



The impact of grouping in mathematics: Views from Kurdistan-Iraqi high school teachers

Shwan Hussein Alshatri

Kharmanan High School, Ministry of Education, Sulaymaniyah, Iraq

*Corresponding author: kakshko0@email.com

Article Info

Article history:

Received: October 29, 2023

Accepted: February 27, 2024

Published: March 28, 2024

Keywords:

Group method
High schools
Students
Teachers

ABSTRACT

Mathematics is one of the primary disciplines in education that can be used to measure students' abilities in learning and understanding scientific equations. This research explores the effectiveness of grouping methods in teaching mathematics at the high school level and its impact on students' scientific literacy. Using data analysis and descriptive methods, this study gathered responses from 60 high school mathematics teachers in Kurdistan who completed questionnaires on using grouping methods in teaching. The results show that all teachers found the grouping method to be an effective way to teach mathematics, improve student understanding, and facilitate student cooperation and critical thinking. The implications of this study include providing beneficial teaching methods for teachers and new insights into the practical and theoretical literature on group learning in mathematics. This research contributes to developing more effective mathematics teaching strategies in high schools, focusing on group learning approaches.

Dampak pengelompokan dalam pembelajaran matematika: Pandangan dari guru-guru sekolah menengah di Kurdistan-Iraqi

ABSTRAK

Kata Kunci:

Metode kelompok
Sekolah menengah
Siswa
Guru

Salah satu disiplin ilmu utama dalam pendidikan yang dapat digunakan untuk mengukur kemampuan siswa dalam belajar dan memahami persamaan ilmiah adalah matematika. Penelitian ini bertujuan untuk mengeksplorasi efektivitas metode pengelompokan dalam pengajaran matematika di sekolah menengah dan dampaknya terhadap literasi ilmiah siswa. Dengan menggunakan metode analisis data dan deskriptif, penelitian ini mengumpulkan tanggapan dari 60 guru matematika di sekolah menengah di Kurdistan, yang mengisi kuesioner tentang penggunaan metode pengelompokan dalam pengajaran. Hasil penelitian menunjukkan bahwa semua guru merasa metode pengelompokan adalah cara yang efektif untuk mengajarkan matematika, meningkatkan pemahaman siswa, dan memfasilitasi kerja sama serta pemikiran kritis di antara siswa. Implikasi penelitian ini mencakup pemberian metode pengajaran yang bermanfaat bagi guru, serta wawasan baru dalam literatur pembelajaran kelompok matematika yang bersifat praktis dan teoritis. Penelitian ini memberikan kontribusi terhadap pengembangan strategi pengajaran matematika yang lebih efektif di sekolah menengah, dengan memfokuskan pada pendekatan pembelajaran kelompok.

1. INTRODUCTION

Forty-five high schools in Kurdistan were selected to fill out a questionnaire on student grouping. Grouping could be a learning strategy in which understudies are partitioned into small, heterogeneous groups with diverse levels of information. Each grouping has between two to three individuals. The students of one group coordinate with each other to attain common objectives, targets, or instructive learning circumstances. Students work as groups in a positive shared interaction in which everybody feels capable of learning, and others learn to realize common points [1], [2]. The problem in this consideration is how teachers can educate understudies within the high school to utilize the grouping student strategy. The purpose of this paper is to gather data about the subject of mathematics through a questionnaire.

As researcher's, a few steps are taken to illuminate and bargain with the issue, let students be in charge of the hroup, and select an fitting group, at that point center on the cooperation of participants, and grant homework, after that emphasize on the significance of participation between the instructor and understudies in distinguishing the issue, at that point collecting data and information from numerous sources beneath the supervision and direction of the educator to the students separately or collectively, and after that the classification of data is done, afterward put the errands of the arrangement since the data is gotten by the understudies must be discussed, executed and decayed within the frame of common arrangements, and confirming the legitimacy of the theories come to, at that point conclusions and finding a arrangement as a result of testing theory, after that knowing the suggestions of the comes about accomplished, at that point application and generalization and uncover the legitimacy of the particular presumptions whether the comes about are satisfactory or not , and finally tune in to all thoughts [3], [4].

The study's impartiality creates the adequacy of the member's commitment to the agreeable exertion to realize the group's targets. After learning about the foremost critical components and components of the agreeable instructive circumstance, we presently come back and know about agreeable learning. Combined learning is the connection between groups of students. This relationship requires positive interest, personal obligation, social aptitudes, and, at long last, valuable and coordinated collaboration with others, which can be grouped by covering a few standard sets. This permits us to enter modern measures for the group location [5], [6]. From this paper, it is clear that we require mathematics to be as long-lasting as material things in our normal lives. Table 1 gives a list of previous studies for grouping work in Mathematics.

