Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

Cooperative Against Independent Learning Through the 5E's: Strategies to Reinforce Grade 8 Students' Skills in Factoring Polynomials

Robin S. Fajardo [1]
1 – Arellano University
robin.fajardo@deped.gov.ph / 0009-0007-4881-5494

Publication Date: July 7, 2026 DOI: **10.5281/zenodo.21242954**

Abstract

This study aims to determine the effectiveness of cooperative learning compared to independent learning using the 5E's strategies in reinforcing the factoring polynomial skills of Grade 8 students at Imelda Integrated Secondary School.

A two-group pretest-posttest quasi-experimental research design was utilized using a researcher-made test. The participants were selected based on the results of the pretest. After approval from the School Division Superintendent and the school principal, the researcher conducted the study. The researcher administered the pretest to 151 Grade 8 students. Students who scored 15 or below were selected using purposive sampling. Eighty students were divided into two groups of 40 each. The cooperative group was subdivided into six smaller groups, while the other group learned independently. The 5E's strategy was used in teaching factoring polynomials. Cooperative learners worked together and presented outputs, whereas independent learners completed tasks individually. A posttest was administered after instruction.

The test consisted of 50 parallel items on factoring polynomials and word problems. Data were analyzed using mean, standard deviation, and t-tests for independent and dependent samples. Results showed both groups had low pretest mastery. After the intervention, the cooperative group reached average mastery, while the independent group remained at low mastery. Both groups improved in posttest scores, but the cooperative group performed significantly better.

This indicates that cooperative learning using the 5E's is more effective than independent learning in enhancing students' factoring polynomial skills among Grade 8 learners in this context. The findings suggest that structured group interaction, discussion, and peer support contribute to deeper understanding, while independent work alone may not fully address learning gaps. Therefore, teachers are encouraged to incorporate cooperative strategies within the 5E's framework to improve mathematics achievement and engagement. This approach can foster collaboration, critical thinking, and problem-solving skills essential for learners' academic success in algebra and beyond.

Keywords: *Cooperative learning, factoring, independent learning, polynomial, reinforcement, 5E's instructional model*

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

1. Introduction

Mathematics is essential in everyday life as it helps develop problem-solving skills and supports understanding in areas like finance, business, and social sciences. However, many students struggle with fundamental mathematical concepts, particularly factorization. They have difficulty identifying common factors and applying identities, largely due to weak foundations in concepts such as prime factorization, greatest common factor, and special products. This learning gap is reflected in international assessments like PISA 2022, where Filipino students ranked among the lowest in mathematics.

Based on six years of teaching experience, the researcher observed persistent difficulties in mathematics among Grades 7 to 10 students. Despite interventions such as remediation and varied teaching strategies, students continued to show low mastery in periodic tests. National and school-based assessments (NAT, ANA, and TOFAS) revealed very low performance in problem-solving, information literacy, and critical thinking. Many students lacked basic skills like multiplication and division, and struggled with more advanced topics such as algebra and factoring polynomials. Historical test results consistently showed poor outcomes, indicating widespread gaps in foundational math skills and comprehension.

Due to continuous low performance and difficulties in factoring polynomials, this study was conducted to address students' learning gaps. The goal is to improve their understanding of mathematical concepts, particularly factorization, and enhance their overall mathematical skills through targeted interventions.

Statement of the Problem

The objective of the study is to determine the effectiveness of cooperative against independent learning through 5E's: strategies to reinforce grade 8 student's skills in factoring polynomials.

Specifically, the study aims to answer the following:

1. What is the 8th graders' pretest and posttest score performance from the use of Independent Learning?

2. What is the 8th graders' pretest and posttest score performance from the use of Cooperative Learning?

3. Is there significant difference between the Independent Learning and Cooperative Learning pretest scores?

4. Is there significant difference between the Independent Learning and Cooperative Learning posttest scores?

5. Is there significant difference between the pretest and posttest scores from Independent and Cooperative Learning?

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

6. What are the score gains of Grade 8 Students from the use of Independent Learning?

7. What are the score gains of Grade 8 Students from the use of Cooperative Learning?

Methodology

This chapter describes the research design, the study's respondents, the instruments used, the data-gathering procedures, and the statistical treatment of the data.

