7.0 Recommendations

Through the presented findings of this study as well as drawn conclusion, the recommendations were also established.

i. Ministry of education should provide policy on education in day secondary schools in Rwanda in order to improve the students' academic performance.
ii. The educational planners should create a productive environment that will boost students' academic achievement as well as teaching strategies that will encourage active participation from the class.
iii. The school head teachers should check that the rules and regulations are being followed. They should also locate all equipment and materials that teachers use in order to use active teaching strategies like cooperative learning and group projects that promote student learning.
iv. Schools should actively integrate cooperative learning methods into their teaching practices to improve academic performance.
v. Training sessions could be organized for teachers to better facilitate the development of these skills.
vi. Additional studies should be conducted to understand the long-term effects of cooperative learning on academic performance, and to explore its effectiveness in different subjects beyond mathematics.
vii. Parents should be made aware of the benefits of cooperative learning and encouraged to support group activities or homework projects.
viii. The curriculum should be flexible enough to allow teachers to incorporate various cooperative learning methods, as the study found that different aspects had different impacts.

Acknowledgments

I give thanks to God, the Almighty, for everything he had done for me. I want to express my gratitude to my supervisor, Dr. Opiyo Andala Hesbon (PhD), who guided me in developing a thorough understanding of this research. I sincerely thank the Mount Kenya University professors that instructed me during my Master's program as well as all members of staff. They assisted me in expanding my knowledge. I appreciate the assistance and companionship of all of my Mount Kenya University coworkers, especially the Master of Education (Mathematics Education) class of January 2022 students who helped me with my academics. I'd want to thank my wife, parents, brothers, and sisters for their financial and emotional support.

REFERENCES

Ali et al. (2009), the factors influencing students' performance. *Journal of technology education* 13, (2)20-32.

Amparo, J., Enríquez, V., Valencia, H. G., María, A., & Oliveira, P. De. (2018). *Strategies used by teachers of mathematics in the implementation of tasks.* 12(5), 114–127. https://doi.org/10.5539/mas.v12n5p114

Ayeni, A. (2011). Teachers' professional development and quality assurance in Nigerian Secondary Schools. *World Journal of Education, 1(2),* 143–149. https://doi.org/10.5430/wje.v1n2p143

Bransford, J., (2000). *How People Learn: Brain, Mind, Experience, and School (expanded edition),* Washington: National Academies Press.

Brodie, K. (2006). Teaching Mathematics for equity: learner contributions and lesson structure. *African Journal of Research in Mathematics, Sciences and Technology Education, 10*(1), 13–24. https://doi.org/10.1080/10288457.2006.10740590

Casey, A., & Fernandez-Rio, J. (2019). Cooperative learning and the affective domain. *Journal of Physical Education, Recreation & Dance,* 90(3), 12-17. https://doi.org/10.1080/07303084.2019.1559671

Darling, N., Caldwell, L. L., & Smith, R. (2005). Participation in school-based extracurricular activities and adolescent adjustment. *Journal of Leisure Research, 37(1), 51–56. https://doi.org/10.1080/00222216.2005.11950040*

Demetriou, A., Shayer, M., & Efklides, A. (1992). *Neo-Piagetian theories of cognitive development: Implications and applications to education.* London: Routledge.

Duffy G. & Jonassen R.M., (1992) *Collaborative Teaching in Schools. London:* Hodder and Sloughlon Education.

Ehsan, N., Vida, S., & Mehdi, N. (2019). The impact of cooperative learning on developing speaking ability and motivation toward learning English. *Journal of Language and Education, 5(3 (19)).* https://doi.org/10.17323/jle.2019.9809

Filmer D, Molina E & Stacy B 2015. *What goes on inside the classroom in Africa? Assessing the relationship between what teachers know, what happened in the classroom, and student performance?*

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014). *Active learning increases student performance in science, engineering, and mathematics.* Proceedings of the National Academy of Sciences, 111(23),8410-8415. http://www.statssa.gov.za/MDG/MDG_Country%20Report_Final30Sep2015.pdf.

Hasanah, M. A., & Surya, E. (2017). Differences in the abilities of creative thinking and problem solving of students in mathematics by using cooperative learning and learning of problem solving. *International Journal of Sciences: Basic and Applied Research (IJSBAR),* 34(01), 286-299.

Johnson, D.W. and Johnson, R. (1989) *Cooperation and Competition: Theory and Research*. Interaction Book Company, Edina.

