WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

EFFECT OF GERLACH AND ELY DESIGN MODEL ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN ALGEBRA IN ANAMBRA STATE

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ABSTRACT :

This study was carried out because students have continued to perform poorly in Mathematics, both in school tests and external exams. The purpose of the study was to examine the effect of the Gerlach and Ely design model on the academic achievement of secondary school students in Anambra State in Algebra. Three research questions guided the study, and three null hypotheses were formulated and tested. The study adopted a quasi-experimental design, specifically the pre-test, post-test, non-equivalent control group type. The target population consisted of 18,702 Senior Secondary One (SS1) students' in the area. From this, four co-educational schools were selected using a combination of purposive and simple random sampling techniques, resulting in a sample size of 230 SS1 students. The tool used to gather data was the Algebraic Achievement Test (AAT). Three experts in Educational Foundations, Educational Technology, and Science Education checked the instrument to make sure it was suitable and covered the right content. The reliability of the test was measured using the Kuder-Richardson Formula 20 (KR-20), and it gave a high reliability score of 0.97. To answer the research questions, the data were analyzed using mean and standard deviation. To test the hypotheses, Analysis of Covariance (ANCOVA) was used at a 0.05 significance level. The results showed that the Gerlach and Ely design model helped students do better in algebra than the traditional Lecture Method. This means that using the Gerlach and Ely model can improve students' performance in Algebra.

Key word: *Gerlach and Ely Design Model, Algebra, and* Academic Achievement.

Introduction

In the world, Mathematics is a key subject that is taught at all educational levels. Many academic fields and other areas of human endeavour depend on it. Mathematics also plays a critical role in the growth of both individuals and nations. Since Mathematics is the foundation of scientific and technological progress, every country that wishes to survive and thrive must improve its teaching and learning in schools. In Nigeria, the Federal Government has made mathematics a compulsory subject at the post-basic level of education because it recognizes the critical role it plays in other academic subjects (Federal Republic of Nigeria, FRN, 2014). The essential knowledge and skills of Mathematics are beneficial to all fields, including Chemistry, Arts, Physics, Biology, and Economics. Abiodun, et.al (2022) noted that knowledge of Mathematics gives pupils the abilities essential to prepare them for admittance into higher education.

Mathematics refers to the study of numbers, forms, objects, and their qualities. It is a science that focuses on structure, order, and relationships, and it began with basic activities like counting, measuring, and describing shapes. Oraneto and Omile (2021) explained that Mathematics involves working with numbers and logical thinking, and over time, it has become more abstract. William (2022) added that Mathematicians use strict logical reasoning based on chosen rules and definitions to find patterns, suggest new ideas, and prove their results. Geometry, Algebra, Trigonometry, Arithmetic, and other topics are covered in Mathematics.

Algebra has long been recognized as a vital branch of Mathematics. Algebra simulates real-world situations using first-order equations with the unknown on both sides of the equal sign. Algebra, as opined by Astodillo (2024), is a sort of arithmetic in which students use both numbers and unknown quantities. It is a branch of Mathematics concerned with the representation of quantities in formulas and equations using letters, numbers, and other symbols. In the opinion of the researcher, algebra is the branch of Mathematics that represents and solves real-world problems using Mathematical symbols and letters from the alphabet. Ojaleye and Awofala (2018) was of the view that society and the world cannot advance without algebra's immense contribution. Algebra is divided into sub-topics in Nigerian senior secondary schools, such as equations (simple simultaneous & quadratic), set theory, inequality, and

variation, each with its own method of solution, the following topics will be selected, the number system, the fundamental operations involving the number base system, indices, and the change of formula subject (Okafor & Nzomiwu 2024). All of these topics are taught and studied with the goal of assisting students in becoming effective in applying the strategies they learn in other areas to solve real-life issues. As a result, it is critical that students have a firm foundation in, and understanding of algebra. Students must master essential algebraic principles, if the aims of algebra in senior secondary schools are to be realized. Ojaleye and Awofala (2018) express that effectiveness of Algebra teaching is often judged by how well students achieve academically on examinations. Moreover, academic achievement in Algebra may guarantee better jobs and future career choices.

