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Timed Practice Drill as a Means of Improving the Learners' Mastery Level of the Operations of Integers in Sagpat High School

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***Abstract*: This study aimed to determine the effect of the timed practice drill in teaching integer operations to the learners from grades 7 through 10 at Sagpat High School. The study utilized the one-group pretest-posttest design, a type of quasi-experiment under experimental research design. The one hundred nineteen junior high school learners of Sagpat High School served as the study's subjects. The study revealed that, when assessed before the implementation of the timed practice drill, the learners in grades 7 through 10 did not achieve minimum proficiency level, or MPL, in integer operations. But when assessed after the implementation of the timed practice drill, the learners in grades 7 through 10 achieved or exceeded the minimum proficiency level, or MPL, in the areas of addition, multiplication, and division, moving from "Did not achieve minimum proficiency level" to "Exceeded the minimum proficiency level. In integer subtraction, learners in grade 9 didn't meet the standard of achieving or exceeding the minimum proficiency level. In terms of mean score, the performance of learners in grades 7, 8, 9, and 10 has improved. The test scores of Grades 7–10 learners in addition, subtraction, multiplication, and division of integers differ significantly before and after the implementation of the timed practice drill. To attain a proficiency rate of at least 60 percent in the subtraction of integers, a mathematics program was proposed based on the findings of the study. Based on the summary and conclusions arrived at, the researcher recommended the use of timed practice drill in classroom mathematics teaching across all grade levels for improved academic achievement.**

***Keywords*: Integers, mastery level, operations of integers, timed practice drill.**

1. Introduction

Algebra is a subfield of mathematics. To be able to master this, one must be well-versed in the fundamentals of pre-algebra; otherwise, their ability to learn higher math will suffer. Prior to entering further into algebra, you need to become proficient in a few core concepts. There's a spiral effect in mathematics. Every new ability relies on previous knowledge. One of the topics under pre-algebra is the integers and their operation. Some competencies in Most Essential Learning Competencies (MELCS) in Mathematics from Grade 7 to Grade 10 require basic skills in integers and their operation, such as adding and subtracting polynomials, factoring completely different types of polynomials, solving quadratic equations, and illustrating arithmetic and geometric sequences. To be able to meet these competencies punctually, the students should have mastery of integers and their operation.

A drill and practice session with time constraints is a timed practice drill. It strictly followed the time limits for such drills. According to Lesaca and Falle (2021), timed drills are also an important factor in developing proficiency. Timing will also boost the learners' time competence. Students will benefit from procedural proficiency in operations with integers as they progress to more abstract algebra concepts; otherwise, poor performance will result and find other mathematics ideas difficult and irritating (Palisoc, Ruga, & Monserrat, 2019).

As simple as it may appear, dealing with integers and performing their four basic operations has been one of the Waterloos of Math students. It was discovered that if this basic skill is not thoroughly understood and mastered, it has a significant impact on their performance (Resare, 2019). This is concerning because the K-12 curriculum considers this a prerequisite for learning other algebraic skills at higher levels (Armayan, 2019). Based on the researcher's own experience, the following study will investigate how timed practice drill might raise learners' proficiency levels in integer operations.

2. Guidelines

This study aimed to determine the effect of the timed practice drill in teaching integer operations to the learners from grades 7 through 10 at Sagpat High School.

Specifically, it seeks to answer the following questions:

1. What are the test scores of learners in the operation of integers before the implementation of the timed practice drill as to:
   1.1. Addition
   1.2. Subtraction
   1.3. Multiplication
   1.4. Division?
2. What are the test scores of learners in the operation of integers after the Implementation of the Timed Practice Drill as to:

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2.1. Addition
2.2. Subtraction
2.3. Multiplication
2.4. Division?

3. What are the test scores of learners in the operation of integers before and after the Implementation of the Timed Practice Drill as to:
3.1. Addition
3.2. Subtraction
3.3. Multiplication
3.4. Division?
4. Is there a significant difference in the test scores of the learners in the operation of integers before and after the Implementation of the Timed Practice Drill as to:
4.1. Addition
4.2. Subtraction
4.3. Multiplication
4.4. Division?
5. What Mathematics program may be proposed based on the findings of the study?

3. Methods

A. Research Design

The study utilized the one-group pretest-posttest design, a type of quasi-experiment under experimental research design. The one-group pretest-posttest design is a type of quasi-experiment in which a non-random set of participants is subjected to a particular intervention two times, with the purpose of measuring the desired outcome each time (Choueiry, 2021). The pre-test and post-test were used to measure how the use of the timed practice drill affects the mastery level of the grade 7–10 learners in the operation of integers. The quantitative analysis was used to determine the difference between the pre-test and post-test means.

