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Formative Assessments in Teaching and Learning Combinatorics Concepts of Grade 10 Mathematics in Sorsogon City, Philippines

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Abstract

This study investigated which between individualized and collaborative formative assessments resulted in better student performance when implemented along with the use of PowerPoint in teaching and learning combinatorics concepts of Grade 10 Mathematics. The respondents in this study were all the Grade 10 students of Osiao Paglingap National High School, one of the coastal public secondary schools in the Schools Division of Sorsogon City. The instruments used were the researcher-made tests, the student-participation checklist, and the anecdotal records. The data collected were analyzed using statistical tools such as weighted mean, independent samples t-test, and paired samples t-test. All tests were at 0.05 level of significance. Cohen's d values were also obtained to determine the effect sizes of individualized and formative assessments as used in facilitating the learning sessions in each group of students. This study found that there was no significant difference between the performance of the two groups of students before the start of the learning sessions, hence, making the two groups ideal subjects of the study. Both groups were taught through direct instruction along with the use of PowerPoint. It was found that students exposed to collaborative formative assessments gained higher mean gain and post-test scores compared to those students who underwent individualized formative assessments. The difference between the performances of the two groups of students, however, was not significant. It has been concluded that both individualized and collaborative formative assessments played an important role in checking the students' understanding during the teaching and learning of the combinatorics concepts of Grade 10 Mathematics. It was recommended that studies similar to this research be conducted while considering other groups of students according to their diversity. In addition, another group of students that will experience a researcher-designed combination of individualized and collaborative formative assessments may be included in the study.

Keywords: Individualized Formative Assessments, Collaborative Formative Assessments, Mathematics Teaching and Learning, Combinatorics, Direct Instruction Model, PowerPoint Instruction, Coastal Public Secondary School

INTRODUCTION

Mathematics is a systematic study that deals with the logic of shape, quantity and order (Hom & Gordon, 2021). In every era of human history, mathematics has been involved. Courant & Robbins (1996) state that understanding mathematics has been considered an essential part of the intellectual equipment of any

civilized person for over two thousand years. Through the mental tools provided by this subject, the expansion of knowledge into other areas of study became possible (Shuttleworth, 2010). For this reason, Mathematics has played a major role in the daily life of people and has been important in the development of the modern world. All this makes Mathematics an important field of study to learn.

The Department of Education (DepEd), as the one that oversees elementary and secondary institutions in the country, implements mechanisms to ensure that Filipino students will have the basic skills needed at their level. The ability and expertise of teachers can promote the academic performance of students, as concluded in the study of Ferdinand & Andala (2023). Therefore, training and seminars suitable to improve the skills and knowledge of teachers are conducted by the DepEd. It provides teachers with the opportunity for continuous professional development by learning new methods, techniques, strategies, skills, and tools. Mathematics is one of the subjects taught to students at every grade level across the country with the goal of developing 21st century skills, critical thinking and problem solving, among students. Developing these skills poses challenges to every Mathematics teacher, particularly in their delivery of instruction to their students. With the help of training and seminars, they are guided in designing a series of learning activities as part of the daily cycle of teaching and learning.

Formative assessment aims to provide ongoing immediate feedback for students to improve their learning and for teachers to improve their teaching (Carnegie Mellon University, 2024). Thus, this assessment is an example of evidence-based decision-making in education. According to the UNESCO Program on Teaching and Learning for a Sustainable Future (UNESCO-TLSF), the series of activities given to the learners is called formative assessment – an ongoing form of assessment that can be given at any time during the teaching and learning process (DO No. 8, s. 2015). As with any teaching style and mechanism, it can be done in different ways by a teacher, such as doing it individually or in groups. The use of formative assessment in the teaching and learning process has been studied and found to have a significant impact on student achievement. In particular, the study of Gums et al. (2014) found that its use benefited students in both their communication and clinical assessment skills. In their study, individualized formative assessment was used. On the other hand, Sunga & David (2016) recommended the use of collaborative formative assessment as an innovative approach of assessment that can promote conceptual understanding in Grade 9 Science classrooms. This recommendation paves the way for the possible use of collaborative formative assessment in the teaching of other fields of study in other contexts.