Table 1. List of earlier studies for group work in mathematics

Authors	Year	Title
Ding, L. and Zhang, Y [7]	2023	Investigation and Research on Group Cooperative Learning in Junior High School Mathematics Teaching
Sjöblom, M., Valero, P. and Olander, C.[8]	2023	Teachers' noticing to promote students' mathematical dialogue in group work.
Levenson, E.S. and Molad, O. [9]	2022	Analyzing collective mathematical creativity among post-high-school students working in small groups
Fujita, T., Doney, J., Flanagan, R. and Wegerif, R.[10]	2021	Collaborative group work in mathematics in the UK and Japan: use of group thinking measure tests
Molad, O., Levenson, E.S. and Levy, S. [11]	2020	Individual and group mathematical creativity among post-high school students
Alshatri et al. [12]	2019	Teaching aids effectiveness in learning mathematics.
Fidele, U., Kizito, N., Angel, M. and Jean, U.[13]	2019	Insights of teachers and students on mathematics teaching and learning in selected Rwandan secondary schools.
Sofroniou, A. and Poutos, K.[14]	2016	Investigating the effectiveness of group work in mathematics.

Koçak, Z.F., Bozan, R. and Işık, Ö. [15] 2009 The importance of group work in mathematics

Later, in 2023, Ding, L. and Zhang, Y [7], the utilization of group work still has certain issues. A common symptom of certain students in many high schools is their lack of participation in class group discussions, which has a low learning impact. Also, in 2023, Sjöblom, M., Valero, P. and Olander, C. [8]. By assigning particular Mathematical problems to every student in the groups, the results demonstrate that teachers increased their awareness of the value of clear instructions and their position as facilitators of Mathematical questions for students.

Then Levenson, E.S. and Molad, O., in 2022, showed that the three found were a disjointed strategy path, an emergent strategy path, and a straightforward strategy path. Fluency was attained by using dialogue techniques, which included seeking clarity, asking for assistance, and outlining tactics. Originality resulted by elaborating on mathematical justifications. Strategies were evaluated to enhance strategic flexibility. Group leadership philosophies also influenced the degree of cooperation and collaboration, supporting various facets of creativity [9].

However, Fujita, T., Doney, J., Flanagan, R. and Wegerif, R [10] 2021 used the "Developing and Trialling a Measure of Group Thinking" test, also known as the Group Thinking Measure. They believe that groups that perform well in subjects like mathematics can be identified using the group thinking measure (GTM). However, in 2020, Molad, O., Levenson, E.S. and Levy, S [11] studied that the majority of research on students' creativity focused on their creative work and how different students' solo work and group work in terms of their mathematical inventiveness. Also, in the classroom, group formation is greatly aided by effective teaching methods in Mathematics [12]. Finally in 2009, Koçak, Z.F., Bozan, R. and Işık, Ö [15]. As one of the integrated approaches of learning theories, we strongly emphasize learning through group work. Students' critical thinking and problem-solving abilities can be enhanced through group work, and it also improves their ability to express themselves.

Various prior studies have been conducted, among them: Investigation and Research on Group Cooperative Learning in Junior High School Mathematics Teaching [7], Teachers' noticing to promote students' mathematical dialogue in group work [8], Analyzing collective mathematical creativity among post-high-school students working in small groups [9], Collaborative group work in mathematics in the UK and Japan: use of group thinking measure tests [10], Individual and group mathematical creativity among post-high school students [11], Teaching aids effectiveness in learning mathematics [12], Insights of teachers and students on mathematics teaching and learning in selected Rwandan secondary schools [13], Investigating the effectiveness of group work in mathematics [14] and The importance of group work in mathematics [15]. Several studies have shown that group learning has been extensively used in mathematics. Yet, there is a lack of research examining the impact of group-based learning in mathematics from the teacher's perspective. This research is expected to assist teachers in providing effective instruction for classroom use.

This study examines the impact of group learning in mathematics from teachers' perspective. Previous research has conducted similar studies. However, those studies did not consider the teachers' perspectives on the impact of group learning. This research provides a questionnaire for mathematics teachers regarding the importance of group learning in the classroom.