B. Respondents and Location

The junior high school learners of Sagpat High School in Sitio Sagpat, Maloma, San Felipe, Zambales served as the study's subjects. The study's participants included 119 junior high schools, composed of 32 from grade 7, 31 from grade 8 and 10, and 25 from grade 9 during the school year 2022-2023.

C. Instrument

The research instrument in this study was the Timed Practice Drill, which included five sets of flashcards as an intervention in integer operations. The junior high school learners at Sagpat High School took a pre-test and post-test to assess their level of mastery before and after the intervention, which involved implementing a 5-minute timed practice drill. The teacher-researcher developed the material for the pre-test, post-test, and flashcards.

There were five sets of flashcards, each of which contained 30 consecutive flashcards with integer operation problems. Each set contained seven addition problems, seven subtraction problems, seven multiplication problems, and seven division problems, as well as one piece with an addition problem and subtraction problem on one side and a multiplication problem and a division problem on the other, for a total of 60 problems on integer operations in each set. Sets A through C of flashcards were displayed by the teacher-researcher, while Sets D and E of flashcards were placed in the wall pocket. No names or other personal information were recorded, and neither were the parents' permissions requested, as the treatment was also a part of the curriculum. The option to forego collecting personal descriptive data is likely to boost participation and reduce refusal out of guilt or embarrassment (Lesaca & Falle, 2019).

Each grade level received a 5-minute pre-test on the first day of the first week of the second quarter of the academic year 2022–2023. This was followed by a 5-minute timed practice drill, which was administered from the second to the twenty-fourth day. Learners used a blank answer sheet produced by the teacher-researcher during the 5-minute timed practice drill to record their responses. Each integer operation question presented by the teacher has a time limit of exactly five (5) seconds. After the 5-minute timed practice drill was completed, learners received instant feedback with the correct response, enabling them to monitor their development ((Lesaca & Falle, 2019). On the 25th day of the fifth week, the post-test was given.

D. Data Collection

The researcher requested permission from the Schools Division Superintendent via the District Supervisor and School Head to administer the pre-test and post-test questionnaire as a data collection tool, as well as the administration of 5-minute Timed Practice and Drill in mathematics subjects per grade level. Learners in grades 7 through 10 took a pre-test on the first day as part of the study's first phase. On the second to twenty fourth day was on implementing an intervention, which was a 5-minute Timed Practice Drill in integer operation. Each grade level received different sets of flashcards in each week. Learners used a blank answer sheet produced by the teacher-researcher during the 5-minute timed practice drill to record their responses. Each integer operation question presented by the teacher has a time limit of exactly five (5) seconds. Then learners received instant feedback with the correct response, enabling them to monitor their development (Lesaca, 2019).

On the first week or second(2nd) day to fifth(5th) day, grade 7 received the set B, flashcards, set C for grade 8, set D for grade 9, and set A for grade 10. On the second week or sixth (6th) day to tenth (10th) day, grade 7 received the set C, flashcards, set D for grade 8, set E for grade 9, and set B for grade 10. On the third week or sixth (11th) day to fifteenth (15th) day, grade 7 received the set D, flashcards, set E for grade 8, set A for grade 9, and set C for grade 10. On the fourth week or sixteenth (16th) day to twentieth (20th) day, grade 7 received the set E flashcards, set A for grade 8, set B for grade 9, and set D for grade 10. On the fifth week or twenty first (21st) day to twenty fourth (24th) day, grade 7 received the set A flashcard, set B for grade 8, set C for grade 9, and set E for grade 10. On the 25th day of the fifth week, the post-test was given to ascertain any changes in their scores. The data collected from the pre-test and post-test scores were checked, compared, tallied, presented, analyzed using SPSS, and interpreted.

E. Data Analysis

All the data gathered from the pre-test and post-test scores were tallied, tabulated, analyzed, and interpreted. The data were processed as follows.

1) Mean. This was used to determine the mean scores of both the pre-test and post-test scores of Grades 7–10 Junior High School learners in the operation of integers before and after the implementation of the 5-minute Timed Practice Drill.
2) Standard Deviation. This was used to measure how much variation such as spread from the mean exists.
3) Likert Scale. This was used as a guide in determining the qualitative interpretation of both the pre-test and post-test scores before and after the conduct of the Timed Practice Drill in the operation of integers.