Academic achievement means how well a student learns or how skilled they are in school tasks. It is usually measured with tests and shown as a score or grade based on how the student performs (Nzomiwu & Ezeigbo 2022). Similarly, academic achievement is the display of knowledge acquired or abilities developed by learners in a particular subject area as determined by exam results given by the teachers. Amoke (2020) noted that student's achievement serves as a benchmark for assessing a country's educational system. Therefore, maintaining good achievement in algebra in internal and largely external. The conventional teaching is also known as the lecture teaching method, and is the most established and widely used method to teaching mathematics (Okafor & Nzomiwu 2024). If a teacher only uses memorization and recitation to teach, students miss the chance to build critical thinking, problem-solving, and decision-making skills. Alicho (2021) agreed that this method, which is teacher-centered, incorporates lectures as well as recitations.

When Mathematics teachers use conventional teaching methods in the classroom, most students are less engaged, enthusiastic, or innovative. Ugwoke, et al (2020) observed that the situation interferes with the educational settings and the students' creative ability. In the aforementioned cases, the teacher is portrayed as a knowledgeable someone who will stand in front of the class and provide knowledge for the students to learn. Alachi, et.al (2016) claimed that the conventional teaching method involves the tutor talking to the learner and writing on the blackboard. Teachers can utilize a wide variety of innovative instructional strategies such as student centered when teaching Algebra such as think-pair-share, open/guided inquiry method, animated-media instructional strategy, problem-solving, brainstorming, and peer tutorial strategy. Similarly, they could adopt interactive instructional strategies such as jigsaw, student-team achievement division, the strategies include learning together, constructive controversy, complex instruction, team-game-tournament, team-assisted individualization, team-accelerated instruction, group investigation, cooperative integrated reading and composition, as well as small group discussions and activity-based methods. The researcher equally proposes that exposing students to activity-oriented strategies such as Gerlach and Ely design model which places the majority of the learning responsibility on students' shoulders, could engage them actively in the classroom. Gerlach and Ely design model is an instructional model design by Vernon and Donald 1971 the main emphasis of this strategy is on methodical planning, with equal emphasis on two key components of effective teaching namely; clearly outlining teaching objectives, and strategies for achieving each of the intended objectives. Sanderson (2023) stated that regardless of the student's academic background, Gerlach and Ely instructional strategy is suitable for educating all levels of students. Wildati et al (2023) observed that the strategy can be used in enhancing teaching at the primary, secondary, and tertiary levels, and that it can be executed with the minimal resources at the teacher's disposal. Wildati et al argued that the strategy works well for instructional planning and design if objectives and material are predetermined. Ten instructional phases were created by Gerlach and Ely as part of a framework to help learners accomplish their learning goals: Content must be specified, goals must be stated, entering behaviour must be evaluated, strategy must be determined, groups must be organized, time and space must be allotted, resources must be chosen, performance must be assessed, and feedback must be analyzed. this instructional strategy paradigm differs from conventional teaching method in that it focuses on enhancing students' performance.

When the Gerlach and Ely design model is employed in the classroom, the amount of commitment, passion, participation, and involvement of the students in the algebra session may be increased because it is personalized to individuals' learning needs, a proper implementation of the Gerlach and Ely design model that could facilitate and sustain students' engagement in algebra. Students who are unsure of their abilities could avoid challenging jobs that they perceive as personal dangers. When these students are faced with challenging algebra assignments, they focus less on how to succeed and more on their flaws as individuals and the challenges they confront (Horn 2024). These students may have difficult psychological obstacles that cause anxiety, jitters, fear, and tension leading to poor academic achievement irrespective of gender.

One component that could always preform a role in the question of students' academic success is gender. It is a term that refers to the behaviour and qualities that people are supposed to possess based on whether they are male or female in a particular community. The community believes that there are roles for males (masculine) and those for females (feminine). People in the society treat males and females differently in their homes. These gender-specific treatments induce females to assume that this is just the way things are and that there is nothing they can do about it. Men tolerate the condition because they believe it will benefit them. Men are frequently advised to act like men, and girls are advised to act like ladies. Gender refers to the biological and physical characteristics that define a person as male or female Onwusa and Nwaosa (2021) defined gender as a psychological word that explains the behaviours and qualities that are expected of individuals based on their gender. In recent times, education has focused over the years on narrowing the achievement gap between male and female students in mathematics.