Meanwhile, technology plays an important role in the 21st century education. It has the power to enhance the teaching and learning process by making it more engaging, efficient, and effective. PowerPoint is a software application and one of the emerging technologies that can serve as a visual aid for teachers to present ideas while teaching students. Although it is not intentionally developed for the teaching and learning process, it can be very helpful in facilitating better communication between teachers and students during the learning process. The study of Anigbo & Orie (2018) on the effect of Microsoft PowerPoint Instruction Strategy (MSPPIS) on the academic achievement of students revealed that the experimental group that was taught using this strategy obtained a higher mean achievement score than the control group that was taught using the lecture method. Students are given the opportunity to learn the web-like connection of the concepts taught to real-life experiences that positively impact their success. The findings lead to the need to develop a curriculum based on activities or PowerPoint presentations, which allows students to be more actively involved in the learning process, with an emphasis on students who play the role of experts in facilitating learning. These findings in the aforementioned study are similar to the

findings of Ibrahim (2018), where it was found that the use of PowerPoint presentations allows students to perform better than their counterparts taught using traditional tools (blackboard and chalk).

The studies of Anigbo & Orie and Ibrahim provided insights into the potential benefits of integrating PowerPoint into the teaching and learning process. As a classroom teacher for three consecutive school years, the researcher understands the importance of formative assessment in preparing students for final examinations. Reflecting on the research conducted by Gums et al. and Sunga & David about the use of individualized and collaborative formative assessment strategies, respectively, the researcher was encouraged to investigate which of the two should be adopted along with the use of PowerPoint in teaching combinatorics concepts of Grade 10 Mathematics to his students. This study highlights the importance of aligning instructional technology with an appropriate formative assessment in order to optimize learning outcomes and student engagement.

Statement of the Problem

This study aimed to determine which between individualized and collaborative formative assessments results in better performance of students when employed in teaching and learning combinatorics concepts of Grade 10 Mathematics. Specifically, it sought to find out the answers to the following questions:

1. What individualized and collaborative formative assessments can be designed for teaching and learning combinatorics concepts of Grade 10 Mathematics?
2. What is the performance level of each group of students before teaching and learning combinatorics concepts of Grade 10 Mathematics?
3. How does each group of students exposed to individualized and collaborative formative assessments participate in teaching and learning combinatorics concepts of Grade 10 Mathematics?
4. What is the performance level of each group of students after teaching and learning combinatorics concepts of Grade 10 Mathematics?

METHODOLOGY

This section describes the research design, research site, respondents of the study, research instrument, and data collection and analysis procedures.

Research Design

This study employed quantitative methods of research, particularly the between-subjects experimental research design. According to Simkus (2023), in this design, different groups of participants are tested under different conditions, allowing the comparison of performance between these groups to determine the effect of the independent variable. PowerPoint has been used in facilitating every learning session for both groups. The individualized and collaborative formative assessments were the two different conditions in which the two groups of students were exposed to while being taught of the combinatorics concepts of Grade 10 Mathematics.

Research Site

The study was conducted at Osiao Paglingap National High School (OPNHS) – Osiao Bacon District, Sorsogon City. The said school is one of the coastal public secondary schools in the Schools Division of Sorsogon City.

Respondents of the Study

The respondents were all the Grade 10 students of OPNHS, 28 from Grade 10 Aristotle, and 29 from Grade 10 Newton. In Grade 10 Aristotle, however, only 27 were included due to the absences of a student from most of the sessions and post-test administration. These two sections were formed by grouping the students heterogeneously at the beginning of the school year, making them ideal subjects of this study, since they were expected to have the same level of performance. The students that belong to Grade 10 Aristotle were exposed to individualized formative assessments, while the students in Grade 10 Newton were given collaborative formative assessments.