4. Result and Discussion

Table 2 displays the test scores of learners in addition of integers before and after the implementation of the timed practice drill. When compared to scores obtained before the implementation of the timed practice drill for integer addition, the table showed that most learners from grades 7 through 10 "Exceeded the Minimum Proficiency Level," which ranged from 8 to 12, while the number of learners in grades 7 through 10 who "didn't achieve the Minimum Proficiency Level" decreased after the timed practice drill's implementation. Also, it shows that when comparing before and after the implementation of the timed practice drill, the mean score for grades 7 through 10 improved, moving from "Did not achieve minimum proficiency level" to "Exceeded the minimum proficiency level." It indicates that learners now have a better understanding of integer addition.

Table 3 displays the test scores of learners in subtraction of integers before and after the implementation of the timed practice drill. The table shows that the majority of the 7th to 10th grade learners who scored 8 to 12 increased after the implementation of timed practice drills. While the number of learners who achieved 0–7 decreased before the implementation of timed practice drills, it also shows that the mean score of grades 7–10 after the implementation of the timed practice drill increased when compared before the implementation of the timed practice drill in subtraction. Based on the results, it appears that the performance of the learners in the subtraction of integers has improved. It's just that learners in grades 7, 8, and 10 didn't meet the standard of achieving or exceeding the minimum proficiency level.

Table 4 displays the test scores of learners in multiplication of integers before and after the implementation of the timed practice drill. The table shows that most of the 7th to 10th grade learners "exceeded the minimum proficiency level," which ranged from 8 to 12 scores, when compared to the scores before the implementation of the timed practice drill in multiplication of integers, while the learners from grades 7 to 10 who "didn't achieve the minimum proficiency level" decreased in number after the implementation of the timed practice. It also shows that the mean score of learners in grades 7 to 10 increased after the implementation of the timed practice drill when compared to

Table 1
Level of pre-test and post-test performance

Raw Scores	**Percentage Score (%)**	**Raw Scores**	**Percentage Score (%)**	**Description**
Addition and Subtraction		Multiplication and Division		
8-13	62 – 100	8-12	67- 100	Achieved or Exceed Minimum Proficiency Level (MPL)
0-7	0-54	0-7	0 - 54	Did not Achieve Minimum Proficiency Level (MPL)

Table 2
Summary of test scores of learners in addition of integers before and after the implementation of the timed practice drill

Raw Scores	**Grade 7**		**Grade 8**		**Grade 9**		**Grade 10**	
	Before (f)	**After (f)**	**Before (f)**	**After (f)**	**Before (f)**	**After (f)**	**Before (f)**	**After (f)**
8-12	0	21	4	21	1	17	5	23
0-7	32	11	27	10	24	8	26	8
Total	32	32	31	31	25	25	31	31
Mean	**1.59**	**8.81**	**3.42**	**9.32**	**2.96**	**8.88**	**5.03**	**9.48**
SD	**1.757**	**3.514**	**3.264**	**3.321**	**2.150**	**3.087**	**3.220**	**3.086**
I	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**

Legend: SD-Standard Deviation; I-Interpretation; DNAMPL Did not achieve minimum proficiency level; EMPL - Exceeded minimum proficiency level.

Table 3
Summary of test scores of learners in subtraction of integers before and after the implementation of the timed practice drill

Raw Scores	**Grade 7**		**Grade 8**		**Grade 9**		**Grade 10**	
	Before (f)	**After (f)**	**Before (f)**	**After (f)**	**Before (f)**	**After (f)**	**Before (f)**	**After (f)**
8-12	0	17	1	15	1	13	0	15
0-7	32	15	30	16	24	12	31	16
Total	32	32	31	31	25	25	31	31
Mean	**1.59**	**7.62**	**2.10**	**7.74**	**1.68**	**7.84**	**2.74**	**7.52**
SD	**1.411**	**3.240**	**1.989**	**3.697**	**1.282**	**3.625**	**1.825**	**3.705**
I	**DNAMPL**	**DNAMPL**	**DNAMPL**	**DNAMPL**	**DNAMPL**	**AMPL**	**DNAMPL**	**DNAMPL**

Legend: SD-Standard Deviation; I-Interpretation; DNAMPL Did not achieve minimum proficiency level; EMPL - Exceeded minimum proficiency level.

Table 4
Summary of test scores of learners in multiplication of integers before and after the implementation of the timed practice drill

Raw Scores	Grade 7		Grade 8		Grade 9		Grade 10	
	Before (f)	After (f)	Before (f)	After (f)	Before (f)	After (f)	Before (f)	After (f)
8-12	4	17	3	22	1	21	0	21
0-7	28	15	28	9	24	4	26	10
Total	32	32	31	31	25	25	31	31
Mean	**2.78**	**8.19**	**3.68**	**9.23**	**2.76**	**10.12**	**3.00**	**9.03**
SD	**3.462**	**2.978**	**3.004**	**2.680**	**2.454**	**2.538**	**2.408**	**2.639**
I	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**

Legend: SD-Standard Deviation; I-Interpretation; DNAMPL Did not achieve minimum proficiency level; EMPL - Exceeded minimum proficiency level.