Research Design

The researcher used a two groups pretest – posttest quasi – experimental research design. A two-group pretest – posttest quasi – experimental is a research design to compare the performance of 8th graders in factoring polynomials using cooperative learning and independent learning. The participants consist of 40 students divided into 6 groups with 6 or 7 members under cooperative learning while other 40 students under independent learning.

Participants

Table 1 presents the profile of the study population consisting of 151 Grade 8 students from five sections at Imelda Integrated Secondary School for S.Y. 2024–2025. The sections include Aguinaldo (32 students), Laurel (28 students), Osmeña (31 students), Quezon (26 students), and Roxas (34 students). Among the participants, there were 80 male and 71 female students who took the pretest.

Table 1
Profile of the Population of the Study

Section	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
Aguinaldo	12	15%	20	28%	32	21%
Laurel	16	20%	12	17%	28	19%
Osmena	20	25%	11	16%	31	20%
Quezon	13	16%	13	18%	26	17%
Roxas	19	24%	15	21%	34	23%
Total	**80**	**100%**	**71**	**100%**	**151**	**100%**

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

Table 2 describes the study sample, consisting of 80 students who scored 15 or below on the pretest. These students were divided equally into two groups: 40 students assigned to cooperative learning (organized into six groups with 6–7 members each) and 40 students assigned to independent learning.

The study used purposive sampling, selecting participants based on specific criteria rather than randomly. Students in the cooperative group were chosen based on their social skills, leadership, availability, and accountability, while those in the independent group were selected for their responsibility, self-motivation, time management, and ability to learn independently.

Table 2
Profile of the Sample of the Study

Group	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
Cooperative Learning	23	57.5%	17	42.5%	**40**	**50 %**
Independent Learning	25	62.5%	15	37.5%	**40**	**50 %**
Total	**48**	**100%**	**32**	**100 %**	**80**	**100 %**

Research Instruments

This study used pretest and posttest assessments to collect data and answer the research questions. A self-developed test was administered to measure the performance of Grade 8 students in factoring polynomials before and after applying the 5E instructional model in both cooperative and independent learning groups.

Data Gathering Procedure

The study has three stages: the pre – experimental stage; experimental stage; and post – experimental stage.

Stage 1: Pre – Experimental Stage

The researcher sent a letter of request to the Division Office of Malabon, through the Schools Division Superintendent (SDS) and the Division Research Committee, to conduct the study and administer the pretest and posttest. Copies of the pretest and posttest, along with the table of specifications and parental consent form, were included in the request. After the Division Office approved the letter, the researcher submitted it to the principal's office of Imelda Integrated Secondary School.

Stage 2: Experimental Stage

Once permission was granted, the researcher administered the pretest to 151 Grade 8 students and identified those who scored 15 or below as participants in the study. After the pretest, the selected students were divided into two groups: 40 students were placed into six

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

cooperative learning groups, each consisting of six or seven members, while another 40 students were assigned to independent learning.

The researcher facilitated the discussion on factoring polynomials using the 5E's. In the 'Explain' phase, students in the cooperative learning group completed group activities, while those in the independent learning group worked on individual written performance tasks.

Stage 3: Post – Experimental Stage

After the experimentation, the posttest was administered, and the tests were checked. The participants' scores were recorded on separate sheets—one for the cooperative learning strategy and the other for the independent learning strategy. The mean, standard deviation, independent t-test, and dependent t-test were computed to analyze and interpret the results.

Data Analysis

The necessary data gathered from the tests were carefully tabulated, analyzed, and interpreted based on the results of the statistical treatments. The researcher used the mean, percentage, standard deviation, independent t-test, and dependent t-test in the study.

Mean. It was used to determine the average scores of the participants as the basis for data analysis.