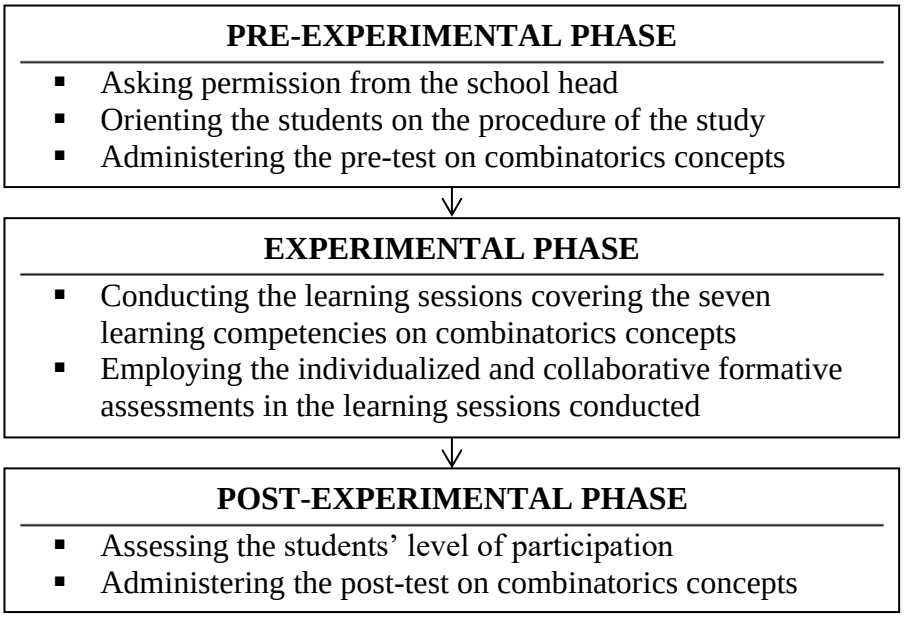
Research Instruments

There were three instruments used in this study. First were the researcher-made tests used in determining the performance level of learners before and after the learning sessions on combinatorics concepts of Grade 10 Mathematics. There were two versions of this instrument which served as the pre- and post-tests in the study. These tests were checked by the school head, whose expertise is also in Mathematics, to ensure the content validity of each item. Second was the student-participation checklist utilized in measuring the students' level of participation during the conduct of the study. Third was the anecdotal record which served as an additional instrument in taking notes of the important details of events that occurred throughout the duration of the study.

Data Collection and Analysis Procedures

Figure 1 outlines the pre-experimental, experimental, and post-experimental phases that the study underwent toward its completion.

Figure 1. Phases of the Study



As shown, during the pre-experimental phase, the researcher asked permission from the school head. This request was granted on the same day, and was followed by an orientation of students on the procedure of the study. The students were informed about the formative assessments they would undergo while being taught of the combinatorics concepts of Grade 10 Mathematics – individualized formative assessments for

Grade 10 Aristotle and collaborative formative assessments for Grade 10 Newton students. Then, the pre-test was administered to both groups of students to check whether or not their performance levels were similar before they were exposed to their assigned formative assessments. The results were analyzed using the t-test for independent groups to determine the significant differences between the performance levels. During the experimental phase, the two groups of students underwent a total of nine learning sessions to cover the seven learning competencies on combinatorics concepts of Grade 10 Mathematics. These sessions were conducted for four weeks where the researcher served as the learning facilitator. Both groups were taught and facilitated in the same manner, but were exposed to different formative assessments – individualized formative assessments for the Grade 10 Aristotle students, and collaborative formative assessments for the Grade 10 Newton students. Students' notable actions and behaviors observed, most especially during the classroom activities and routines, have been recorded.

After all the learning sessions, the students assessed their level of participation using the student-participation checklist. To obtain the mean rating of each group, the mean score ratings of all students in each class were added and divided by the total number of students. The mean rating interval presented by Pimentel (2010), as shown in Table 1, along with its corresponding interpretation, was used to describe the level of participation of the students.

Table 1: Scale Used to Interpret the Level of Participation of the Students

Mean Rating Interval	Interpretation
1.00 – 1.79	Very Low
1.80 – 2.59	Low
2.60 – 3.39	Moderate
3.40 – 4.19	High
4.20 – 5.00	Very High

The post-test was also administered to measure the performance level of the students after exposing them to their assigned formative assessments. Together with the pre-test results, mean gain scores were obtained, and the paired samples t-test was used to determine if there was a significant difference between the performance level of the two groups of students before and after they were taught of the combinatorics concepts of Grade 10 Mathematics. Cohen's d values or standardized mean differences were calculated to identify the effect sizes of the learning sessions conducted for each group of students. The Cohen's d values obtained were interpreted according to the study of Alwahaibi et al. (2020). Moreover, the independent t-test was applied to determine the significant differences in the post-test results. All statistical tests were at 5% level of significance.