Table 5
Summary of test scores of learners in division of integers before and after the implementation of the timed practice drill

Raw Scores	Grade 7		Grade 8		Grade 9		Grade 10	
	Before (f)	After (f)	Before (f)	After (f)	Before (f)	After (f)	Before (f)	After (f)
8-12	4	20	5	20	0	23	1	22
0-7	28	12	26	11	25	2	30	9
Total	32	32	31	31	25	25	31	31
Mean	**2.84**	**8.56**	**3.13**	**8.32**	**1.96**	**10.24**	**2.32**	**9.29**
SD	**3.371**	**2.590**	**2.986**	**3.885**	**2.091**	**2.067**	**2.242**	**2.935**
I	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**	**DNAMPL**	**EMPL**

Legend: SD-Standard Deviation; I-Interpretation; DNAMPL Did not achieve minimum proficiency level; EMPL - Exceeded minimum proficiency level.

Table 6
Summary on test of differences in multiplication of integers before and after the implementation of the timed practice drill

Integer Operations	Mean Score						
	Before	After	t	df	p	Decision	Cohen's d
Addition	3.25	9.13	18.955				1.74
Subtraction	2.04	7.67	18.449				1.69
Multiplication	3.07	9.08	21.941			Reject the null hypothesis	2.01
Division	2.60	9.04	22.128	118	.000		2.03

Table 7
Proposed mathematics program

KEY AREA	OBJECTIVE/S	SPECIFIC ACTIVITIES & OUTPUTS	Person(s) Involved	Time Frame	Proposed Budget	Success Indicator
Attain a minimum proficiency level of at least 60% in integer subtraction among learners.	1. Improve accuracy and mastery in performing the subtraction of positive integers. 2. Perform the subtraction of integers with accuracy and proficiency. integers before the lesson	1. Conduct a drill on subtraction of positive integers using flashcards before starting the lesson. 2. Re-teach the rules for subtraction of integers during Independent/ Cooperative Learning (ICL) time in math subjects. 3. Conduct atimed practice drill on the subtraction of	School Head, Math teachers, Grades 7-10 learners	February - April 2023	Php 500.00	Attained a minimum proficiency level of at least 60% in integer subtraction among learners.

before, with an equivalent interpretation of "did not achieve the minimum proficiency level" to "exceeded the minimum proficiency level." It shows that the mastery of the learners in the multiplication of integers has improved.

Table 5 displays the test scores of learners in division of integers before and after the implementation of the timed practice drill. The results showed that most learners in grades 7 through 10 "Exceeded the Minimum Proficiency Level," which ranged from 8 to 12, when compared to scores obtained prior to the implementation of the timed practice drill for integer division. In contrast, the number of students in grades 7 through 10 who "didn't achieve the Minimum Proficiency Level" decreased following the implementation of the timed practice drill. We can infer that students now have a better understanding of integer division from the fact that, when comparing before and after the implementation of the timed practice drill, the mean score for grades 7 through 10 improved, moving from "Did not achieve minimum proficiency level" to "Exceeded the minimum proficiency level."

Table 6 shows that the average test scores in addition of integers after timed practice drill implementation (M = 9.13) are significantly higher than the average test scores before timed practice drill implementation (M = 3.25), the computed t-value is 18.955, the degree of freedom is 118, and the p-value is.000. Based on the data, the computed p-value of.000 is less than the 0.05 alpha level of significance, indicating that the null hypothesis is rejected and there is a significant difference. The test scores of Grades 7–10 students in the addition of integers differ significantly before and after the implementation of the timed practice drill. Based on Cohen's d value of 1.74, it

indicates that the effect of the timed practice drill in teaching integer addition is large because the value is higher than 0.80. subsection. Once you paste it, change the subsection heading asper your requirement.

In subtraction of integers, shows that the average test scores after timed practice drill implementation (M = 7.67) are significantly higher than the average test scores before timed practice drill implementation (M = 2.04), the computed t-value is 18.449, the degree of freedom is 118, and the p-value is .000. Based on the data, the computed p-value of .000 is less than the 0.05 alpha level of significance, indicating that the null hypothesis is rejected and there is a significant difference. The test scores of Grades 7–10 students in the subtraction of integers differ significantly before and after the implementation of the timed practice drill. Based on Cohen's d value of 1.69, it denotes that the effect of the timed practice drill in teaching integer subtraction is large because the value is higher than 0.80.