Admittedly, each of these factors can limit students' academic success based on gender if they are not addressed. Therefore, one of the purposes of this research is to determine whether gender influences the achievement of Mathematics students exposed to both traditional teaching methods and the Gerlach & Ely instructional style. Male students outperformed female students in mathematics; research carried by (Rodrguez et al 2020). Nevertheless, this is in contrast to earlier research by Johnson et al (2022) which revealed that girls consistently outperformed boys in mathematics. Ghasemi and Burley (2019) found that there was no difference in Mathematics performance between boy and girl students. This shows that there is still a gap between the academic success of a boy and girl students in Mathematics. It also shows that there may not be a discernible difference between boy and girl students' achievement scores in Mathematics. So, in order to ensure that students of all genders have the best possible knowledge of algebra topic, a high-quality research study is required to identify an effective strategy of teaching Algebra in the classroom. The sub-themes are also chosen based on the Chief Examiners' report of failure in certain areas in the West African Examination Council. These topics was chosen since they fall under the umbrella of Algebra and are also covered in the SS1 scheme of work. Geometry, Trigonometry, and Arithmetic, which are also distinct topics in the mathematics curriculum, was not covered in this study. Algebra was chosen because it contains challenging mathematical concepts that make it challenging for students to get decent grades. This study therefore will investigate effect of Gerlach and Ely design model on secondary schools' students' achievement in Algebra in Anambra State.

Statement of the Problem

The researcher expresses apprehension that the ongoing subpar performance of students in Mathematics may hinder the cultivation of individuals necessary to guide Nigeria towards advancements in technology and industry. It is evident that multiple factors may contribute to subpar academic performance, with the predominant one, as suggested by the researcher, likely being the instructional strategies employed by Mathematics educators. The prevalence of traditional pedagogical approaches has characterized the instructional framework in secondary schools across Nigeria, drawing criticism from educational specialists who argue that these methods contribute to the persistent decline in students' performance in Mathematics. Nevertheless, the researcher posits that the instructional strategy developed by Gerlach and Ely may serve to augment the efficacy of Algebra instruction and elevate student performance in the discipline. Nevertheless, it is imperative that this be substantiated through scientific or empirical validation, given the insufficient research conducted in this domain. Consequently, the present investigation into the impact of the Gerlach and Ely design model on students' achievement in Algebra within secondary schools in Anambra State aims to address this prevailing unsatisfactory situation.

This study examined the impact of the Gerlach and Ely design model on the academic performance of secondary school students in Algebra within Anambra State. This study aims to ascertain the following:

1. The average achievement scores of students instructed in Algebra through the Gerlach and Ely design model compared to those taught via the lecture method.
2. Average achievement scores of male and female students instructed in Algebra utilizing the Gerlach and Ely design model.
3. The interaction effect of pedagogical approaches (Gerlach & Ely, lecture method) and gender on students' performance in Algebra.

Aligned with the overarching objective, the subsequent research questions directed the inquiry:

1. What are the average achievement scores of students instructed in Algebra utilizing the Gerlach and Ely design model compared to those educated through the lecture method?
2. What is the average achievement score of male and female students instructed in Algebra utilizing the Gerlach and Ely design model?
3. What is the interaction effect of pedagogical approaches (Gerlach & Ely, lecture method) and gender on students' performance in Algebra?

The subsequent null hypotheses, aligned with the study's objectives, were articulated and examined at a significance level of 0.05:

Ho_1: There exists no notable disparity in the average achievement scores of students instructed through the Gerlach and Ely design model compared to those educated via the lecture method.

Ho_2: There exists no notable disparity in the average achievement scores between male and female students instructed in algebra through the Gerlach and Ely design model compared to those receiving instruction via the lecture method.

Ho_3: There exists no notable distinction in the interaction effect of pedagogical approaches (Gerlach & Ely, lecture method) and gender on students' performance in Algebra.

Research Method

The study used a quasi-experimental design, specifically the non-equivalent control group design. This type of design is appropriate for educational research when it is not possible to randomly assign participants to groups (Adebayo, 2024). The research was conducted in Anambra State, which is in the southeastern part of Nigeria. Anambra is one of Nigeria's 36 states and was created on August 27, 1991, from the former Anambra State, which was originally carved out in 1976 from the East Central State. The research was conducted within the confinement of Onitsha Education Zone in Anambra State. The selection of this locale was deliberate, as Onitsha Education Zone is one of the oldest zones and represents a metropolitan community facing challenges such as an insecure learning environment and students' underperformance in academics, particularly in Mathematics. The study comprised a total of 18,702 (SS1) Mathematics students in the thirty-three (33) government-owned schools both the co-educational secondary schools in Onitsha Education Zone Anambra State.