RESULTS AND DISCUSSION

This chapter discusses the results of the study. It includes the results, analysis, and interpretation of the data gathered. The data are shown in tables for a clearer presentation and order as follows: (1) The formative assessments in teaching and learning combinatorics concepts of Grade 10 Mathematics; (2) The performance level of each group of students before teaching and learning combinatorics concepts of Grade 10 Mathematics; (3) The participation of each group of students exposed to individualized and collaborative formative assessments; and (4) The performance level of each group of students after teaching and learning combinatorics concepts of Grade 10 Mathematics.

1. The formative assessments in teaching and learning combinatorics concepts of Grade 10 Mathematics

There are seven learning competencies that comprise the combinatorics concepts of Grade 10 Mathematics. These are: (1) The learner illustrates the permutation of objects. *M10SP-IIIa-1*; (2) The learner derives the formula for finding the number of permutations of *n* objects taken *r* at a time. *M10SP-IIIa-2*; (3) The learner solves problems involving permutations. *M10SP-IIIb-1*; (4) The learner illustrates the combination of objects. *M10SP-IIIc-1*; (5) The learner differentiates permutation from combination of *n* objects taken *r* at a time. *M10SP-IIIc-2*; (6) The learner derives the formula for finding the number of combinations of *n* objects taken *r* at a time. *M10SP-IIId-1*; and (7) The learner solves problems involving permutations and combinations. *M10SP-IIId-e-2*. Direct instruction was used along with PowerPoint, as an instructional tool, in facilitating all learning sessions in teaching and learning combinatorics concepts. In direct instruction, teaching strategies are structured, sequential, and teacher-led, and the presentation of academic content to students by teachers is done in a lecture or demonstration manner (Sabbott, 2013). Lesson plans were prepared for each learning session. Table 2 shows the basic parts of a lesson plan, and the summary of the procedures or activities in each learning session carried out in the two groups of students exposed to individualized and collaborative formative assessments.

Table 2: Basic Parts of a Lesson Plan and Procedure or Activities in Each Learning Session

Basic Parts of a Lesson Plan (*DO No. 42, s. 2016*)	**Grade 10 Aristotle** *Individualized Formative Assessment*	**Grade 10 Newton** *Collaborative Formative Assessment*
Before the Lesson	▪ The teacher facilitates the recall of previously learned concepts. ▪ The teacher provides engaging tasks in preparation for the new lesson. ▪ The specific learning objective or content is presented to the students.	
The Lesson Proper	▪ The teacher discusses the learning content, in line with the learning objectives, by presenting definitions and procedures. Examples are provided to help the students master the new lesson. ▪ The teacher addresses questions posed by the students.	
After the Lesson	▪ The students are given seatwork individually. ▪ The answers of the students are checked by exchanging their outputs with their classmates. ▪ A student who is willing to share his thoughts about the lesson provides the summary of the lesson in each learning session. ▪ The direct feedback given to the student who shared his thoughts is heard by every student in the classroom. ▪ The teacher gives credit to students who share their ideas.	▪ The students are given seatwork by group. ▪ The answers of the students are checked during the presentation of outputs. There is only one output required from each group. ▪ An assigned group member generalizes the lesson in their respective groups. ▪ The feedback on the generalization drawn by the assigned group member is given during the presentation of outputs. ▪ The group leader is empowered to give ratings to all its members based on their level of contribution.

As indicated, the three basic parts of a lesson are before the lesson, the lesson proper, and the after the lesson, as stipulated in DO No. 42, s. 2016. The seats of Grade 10 Aristotle students were arranged in such a way that they were separated from each other to ensure smooth delivery of formative assessments individually, while Grade 10 Newton students were grouped around tables with five to six members. Student grouping was randomized, based on their pre-test scores, to ensure equal representation across all groups. In this manner, checking students' understanding, like asking a particular question relevant to the topic in order to encourage interaction in the classroom, was done according to the assigned formative assessments. The difference became more obvious in after the lesson part where both groups were given the activities in different manners. A type of this activity is the quiz, which is a common formative assessment tool that teachers use (DM 158, s. 2011, p 10). The Grade 10 Aristotle students were given with such assessment individually. One output is required from each student and checking was done by exchanging their outputs with their seatmates. Additional credits were given to students who shared their ideas. On the other hand, the Grade 10 Newton students were given assessments by group, requiring only one output from each group. The output was a product of collaborative efforts of all the members of the group and checking of outputs was done through a member's presentation of their work. The group leaders received the maximum possible score for each group activity and were empowered to give ratings to all their group members.