Contribution to the literature

This research contributes to filling gaps in the literature on group learning in mathematics by providing new insights that are both practical and theoretical. The main contributions of this study include:

- Expanding students' understanding of mathematical concepts through the proven effective group learning approach.
- Providing teachers with information on effective methods for teaching mathematics.
- Identify appropriate group teaching methods and offer a clear picture of the outcomes that can be applied effectively.

2. METHOD

The sampling strategy and the application of analytical techniques are part of the study's type. Kurdistan's 45 high schools were chosen for a student group study. Sixty teachers in Kurdistan-Iraq used a Google form to complete the forms. These methods of instruction are novel and advanced. According to Mukhamadovna et al. [16], innovative technologies are highly effective, particularly the innovative group approach method (SAVT).

The data was collected in this study, and then the analytical sampling method was used. This study used a questionnaire for some mathematics teachers as models. For this reason, only 60 teachers answered the questions completely; they answered 60 questions using Google Forms. This study consists of five steps, as shown in Figure 1, to design and analyze the collection date; we have used Microsoft Word.

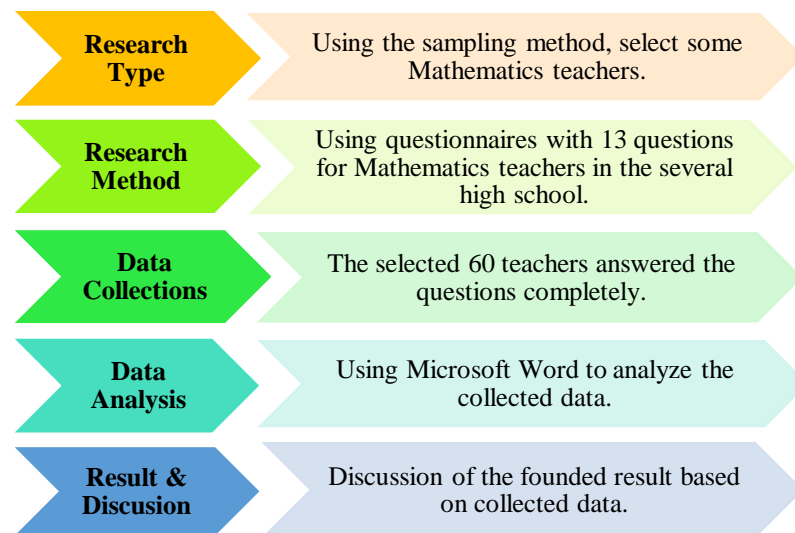


Figure 1. The steps of the research processes

3. RESULTS AND DISCUSSION

This paper is considered necessary for publication because most teachers think that group work with students in mathematics classes in high school is a valuable way to help them understand the material just as quickly. The opinions of sixty mathematics teachers from various high schools were gathered for this study regarding the group method of providing mathematics instruction to students in 10th through 12th grades. It has been demonstrated that teaching mathematical concepts in groups facilitates higher thinking

levels among students and expedites information delivery. The answers varied, as indicated in Table 2, according to the findings of the questionnaire given to the teachers regarding the group projects that their students completed in class.

In the context of this material, the research findings align with the understanding that grouping in mathematics learning can enhance students' comprehension of the subject matter. Other relevant studies indicate that grouping can facilitate critical thinking and collaboration among students, consistent with findings that teaching mathematical concepts in groups can elevate the level of higher-order thinking among students. Furthermore, these findings can also be linked to teachers' views on grouping in mathematics learning, which may reflect their belief in the effectiveness of grouping as a teaching method. This suggests that grouping can be considered an effective strategy for helping students better understand the material in the context of secondary school mathematics learning.

Table 2. Vital questions to the mathematics teachers in the questionnaire

No	Questions	Yes	Yes (%)	Some Extent	Some Extent (%)	No	No (%)
Q1	Does using this method affect the advanced scientific students' performance?	38	63.34	10	16.66	12	20
Q2	Does this method care about students' capacity for creativity and critical thought?	32	53.33	20	33.33	8	13.34
Q3	Do students accept individual differences in IQ and level of proficiency within their groups?	42	70	10	16.66	8	13.34
Q4	Do students in the classroom assist with using this method?	30	50	18	30	12	20
Q5	Does the use of this method give any thought to the development of strong student-teacher relationships?	33	55	22	36.66	5	8.34
Q6	Does using this method in the classroom lead some students to shirk their responsibilities and rely more on their friends?	32	52.33	21	35	7	11.67
Q7	Does the subject need a lot of time to apply this method?	8	13.33	12	20	40	66.67
Q8	Are students cooperating with their friends while they are learning this method?	30	50	15	25	15	25
Q9	Can the teacher maintain control over the class when using this method?	28	46.67	18	30	14	23.33
Q10	For the weaker students, learning in groups would be beneficial.	45	75	12	20	3	5
Q11	Does this approach aid isolated students who are participating?	42	70	10	16.66	8	13.34
Q12	Is it challenging for teachers and students to use the group method?	4	6.67	16	26.67	40	66.66
Q13	Do the group and individual exams use this method easily?	38	63.34	12	20	10	16.66