Kartal, Ş. & Özbek, R., (2016). İşbirlikli öğrenme tekniklerinden ötbb tekniğiyle işlenen ingilizce dersine ilişkin öğrenci görüşleri. *The Journal of International Lingual, Social and Educational Sciences,* 2(2), 85-106.

Kezoui, N. (2015). *Cooperative learning groups in EFL grammar classes: A learners' boost outcomes the case of second year EFL students at Tlemcen University.* People's Democratic Republic of Algeria Ministry of Higher Education and Scientific Research.

Kober, N. (2015). *Reaching students: What research says about effective instruction in undergraduate science and engineering.* In available from The National Academies Press at http://www.nap.edu/catalog.php?record_id=18687

Lestari, F., Saryantono, B., Syazali, M., Saregar, A., Madiyo, M., Jauhariyah, D., & Rofiqul, U. M. A. M. (2019). Cooperative learning application with the method of "network tree concept map": Based on Japanese learning system approach. *Journal for the Education of Gifted Young Scientists*, 7(1), 15-32. https://doi.org/10.17478/jegys.471466

Muema, S., Mulwa, D., & Mailu, S. (2018). *Relationship Between Teaching Method And Students' Performance In Mathematics In Public Secondary Schools In Dadaab Sub County, Garissa County; Kenya. 8*(5), 59–63

Piaget, Jean. (1973). *To Understand is to Invent*. New York: Grossman. (http://curriculum.calstatela.edu/faculty/psparks/theorists/501const.htm).

Rabgay, T. (2018). The effect of using cooperative learning method on tenth grade students' learning achievement and attitude towards biology. *International Journal of Instruction,* 11(2), 265-280. https://doi.org/10.12973/iji.2018.11218a

Sinay, E., & Nahornick, A. (2016). *Teaching and learning mathematics research: Effective instructional strategies.* (Research Report No. 16/17-08). Toronto, Ontario, Canada: Toronto District School Board, 44.

Springer, L., Stanne, M.E. and Donovan, S.S. (2008) *Effects of Small-Group Learning on Undergraduates in Science, Mathematics, Engineering, and Technology*: A Meta-Analysis. Review of Educational Research, 69, 21-51. https://doi.org/10.2307/1170643

Statistics South Africa (2015). *Millennium development goals*: Country report 2015. Pretoria,South Africa: Statistics South Africa.

Sundre, D., Barry, C., Gynnild, V. & Ostgard, E. T. (2012). *Motivation for achievement and attitudes toward mathematics instruction*. Calculus course at the Norwegian University of Science and Technology. Numeracy, 5(1), Art.4. https://doi.org/10.5038/1936-4660.5.1.4

Tobias, S.; Duffy, T. M. (2009). *Constructivist instruction: Success or failure?*. New York: Taylor & Francis. ISBN 9780415994231. https://doi.org/10.4324/9780203878842

Tran, V. D. (2019). Does cooperative learning increase students' motivation in learning? *International Journal of Higher Education,* 8(5), 12-20. https://doi.org/10.5430/ijhe.v8n5p12

Turker, K. (2021). What are the causes of a poor relationship between a student and teacher? *The classroom / empowering students in their college Journey.* Retrieved March 3, 2022.

Umugiraneza, O., Bansilal, S., & North, D. (2017). Exploring teachers' practices in teaching mathematics and statistics in KwaZulu-Natal schools. *South African Journal of Education*, 37(2), 1–13. https://doi.org/10.15700/saje.v37n2a1306

UNESCO (2008), *The School Effectiveness and Education Quality*. Eastern and Southern Africa, Paris, UNESCO.

Van Wyk, M. (2015). Measuring the effectiveness of Student Teams Achievement Divisions as a teaching strategy on Grade 10 Learners' Economic Knowledge. *International Journal of Educational Sciences*, 10(2), 325−337. https://doi.org/10.1080/09751122.2015.11917664

Yeh, K. H., & She, H. C. (2010). *On-line synchronous scientific argumentation learning: Nurturing students' argumentation ability and conceptual change in science context.* Computers & Education, 55(2), 586– 602. https://doi.org/10.1016/j.compedu.2010.02.020

Zakaria, E., Chin, L.C. and Daud, M.Y. (2010) The Effects of Cooperative Learning on Students' Mathematics Achievement and Attitude towards Mathematics. *Journal of Social Sciences*, 6, 272-275. *https://doi.org/10.3844/jssp.2010.272.275*