The population consists of 8506 males and 10,196 females, across the SS1 students. The sample consisted of 230 SS1 Mathematics students in Onitsha Education Zone in Anambra State (90 males & 139 females) which was drawn from four schools out of 16 co-educational secondary school in the zone, both male and female students were equally included in the experiment to ensure balanced representation, as gender was considered an important moderating variable in the study. Two of the schools were assigned to experimental group (46 male & 68 female) using purposive sampling in the process of choosing schools according to certain standards such as mixed school, number of students, availability of qualified graduate Mathematics teachers. Two schools were randomly assigned to the control group (44 male & 71 female). Finally, from each school, one intact class was selected using a simple random sampling technique in total, four schools were selected, resulting in four intact classes.

The researcher utilizes the Algebraic Achievement Test (AAT) for data collection, this is a standardized test made up of multiple-choice and short-answer questions was used covering key Algebraic concepts. It was used to assess students' academic achievement in Algebra. The instrument for data collection face and content validated by three experts. One expert in the department of Education Foundation Chukwuemeka Odumegwu Ojukwu University Igbariam campus, another expert from Department of Science Education Nnamdi Azikiwe University and the last expert in Department of Education Technology of Enugu State University Enugu. The reliability of the instruments was determined through a tired test involving 20 SS 1 students from a Community School in Otuocha Education Zone, in Anambra State which was not part of the area of study. the instruments were collected and handed over to the researcher. The reliability of AAT was determined using Kudder-Richardson Formula 20 (KR-20) because the test items were dichotomously

scored and have no right or wrong answer. The coefficient value of 0.97 were obtained. These reliability coefficient values were considered high enough to serve as instrument for data collection because Ifeakor (2018) reliability coefficient of 0.60 and above can be regarded adequate for an instrument for data collection.

Before teaching began in both the experimental and control schools, students in the two groups took the AAT as a pre-test to assess their performance before the instructional intervention. The experimental group was taught algebra using the Gerlach and Ely design model for a period of six weeks. This strategy involves systematic planning and implementation of instructional processes, including the identification of objectives, selection of content, methods, and evaluation. The control group receives the same content using lecture methods. After the intervention, both the experimental and control groups were reassessed using the AAT to evaluate changes in academic achievement. The hypotheses were tested at a 0.05 level of significance. If the p-value was less than 0.05, the null hypothesis was rejected. If the p-value was greater than 0.05, the null hypothesis was accepted. The mean scores and ANCOVA analysis were computed using SPSS version 23.

Research Question 1

What are the mean achievement scores of students taught Algebra using Gerlach and Ely design model and those taught with lecture method?

Table 1: Summary of analysis on the pre-test and post-test mean scores and standard deviation of students taught Algebra using *Gerlach and Ely* design model and those taught with *Lecture Method*

Source of Variance	N	Pre-test Mean	SD	Post-test Mean	SD	Mean Gain	Gain diff
Experimental Group	114	31.85	7.85	68.65	3.95	36.80	18.93
Control Group	116	19.96	2.86	37.83	4.86	17.87	

Table 1 shows a clear comparison of students' academic performance before and after the intervention using two different teaching methods: the Gerlach and Ely Design Model (treatment group) and the Lecture Method (control group). In the treatment group, students were taught algebra using the Gerlach and Ely Design Model. Their average (mean) score after the test was 68.65, with a standard deviation (SD) of 3.95. Before the test, their mean score was 31.85, with a standard deviation of 7.85. This shows a large improvement in their performance. In the control group, students were taught using the traditional Lecture Method. Their mean post-test score was 36.80 (SD = 4.86), and their mean pre-test score was 19.96 (SD = 2.86). Although they improved, the gain was smaller compared to the treatment group. The difference in the average improvement (18.93) further shows the effect of the teaching methods. The treatment group had a gain of 36.80, while the control group had a gain of only 17.87. This means that students taught with the Gerlach and Ely Design Model improved more in algebra than those taught with the Lecture Method.

Research Question 2

What is the mean achievement score of male and female students taught Algebra using Gerlach and Ely design model?