The equations are displayed below:

$$X_i = \frac{L_i}{0.6}, \text{ for } i \text{ from } 1 \dots 13 \tag{1}$$

X_i = Percentage of responses of each equation
 L_i = Number of teachers who answered "Yes."

$$Y_i = \frac{M_i}{0.6} \tag{2}$$

Y_i = Percentage of responses of each equation
 M_i = Number of teachers who answered "Some Extent."

$$Z_i = \frac{N_i}{0.6} \tag{3}$$

X_i = Percentage of responses of each equation
 N_i = Number of teachers who answered "No".

Here, we briefly discuss the above equations. For example, in Q1, we have ($L_1= 38$ for "Yes," i.e., $X_1= 63.34\%$), as shown in (1), ($M_1= 10$ for "Some Extent," i.e., $Y_1= 16.66\%$) as seen (2), and ($N_1= 12$ for "No," i.e., $Z_1 = 20\%$) as shown in (3). But in Q2, we have ($L_2= 32$ for "Yes," i.e., $X_2= 53.33\%$), ($M_2= 20$ for "Some Extent," i.e., $Y_2= 33.33\%$), and ($N_2= 8$ for "No," i.e., $Z_2 = 13.34\%$) ,and so on.

$$\psi_i = X_i + Y_i + Z_i \tag{4}$$

$$\sum_{i=1}^{13} \psi_i = 100\% \tag{5}$$

From 1 to 13, we have shown in equation (4) that the total percentage of all three legends is one hundred percent, as we have pointed out in (5).

This study found that the use of groups in grades 10 through 12 high schools is the best solution for Mathematics teachers to teach students scientifically, and it is the calmest and greatest technique to familiarize students in the Kurdistan region of Iraq. OriginProLab software designed the bar chart that shows the number of questions from Q1–Q13 in the three legends (Yes by %, Some Extent by %, and No by %).

The findings of this study are supported by previous research conducted by Garrett and Hong [17], which demonstrates the significant benefits of heterogeneous grouping, especially when accompanied by sufficient learning time allocation. Their study provides insights into the effectiveness of grouping strategies in the context of mathematics education, particularly for language-minority students at the kindergarten level. Although both studies focus on student grouping in mathematics learning, this research adds a new dimension by exploring the perceptions of mathematics teachers at the secondary school level in Kurdistan-Iraq.

The differences in geographical context, educational level, and focus on teachers' perspectives constitute the novelty of this research. Whereas Garrett and Hong examined the impact of grouping on students directly, this study delves into how mathematics teachers view and implement grouping strategies, offering a new perspective on how these strategies can be adapted and effectively implemented in different environments. Moreover, this research also highlights how cultural and institutional factors in Kurdistan-Iraq affect the implementation and perceptions of grouping in mathematics education, significantly contributing to the global literature on grouping in mathematics education.

4. CONCLUSION

This study reveals that the grouping method in mathematics teaching in secondary schools significantly enhances students' understanding of the material. Involving 60 teachers in Kurdistan, the research results show a strong consensus that grouping facilitates better critical thinking, cooperation, and social interaction among students, contributing to a higher level of mathematical concept comprehension. These findings underscore the importance of the grouping method as an effective teaching strategy, offering practical guidance for teachers to implement it in the classroom, as well as providing a theoretical

contribution to the literature on group learning in mathematics, which can guide the development of more effective teaching practices in the future.