Standard Deviation. It was used to assess the variability of the pretest and posttest scores.

t- test for independent Samples. It was used to determine if both pretest of independent learning and cooperative and if both posttest of independent learning and cooperative learning strategies have a significant difference.

t - test for Dependent Samples. It was used to determine if the pretest and posttest of independent learning and the pretest and posttest of cooperative learning have a significant difference.

Results

1. What is the 8th graders' pretest and posttest score performance from the use of Independent Learning?

Table 3
General Table for the PRETEST and POSTTEST of Grade 8 Students from the use of Independent Learning

INDEPENDENT LEARNING					
Scores	**Descriptions**	**Pretest**		**Posttest**	
		F	***(%)***	***F***	***(%)***
41 – 50	Mastered	0	0.00	0	0.00
31 – 40	Moving Towards Mastery	0	0.00	2	5.00

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

21 – 30	Average Mastery	0	0.00	6	15.00
11 – 20	Low Mastery	30	75.00	27	67.50
1 – 10	Very Low Mastery	10	25.00	5	12.50
Total		**40**	**100.00**	**40**	**100.00**
Mean		**12.25**		**16.43**	
SD		**2.29**		**6.13**	
Description		**Low Mastery**		**Low Mastery**	

2. What is the 8th graders' pretest and posttest score performance from the use of Cooperative Learning?

Table 4
General Table for the PRETEST and POSTTEST of Grade 8 Students from the use of Cooperative Learning

COOPERATIVE LEARNING					
Scores	**Descriptions**	**Pretest**		**Posttest**	
		F	***(%)***	***F***	***(%)***
41 – 50	Mastered	0	0.00	1	2.50
31 – 40	Moving Towards Mastery	0	0.00	6	15.00
21 – 30	Average Mastery	0	0.00	17	42.50
11 – 20	Low Mastery	35	87.50	15	37.50
1 – 10	Very Low Mastery	5	12.50	1	2.50
Total		**40**	**100.00**	**40**	**100.00**
Mean		**12.82**		**23.60**	
SD		**1.76**		**6.94**	
Description		**Low Mastery**		**Average Mastery**	

3. Is there significant difference between the Independent Learning and Cooperative Learning pretest scores?

Table 5

Test of Significant Difference between the Independent Learning and Cooperative Learning PRETEST SCORES

Group	Pretest Mean	p-value	*α*	Decision	Description
Independent Learning	12.25	0.213	0.05	Accept Ho	Not Significant
Cooperative Learning	12.83				

**Significant if p-value is lesser than the level of significance at 0.05*

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

4. Is there significant difference between the Independent Learning and Cooperative Learning posttest scores?

Table 6
Test of Significant Difference between the Independent Learning and Cooperative Learning POSTTEST SCORES

Group	Posttest Mean	p-value	α	Decision	Description
Independent Learning	16.43	0.000* (5.19E-06)	0.05	Reject Ho	Significant
Cooperative Learning	23.60				

**Significant if p-value is lesser than the level of significance at 0.05*

5. Is there significant difference between the pretest and posttest scores from Independent and Cooperative Learning?

Table 7
Test of Significant Difference between the PRETEST and POSTTEST scores from Independent and Cooperative Learning

Group	Pretest Mean	Posttest Mean	p-value	α	Decision	Description
Independent Learning	12.25	16.43	0.000*	0.05	Reject Ho	Significant
Cooperative Learning	12.83	23.60	0.000* (2.7621E-12)		Reject Ho	Significant

**Significant if p-value is lesser than the level of significance at 0.05*

6. What are the score gains of Grade 8 Students from the use of Independent Learning?

Table 8
Score Gains in the Independent Learning Group

STUDENTS	PRETEST	POSTTEST	SCORE GAINS
1	15	9	**-6**
2	14	10	**-4**
3	10	8	**-2**
4	15	13	**-2**
5	15	17	**2**

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal
of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