The average test scores in multiplication of integers after timed practice drill implementation (M = 9.08) are significantly higher than the average test scores before timed practice drill implementation (M = 3.07), the computed t-value is 21.941, the degree of freedom is 118, and the p-value is .000. Based on the data, the computed p-value of .000 is less than the 0.05 alpha level of significance, indicating that the null hypothesis is rejected and there is a significant difference. The test scores of Grades 7–10 students in the multiplication of integers differ significantly before and after the implementation of the timed practice drill. Based on Cohen's d value of 2.01, the timed practice drill has a large impact on teaching integer multiplication because the value is greater than 0.80.

Whereas, in the division of integers, the average test scores after timed practice drill implementation (M = 9.04) are significantly higher than the average test scores before timed practice drill implementation (M = 2.60), the computed t-value is 22.128, the degree of freedom is 118, and the p-value is .000. Based on the data, the computed p-value of .000 is less than the 0.05 alpha level of significance, indicating that the null hypothesis is rejected and there is a significant difference. The test scores of Grades 7–10 students in the division of integers differ significantly before and after the implementation of the timed practice drill. Based on Cohen's d value of 2.03, it implies that the effect of the timed practice drill in teaching integer division is large because the value is higher than 0.80.

The current study's findings are consistent with Viduy's (2019) study, which found that using a five-minute flashcard drill to improve student's knowledge of the competency beneficial. As she mentioned, consistent practice of the fundamental principles will lead to a complete understanding of the skill. Math teachers should remember to go back to the basics if students are having difficulty grasping the current competency. Rathakrishnan, Raman, Haniffa, Mariamdaran, and Haron, (2018) revealed that choosing or utilizing effective teaching strategies in the instructional process to achieve quality learning proves that drilling and training methods are effective in teaching and learning among lower secondary students. On the other hand, the use of Timed Practice Drill intervention in mathematics teaching throughout all years and grade levels to improve academic achievement strongly advocated (Lesaca & Falle, 2021).

5. Conclusion

Based on the findings of the investigations, the researcher concluded that the learners in grades 7 through 10 did not achieve minimum proficiency level, or MPL, in the areas of integer addition, subtraction, multiplication, and division when assessed before the implementation of the timed practice drill. The learners in grades 7 through 10 achieved or exceeded the minimum proficiency level, or MPL, in the areas of addition, multiplication, and division when they were assessed after the implementation of the timed practice drill. In terms of integer subtraction, learners in grade 9 achieved the minimum proficiency level, while those in grades 7, 8, and 10 improved their performance; it's just that they didn't meet the standard of achieving or exceeding the minimum proficiency level. For integer addition, multiplication, and division, the performance of learners in grades 7 through 10 improved when compared to scores obtained before and after the implementation of the timed practice drill, moving from "Did not achieve minimum proficiency level" to "Exceeded the minimum proficiency level." For integer subtraction, learners in grades 9 achieved the minimum proficiency level, or MPL, when compared before the implementation of timed practice drills. While the performance of learners in grades 7, 8, and 10 has improved. Simply put, they did not meet the requirement of achieving or exceeding the minimal proficiency level. The test scores of Grades 7–10 learners in addition, subtraction, multiplication, and division of integers differ significantly before and after the implementation of the timed practice drill. A mathematics program based on the findings of the study was proposed to attain a proficiency rate of at least 60 percent in the subtraction of integers.

The suggested program or plan to help the learners' mastery of integer operation is shown in Table 7. For the learners who didn't achieve the minimum proficiency level on the specified integer operation, a plan based on the results of the current study was developed. The plan or proposed program is made up of seven (7) different components, including the Key Area, Objective, Specific Activities/Outputs, Person(s) Involved, Time Frame and Proposed Budget, and Success Indicator. The researcher additionally conducted reviews of relevant literature and studies to help finalize the contents of the proposed plan/program.

6. Recommendations

The researcher has made the following recommendations based on the summary and conclusions arrived at:

1) Timed practice drills are strongly recommended in classroom mathematics teaching across all grade levels for improved academic achievement.
2) Before implementing timed practice drills in integer operations, math teachers ensure that students are fluent in performing operations on positive integers.
3) Intensify the exercises for timed practice drills to

achieve mastery and a high level of competence.

4) Identify learners who will require intervention in integer operation and use timed practice drills as one intervention program in a classroom or school.
5) Conduct a similar study to validate and/or confirm the findings of this study.

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