REFERENCES

- [1] R. T. Johnson and D. W. Johnson, "Active learning: Cooperation in the classroom," *The annual report of educational psychology in Japan*, vol. 47, no. 1, pp. 29-30, 2008, doi : https://doi.org/10.5926/arepj1962.47.0_29
- [2] D. M. Hung and L. T. T. Mai, "High school teachers' perceptions and implementations of group work in english speaking classes," *International Journal of Instruction*, vol.13, no. 2, pp. 445-462, 2020, doi : <https://doi.org/10.29333/iji.2020.13231a>.
- [3] T. Bachmann, "Functional group positions and contact behavior in problem-solving groups," *Gruppe. Interaktion. Organisation. Zeitschrift für Angewandte Organisationspsychologie (GIO)*, vol.53, no. 1, pp. 131-144, 2022, doi : <https://doi.org/10.1007/s11612-021-00613-6>
- [4] B. A. Nijstad and J. M. Levine, "Group creativity and the stages of creative problem solving," in *The Scope of Social Psychology*, vol. 1, no. 2, pp. 171-184, 2007, doi : <https://doi.org/10.4324/9780203965245-18>
- [5] L. Constantinou and R. Gani, "New group contribution method for estimating properties of pure compounds," *AIChE Journal*, vol. 40, no. 10, pp. 1697-1710, 1994, doi : <https://doi.org/10.1002/aic.690401011>
- [6] K. G. Joback and R. C. Reid, "Estimation of pure-component properties from group-contributions," *Chemical Engineering Communications*, vol. 58, no. 6, pp. 233-243, 1987, doi : <https://doi.org/10.1080/00986448708960487>
- [7] L. Ding and Y. Zhang, "Investigation and research on group cooperative learning in junior high school mathematics teaching," *Advances in Education, Humanities and Social Science Research*, vol. 8, no. 1, pp. 371-371, 2023, doi : <https://doi.org/10.56028/aehtsr.7.1.371.2023>
- [8] M. Sjöblom, P. Valero, and C. Olander, "Teachers' noticing to promote students' mathematical dialogue in group work," *Journal of Mathematics Teacher Education*, vol.26, no. 4, pp. 509-531, 2023, doi : <https://doi.org/10.1007/s10857-022-09540-9>
- [9] E. S. Levenson and O. Molad, "Analyzing collective mathematical creativity among post high-school students working in small groups," *ZDM—Mathematics Education*, vol. 54, no. 1, pp. 193-209, 2022, doi : <https://doi.org/10.1007/s11858-021-01321-7>
- [10] T. Fujita, J. Doney, R. Flanagan, and R. Wegerif, "Collaborative group work in mathematics in the UK and Japan: use of group thinking measure tests," *Education 3-13*, vol. 49, no. 2, pp. 119-133, 2021, doi : <https://doi.org/10.1080/03004279.2019.1701513>
- [11] O. Molad, E. S. Levenson, and S. Levy, "Individual and group mathematical creativity among post-high school students," *Educational Studies in Mathematics*, vol.104, no. 2, pp. 201-220, 2020, doi : <https://doi.org/10.1007/s10649-020-09952-5>
- [12] S. H. Alshatri, K. Wakil, K. Jamal, and R. Bakhtyar, "Teaching aids effectiveness in learning mathematics," *International Journal of Educational Research Review*, vol. 4, no. 3, pp. 448-453, 2019, doi : <https://doi.org/10.24331/ijere.573949>
- [13] U. Fidele, N. Kizito, M. Angel, and U. Jean, "Insights of teachers and students on mathematics teaching and learning in selected Rwandan secondary schools,"

- African Journal of Educational Studies in Mathematics and Sciences*, vol.15, no. 2, pp. 93-106, 2019, doi : <https://doi.org/10.4314/ajesms.v15i2.8>
- [14] A. Sofroniou and K. Poutos, "Investigating the effectiveness of group work in mathematics," *Education Sciences*, vol. 6, no. 1, pp. 1-30, 2016, doi : <https://doi.org/10.3390/educsci6030030>
- [15] Z. F. Koçak, R. Bozan, and Ö. Işık, "The importance of group work in mathematics," *Procedia-Social and Behavioral Sciences*, vol. 1, no. 1, pp. 2363-2365, 2009, doi : <https://doi.org/10.1016/j.sbspro.2009.01.414>
- [16] T. M. Mukhamadovna, H. A. Sharipovna, and H. N. Supkhonovna, "The system of development of professional competence in future primary school teachers," *System*, vol. 7, no. 13, pp. 1-20,, 2020.
- [17] R. Garrett, G. Hong, "Impacts of grouping and time on the mathematics learning of language minority kindergartners," *Educational Evaluation and Policy Analysis*, vol 20, no. 10, pp. 1-23, 2015, <https://doi.org/10.3102/0162373715611484>