6	14	12	**-2**
7	14	21	**7**
8	14	13	**-1**
9	10	11	**1**
10	7	13	**6**
11	15	21	**6**
12	15	18	**3**
13	13	11	**-2**
14	12	17	**5**
15	12	13	**1**
16	11	15	**4**
17	15	13	**-2**
18	13	17	**4**
19	13	14	**1**
20	9	12	**3**
21	7	21	**14**
22	13	10	**-3**
23	15	29	**14**
24	10	29	**19**
25	13	13	**0**
26	13	17	**4**
27	12	31	**19**
28	7	17	**10**
29	10	17	**7**
30	13	20	**7**
31	13	8	**-5**
32	14	17	**3**
33	13	25	**12**
34	11	12	**1**
35	14	13	**-1**
36	13	19	**6**
37	12	19	**7**
38	11	16	**5**
39	10	13	**3**
40	10	33	**23**
			4.18

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal
of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

7. What are the score gains of Grade 8 Students from the use of Cooperative Learning

Table 9
Score Gains in the Cooperative Learning Group

STUDENTS	PRETEST	POSTTEST	SCORE GAINS
1	13	28	15
2	12	20	8
3	11	29	18
4	10	31	21
5	8	25	17
6	15	30	15
7	15	41	26
8	14	18	4
9	14	19	5
10	14	32	18
11	13	21	8
12	13	31	18
13	13	17	4
14	10	10	0
15	13	40	27
16	14	27	13
17	14	26	12
18	13	22	9
19	12	24	12
20	13	20	7
21	13	13	0
22	12	16	4
23	15	26	11
24	15	20	5
25	15	26	11
26	14	19	5
27	14	23	9
28	14	23	9
29	14	17	3
30	8	16	8
31	14	18	4
32	14	17	3
33	13	31	18
34	13	26	13
35	13	36	23
36	10	25	15
37	13	19	6

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

38	13	23	10
39	11	15	4
40	11	24	13
			10.78

Discussion

The pretest results of the **independent learning group** showed that students had a low level of mastery in factoring polynomials before the implementation of the 5E instructional model. Out of 40 students, 75% scored between 11–20 (low mastery) and 25% scored between 1–10 (very low mastery). The mean score was 12.25 with a standard deviation of 2.29, indicating that most students performed similarly and had limited prior knowledge of factoring polynomials. Students particularly struggled with factoring common monomials, difference of two squares, sum and difference of two cubes, perfect square trinomials, general quadratic trinomials, and word problems involving factoring.

After the implementation of the 5E learning approach, students showed improvement in the posttest. The mean score increased to 16.42, although it still fell within the low mastery category. The posttest results showed that 12.5% of students remained at very low mastery, 67.5% were at low mastery, 15% reached average mastery, and 5% progressed toward mastery. The standard deviation increased to 6.13, indicating greater variation in student performance.

Analysis of specific skills revealed that several competencies improved from very low or low mastery to average mastery, including factoring polynomials into simpler factors, factoring perfect square trinomials, finding cube roots of monomials, factoring certain quadratic trinomials, and evaluating factoring solutions. However, students continued to struggle with skills such as identifying the greatest common factor, factoring using common monomial factors, recognizing and factoring differences of two squares and cubes, identifying perfect cubes, and solving more complex factoring tasks.

The pretest results of the **cooperative learning group** revealed that students had a **low level of mastery in factoring polynomials** before the implementation of the 5E learning model. Among the 40 students, **35 students (87.5%)** scored between **11–20**, indicating **low mastery**, while **5 students (12.5%)** scored between **1–10**, indicating **very low mastery**. The mean score was **12.82** with a standard deviation of **1.76**, showing that students had similar levels of performance and limited prior knowledge of factoring polynomials.