Table 2: Summary of analysis on the pre-test and post-test mean scores and standard deviation of students taught Algebra with Gerlach and Ely design model for gender

Source of Variance	N	Pre-test Mean	SD	Post-test Mean	SD	Mean Gain
Male	46	21.00	8.00	62.40	3.62	41.40
Female	68	22.78	8.66	65.87	4.20	43.09
Mean Gain Diff						**1.69**

Table 2 shows that the male students who were taught Algebra using the Gerlach and Ely design model had a pre-test mean score of 21.00 and a post-test mean score of 62.40, with standard deviations of 8.00 and 3.62 respectively. In comparison, the female students had a pre-test mean score of 22.78 and a post-test mean score of 65.87. For male students, the standard deviation in the pre-test was higher than in the post-test, indicating greater variation in scores before the intervention. This means their scores were more spread out in the pre-test and became closer to the average in the post-test. A similar pattern was observed among the female students, as their pre-test standard deviation was also higher than that of the post-test, suggesting reduced variability after the intervention. The mean gain score for male students was 41.40, while that of female students was 43.09. This shows a mean difference of 1.69 in favor of the female students. This suggests that the Gerlach and Ely design model may be slightly more effective in improving the academic achievement of female students in Algebra compared to their male counterparts.

Research Question 3

What is the interaction effect of teaching methods and gender on students' achievement in Algebra?

Table 3: Summary of analysis on the interaction of teaching methods and gender on students' academic achievement in Algebra

Source of Variance	Gender	N	Pre-test Mean	SD	Post-test Mean	SD	Mean Gain
G&E							
	Male	46	21.00	8.03	62.40	3.62	41.40
	Female	68	22.78	8.66	65.87	4.20	43.09
Diff in mean gain						**1.69**	
LM	Male	44	15.25	2.34	47.25	11.68	32.00
	Female	72	11.07	5.32	59.13	18.45	48.06
Diff in mean							**16.06**

Table 3 shows a comparison of the pre-test and post-test average scores of male and female students who were taught Algebra using either the Gerlach and Ely design model or the conventional Lecture Method (LM). Among the male students taught with the Gerlach and Ely model, the average score before the lesson was 21.00 (with a standard deviation of 8.03). After the lesson, their average score rose significantly to 62.40 (SD = 3.62), showing a gain of 41.40 points. Female students in the same group started with a pre-test average of 22.78 (SD = 8.66) and improved to 65.87 (SD = 4.20), with a gain of 43.09 points. For those taught with the Lecture Method, male students had a pre-test average of 15.25 (SD = 2.34) and a post-test average of 47.25 (SD = 11.68), resulting in a 32.00-point gain. Female students in this group started with a pre-test average of 11.07 (SD = 5.32) and scored an average of 59.13 (SD = 18.45) after the lesson, gaining 48.06 points. In all groups, the post-test scores were higher than the pre-test scores, showing that all students improved. However, students taught with the Gerlach and Ely design model performed better than those taught with the traditional Lecture Method, showing that the Gerlach and Ely model was more effective in improving Algebra achievement.

Hypothesis 1

Ho_1: There is no significant difference in the mean achievement scores of students taught Algebra using Gerlach and Ely design model and those taught using lecture method

Table 4: Test of significance analysis on ANCOVA for testing the significant effect of Gerlach and Ely design model on students' achievement in Algebra when compared to those taught with lecture method

Source	SS	df	MS	Cal. F	P-value	Decision
Corrected Model	14839.998[a]	2	7415.999	53.76	0.00	
Intercept	11415.550	1	11316.550	82.04	0.00	
Pretest	2142.932	1	2133.932	15.47	0.00	
Method	4940.073	1	4931.073	35.75	0.00	S
Error	10354.117	227	138.922			
Total	181787.000	230				
Corrected Total	25164.115	229				

a. R Squared = .589 (Adjusted R Squared = .578) S = Significant, NS = Not Significant

Table 4 showed that the instructional method used had a significant effect on students' achievement scores, explaining 58% of the total variation. The analysis produced an F-value of F(1, 229) = 35.75 with a p-value of 0.00. Since the p-value is less than 0.05, the result is statistically significant. Therefore, the null hypothesis was rejected. This means that students taught using the Gerlach and Ely design model performed significantly better in Algebra than those taught with the traditional Lecture Method. This result highlights the effectiveness of the Gerlach and Ely model in enhancing students' performance in Algebra.