Analysis of specific skills showed that students demonstrated **low mastery** in determining the greatest common factor, multiplying monomials and binomials, factoring common monomial factors, factoring difference of two squares, factoring perfect square trinomials, factoring general trinomials, and solving word problems involving factoring. They also showed **very low mastery** in more complex skills such as expressing polynomials as products of simpler factors, identifying perfect squares, finding square and cube roots, factoring difference of two cubes, verifying factoring solutions, and solving area-related applications. Overall, most students performed at the

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

very low and low mastery levels, mainly because they had not yet studied factoring polynomials.

Following the implementation of the **5E instructional model**, the cooperative learning group showed **substantial improvement** in the posttest. Only **1 student (2.5%)** remained in the very low mastery level, while **15 students (37.5%)** were classified under low mastery. In contrast, **17 students (42.5%)** reached the average mastery level, **6 students (15%)** progressed toward mastery, and **1 student (2.5%)** achieved the mastered level. The mean score increased significantly to **23.60**, corresponding to **average mastery**, while the standard deviation of **6.94** indicated a wider range of student performance.

The results further showed that several skills improved from **low mastery to moving toward mastery**, including evaluating factoring solutions involving difference of two squares, factoring perfect square trinomials, expressing perfect square trinomials in factored form, and factoring general trinomials with coefficients of both **A = 1** and **A > 1**. Notably, the skill of **factoring binomials that are differences of two squares** improved from low mastery to **mastered level**, indicating that students successfully learned and applied this factoring technique. Students also mastered finding the **greatest common factor (GCF) of two whole numbers** after the intervention.

Despite these improvements, some skills remained at the same mastery level, particularly verifying factoring using common monomial factors, identifying perfect cubes, factoring difference of two cubes, evaluating squared binomial expansions, and determining missing factors in trinomials. A few skills remained at the **very low mastery level**, such as analyzing the correctness of factoring solutions and determining missing terms that make a trinomial a perfect square. These findings suggest that while students learned factoring procedures, some still struggled with higher-order reasoning, error analysis, and pattern recognition.

Table 5 shows that the independent learning group had a mean pretest score of 12.25, while the cooperative learning group had a mean score of 12.83, indicating that both groups performed at a similar level before the implementation of the 5E instructional model. Statistical analysis revealed a p-value of 0.213, which is greater than the 0.05 significance level. Therefore, the null hypothesis was accepted, indicating that there was no significant difference between the pretest scores of the two groups.

The findings suggest that both groups had not yet mastered the skills in factoring polynomials prior to the intervention. Many students reported difficulty answering the pretest because factoring polynomials had not yet been taught, while others were only slightly familiar with some concepts but lacked adequate understanding. Some students also noted that time constraints prevented them from completing all items, resulting in guesses for several questions. The highest score obtained in both groups was 15, further demonstrating their comparable level of performance.

In terms of specific skills, the independent learning group showed 24 skills at low mastery and 22 skills at very low mastery, while the cooperative learning group demonstrated 27 skills at low

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

mastery and 19 skills at very low mastery. Overall, both groups exhibited similar deficiencies in factoring polynomial skills before the implementation of the 5E learning approach.

These results support the findings of Puertollano (2024), who reported no significant difference between control and experimental groups during the pretest phase of a study on improving students' factoring polynomial skills. Similarly, the present study confirms that both the independent and cooperative learning groups started at a comparable level before the implementation of the 5E learning model**.**

Table 6 shows that after the implementation of the 5E instructional model, the cooperative learning group achieved a higher mean posttest score (23.60) than the independent learning group (16.43). The statistical analysis yielded a p-value of 0.000, which is lower than the 0.05 significance level. Therefore, the null hypothesis was rejected, indicating a significant difference between the posttest performances of the two groups.

The cooperative learning group demonstrated stronger mastery of factoring polynomial skills, with 20 skills at the average mastery level, 8 skills moving toward mastery, and 2 skills at the mastered level. In contrast, the independent learning group achieved only average mastery across 20 skills. These findings suggest that cooperative learning was more effective in improving students' understanding and performance in factoring polynomials.

The researcher observed that students in both groups participated in lessons, listened attentively, and took notes during discussions. However, students in the cooperative learning group benefited from collaboration, idea-sharing, peer support, and group review sessions, which helped them solve problems more effectively and develop critical-thinking skills. Group leaders also promoted active participation by assigning responsibilities to members. Meanwhile, students in the independent learning group relied primarily on worksheets and individual study, though some sought assistance from classmates when they encountered difficulties.

Despite the improvements, students in both groups continued to experience challenges with word problems and factoring general trinomials, particularly in identifying appropriate factor pairs and determining correct signs. However, they showed better understanding of factoring common monomial factors, difference of two squares, sum and difference of two cubes, perfect square trinomials, identifying factoring methods, and verifying factored polynomials.

Overall, the results indicate that the 5E instructional model improved students' factoring polynomial skills, but it was more effective when combined with cooperative learning than with independent learning. These findings support previous research, including Tinambacan (2022), which found that students taught through enhanced instructional strategies achieved significantly higher posttest performance than those taught using more traditional or independent learning approaches.

Table 7 reveals that the pretest mean scores of the independent learning and cooperative learning groups were 12.25 and 12.83, respectively, indicating that both groups had similar levels of performance before the implementation of the 5E instructional model. After the intervention, the

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

posttest mean scores increased to 16.43 for the independent learning group and 23.60 for the cooperative learning group. Since the p-value (0.000) was lower than the 0.05 significance level, the null hypothesis was rejected, indicating a significant difference between the posttest performances of the two groups.

The findings imply that the 5E instructional model was more effective when used with cooperative learning than with independent learning. While both groups started with comparable knowledge and skills in factoring polynomials, students in the cooperative learning group showed substantially greater improvement. Many students progressed from very low and low mastery levels to average mastery, moving toward mastery, and mastered levels. In contrast, students in the independent learning group showed only moderate improvement, with most moving from very low and low mastery to average mastery.

The researcher observed that cooperative learning promoted active participation, collaboration, and peer support. Students discussed problem-solving strategies, shared ideas, assigned group responsibilities, verified answers with group leaders, and learned alternative methods of factoring polynomials. Group leaders provided guidance, corrected errors, and offered additional explanations, which strengthened students' understanding. These collaborative activities contributed significantly to the group's higher achievement.

In the independent learning group, students also demonstrated engagement by asking questions, requesting additional examples, and completing individual activities. Some students sought help from classmates who had stronger mathematical abilities. Although improvements were evident, many students continued to struggle with factoring polynomial expressions, resulting in less substantial gains compared to the cooperative learning group.

Table 8 shows the learning gains of the **independent learning group** after the implementation of the **5E instructional model**. Out of 40 students, **28 students (70%) improved their posttest scores**, **11 students (27.5%) performed worse on the posttest**, and 1 student (2.5%) obtained the same score in both the pretest and posttest. The group achieved a **learning gain of 4.18 points**, indicating a positive increase in students' performance in factoring polynomials.

Table 9 shows that among the 40 students in the cooperative learning group, 38 students (95%) answered all posttest questions correctly, while only 2 students (5%) maintained the same scores in both the pretest and posttest. The group achieved a learning gain of 10.78, indicating that the implementation of the 5E instructional model in cooperative learning effectively enhanced students' factoring polynomials skills. Overall, the results demonstrate that the majority of students showed significant improvement after the intervention.

Conclusion

Based on the findings of the study, the following conclusions were drawn.

1. The Grade 8 students from the independent learning group did not demonstrate mastery of the concepts in factoring polynomials before and after the implementation of the 5E's.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 7 (2026)

2. After the implementation of the 5E's, the Grade 8 students from the cooperative learning group showed an increase in their performance in factoring polynomials.

3. Before implementing the 5E's in teaching factoring polynomials, the performance of the Grade 8 students in both groups were statistically similar.

4. After implementing the 5E's in teaching factoring polynomials, the cooperative learning group performed better than the independent learning group during the posttest.

5. There was a significant difference in the performance of the students from the independent group between the pretest and posttest scores. Likewise, a significant difference was observed between the pretest and posttest scores of the cooperative group.