Hypothesis 2

Ho_2: There is no significant difference in mean achievement scores of male and female students taught Algebra using Gerlach and Ely design model and those taught using lecture method

Table 5: Test of significance analysis on ANCOVA for testing the significant effect of Gerlach and Ely design model on students' achievement in Algebra in respect to gender

Source	SS	df	MS	Cal. F	P-value	Decision
Corrected Model	35.147[a]	2	17.074	1.11	0.34	
Intercept	15160.015	1	15160.015	982.83	0.00	
Achievement	33.145	1	33.145	2.08	0.16	
Gender	11.460	1	11.460	0.75	0.39	NS
Error	541.063	111	15.431			
Total	149889.000	114				
Corrected Total	573.211	113				

a. R Squared = 0.059 (Adjusted R Squared = 0.006) S= Significant, NS = Not Significant

Table 5 showed that gender did not have a significant effect on students' achievement scores. The result of the statistical test was F(1, 113) = 0.75, p = 0.39, which is greater than the 0.05 significance level. Therefore, the null hypothesis was upheld. This means that the Gerlach and Ely design model did not lead to any significant difference in Algebra achievement between male and female students. The finding suggests that the instructional model is equally effective for both genders.

Hypothesis 3

Ho_3: There is no significant difference in the interaction effect of teaching methods (Gerlach & Ely, lecture method) and gender on students' achievement in Algebra.

Table 6: Test of significance analysis on ANCOVA for interaction effect of teaching methods and gender on students' achievement

Source of variation	SS	df	MS	Cal. F	P-value	Decision
Corrected Model	12117.984	4	3029.496			
Intercept	3136.612	1	3136.612			
Pre-test	154.990	1	54.990			
Treatment models	8348.862	1	8348.862			
Gender	590.108	1	590.108			
Treatment * Gender	193.233	1	193.233	3.61	0.06	NS
Error	4009.566	227	53.461			
Total	261882.000		230			
Corrected Total	16127.550	229				

Table 6 shows that at the 0.05 level of significance, with 1 degree of freedom for the numerator and 229 for the denominator, the calculated F-value is 3.61 and the p-value is 0.06. Since the p-value is greater than 0.05, the null hypothesis was retained. This means that there is no significant interaction between the Gerlach and Ely design model and gender on students' achievement in Algebra. In simple terms, the effectiveness of the instructional model in enhancing students' performance in Algebra does not vary based on gender.

Discussion of Results

The results of this study showed that the Gerlach and Ely design model was significantly more effective in improving students' academic performance in Algebra than the traditional lecture method (LM). Students who were taught Algebra using the Gerlach and Ely model achieved much higher academic results compared to those taught with the lecture method, with findings clearly favoring the experimental group. The analysis also indicated that female students performed better than male students when taught Algebra using the Gerlach and Ely model. However, the study found an interaction effect between the instructional model and students' gender on academic achievement. Although female students in both the experimental and control groups had slightly higher mean scores than their male counterparts, the difference was small. When the hypothesis was tested (as shown in Table 6), it was found that the interaction between the instructional model and gender was not statistically significant. This means that the effectiveness of the Gerlach and Ely model in improving students' achievement in Algebra does not depend on whether the student is male or female.

Conclusion

The results of this study showed that the Gerlach and Ely design model helps students develop critical thinking and problem-solving skills. It allows them to handle academic tasks on their own, work together in small groups, and participate actively in whole-class activities. The study strongly supports the idea that this teaching method improves students' performance in Algebra, whether they are male or female. Based on these findings, the researcher concludes that using the Gerlach and Ely design model greatly boosts students' achievement in Algebra. The study also shows that gender does not

significantly affect students' success when this method is used. On the other hand, the traditional lecture method tends to make students passive, which often leads to lack of interest, poor memory, and lower performance in Algebra. However, using the Gerlach and Ely model can overcome these problems by creating an interactive, student-centered learning environment. This method not only helps students understand concepts better but also encourages active participation, long-term memory, and higher achievement in Algebra.

Recommendations

From the results of this study, the following suggestions were made to improve the teaching of Mathematics and help students learn better:

1. Mathematics teachers should integrate the Gerlach and Ely design model into their teaching practices to foster active student participation in the learning process. This model encourages an interactive classroom environment where students engage in problem-solving activities individually, in pairs, and within larger groups.
2. To ensure the successful implementation of the Gerlach and Ely design model, Mathematics teachers should have access to continuous professional development opportunities.
3. Teachers of Mathematics need to explain the benefits of the Gerlach and Ely design model and how it can enhance students' learning experience.
4. The current time allocation for Algebra lessons in secondary school timetables may not be sufficient for the effective implementation of the Gerlach and Ely design model.

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