6. From the learning gains of the two groups, the use of 5E's was more effective in teaching factoring polynomial using cooperative learning.

Recommendations

Based from the findings and conclusions, the following recommendations are offered:

1. The math teacher should always provide more examples of factoring polynomials and seatwork ranging from easy to average levels for independent learners so that they can have more practice in solving factoring polynomials.

2. The math teacher should review and improve the lessons, especially on factoring polynomials, so that students in the independent learning group can keep up. The lessons should also match the students' level, not just the teachers.
3. The math teacher should use the cooperative learning strategy consistently, not just during observations, so that the "challenger" learners are supported by the advanced learners and everyone can share their ideas, especially in lessons on factoring polynomials.

4. The School Division Office should provide training/ seminars for math 8 teachers about the 'CONTENT MASTERY" so that teacher can master more know beyond his/her lesson topic in "factoring polynomials".

5. Future researchers may conduct a similar study in other schools or divisions to further validate the effectiveness of the 5E's in teaching factoring polynomials.

References

Abramczyk, A., & Jurkowski, S. (2020). Cooperative learning as an evidence-based teaching strategy: What teachers know, believe, and how they use it *Journal of Education for Teaching*, *46*(3), 296-308.

Bandala, M. P. THE IMPACT OF VEDIC MATHEMATICS TECHNIQUES (VMT) ON STUDENTS'PERFORMANCE IN FACTORING POLYNOMIALS.

Baquiller, G. E., & Abellon Jr, W. (2021, October). **TEACHERS PROBLEMS IN TEACHING MATHEMATICS USING MOTHER TONGUE IN A DISTRICT OF THE PHILIPPINES**. In *Proceedings of the International Conference on Education* (Vol. 7, No. 1, pp. 430-436).

Cabuquin, J. C., & Abocejo, F. T. (2023). Mathematics learners' performance and academic achievement at a public high school institution in Leyte, Philippines. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *13*(2).

Casinillo, L. F., (2022). How challenging it is to learn mathematics online. *Philippine Social Science Journal*, *5*(1), 80-89.

Chand, S., Chaudhary, K., Prasad, A., & Chand, V. (2021). Perceived causes of students' poor performance in mathematics: A case study at Ba and Tavua secondary schools. *Frontiers in Applied Mathematics and Statistics*, *7*, 614408.

Dagoc, D., & Tan, D. A. (2018). Effects of metacognitive scaffolding on the mathematics performance of grade 6 pupils in a cooperative learning environment. *International Journal of English and Education*, *7*(4), 378-391.

Ekamornaroon, T., Ngiamsunthorn, P. S., Phaksunchai, M., & Chonchaiya, R. (2024). Identifying common errors in polynomials of eighth grade students. *Int J Eval & Res Educ*, *13*(1), 57-68.

Ferguson-Patrick, K. (2020). Cooperative learning in Swedish classrooms: Engagement and relationships as a focus for culturally diverse students. *Education Sciences*, *10*(11), 312.

In'am, A., & Sutrisno, E. S. (2021). Strengthening Students' Self-Efficacy and Motivation in Learning Mathematics through the Cooperative Learning Model. *International Journal of Instruction*, *14*(1), 395-410.

Lu, X. (2022). The Application of Scaffolding in Junior School Teaching: Taking a Math Class as an Example. *Highlights in Business, Economics and Management*, *4*, 342-349.

Malia. (2024, October 11). *Teaching students how to factor polynomials*. Math With Ms. Rivera. https://maliarivera.com/teaching-students-how-to-factor-polynomials.

Peteros, E., Gamboa, A., & Arcadio, R. (2019). Factors affecting mathematics performance of junior high school students. *International Electronic Journal of Mathematics Education*, *15*(1), em0556.

Petre, G. E. (2022). Transferring cooperative learning strategies from initial teacher training to the classroom. In *INTED2022 Proceedings* (pp. 4475-4484). IATED.