2. The performance level of each group of students before teaching and learning combinatorics concepts of Grade 10 Mathematics

The performances of the students in Grade 10 Aristotle and Grade 10 Newton were determined before they were taught of the combinatorics concepts of Grade 10 Mathematics. Table 3 shows the statistical basis and analysis of the results.

Table 3: The Performance Level of the Two Groups of Students Before Teaching and Learning Combinatorics Concepts of Grade 10 Mathematics

Statistical Basis	Statistical Analysis	
	Grade 10 Aristotle	Grade 10 Newton
Number of students	27	29
Mean score	10.926	10.483
Standard deviation	3.005	2.799
degree of freedom	54	
Level of significance	0.05	
t-critical value	2.009	
t-computed value	0.5714	
Decision on H_o	Accept H_o	
Conclusion	Not Significant	

As presented in the table, there are 27 students in Grade 10 Aristotle and 29 students in Grade 10 Newton. They served as the respondents of the study and were exposed to individualized and collaborative formative assessments, respectively. During the pre-test, the first group obtained a mean score of 10.926 with a standard deviation of 3.005, while the second group obtained a mean score of 10.483 with a standard deviation of 2.799. These results were used to obtain the t-computed value of 0.5714. This value is less than the t-critical value of 2.009 at 0.05 level of significance with 54 as the degree of freedom. This means

that the null hypothesis is accepted. Hence, there is no significant difference between the performance levels of the two groups of students before teaching and learning combinatorics concepts of Grade 10 Mathematics.

Pre-test is a valuable tool for teachers, as it allows them to identify areas of deficiency among the students. It enables learning resources to be maximized by efficiently targeting the learning concepts that contribute to the acquisition of a target learning competency. The pre-test results in this study indicate that the two groups of students that were about to be exposed to individualized and collaborative assessments were of the same level of performance in the concepts to be taught. Particularly, the transmuted mean percentage scores obtained by both groups of students is 70, described as "Did Not Meet Expectations" as per DO No. 8, s. 2015. Furthermore, the results agree with how they were grouped in sections at the beginning of the school year. It is important for the subjects in a study to have no significant difference at the start, as this allows to confirm which between the exposure to individualized or collaborative formative assessment could gain better results on their performances after they were taught of the combinatorics concepts. Moreover, this will enable contributive decisions on how to better teach other concepts in Grade 10 Mathematics.

3. The participation of each group of students exposed to individualized and collaborative formative assessments

Table 4 shows the ten statements in which the Grade 10 Aristotle and Grade 10 Newton students assessed their level of participation during the learning sessions. Mean scores were obtained from each class and their corresponding interpretations in each indicator were enumerated.

Table 4: Student's Level of Participation in Teaching and Learning Combinatorics Concepts of Grade 10 Mathematics

Statements	Level of Participation			
	Grade 10 Aristotle		Grade 10 Newton	
	MR	*I*	*MR*	*I*
1. I listened carefully in the discussions. *	3.80	A	3.92	A
2. I focused and concentrated on all activities. *	3.71	A	3.60	A
3. I enjoyed working on the activities given to us by our teacher. *	3.68	A	3.96	A
4. I asked questions that go with the discussions. *	3.20	N	3.68	A
5. I worked on the task even without the supervision of the teacher. *	3.64	A	3.56	A
6. The activities helped me to understand mathematics better. *	4.04	A	4.04	A
7. I am interested in learning Mathematics. *	3.92	A	3.88	A
8. I am able to learn from the activities after each lesson. *	3.63	A	4.24	SA
9. I like doing all the tasks in groups/individually.	3.56	A	4.19	A
10. I enjoyed sharing my knowledge while doing the activities with my groupmates. / I enjoy working the activities alone.	3.64	A	3.92	A
OVERALL	**3.68**	**High**	**3.90**	**High**

* common statements in both checklists

Legend: MR - Mean Rating I - Interpretation SA - Strongly Agree A - Agree N – Neutral

As shown in the table, Statements 1 to 8 are exactly the same as those statements found in the student-participation checklist given to both groups of students, denoted by *. On the other hand, statements 9 and 10 are combined in the table for ease of presentation. The table reveals that both Grade 10 Aristotle and Grade 10 Newton students have the same mean rating interpretation for statements 1, 2, 3, 5, 6, 7, 9, and 10, all falling under the "Agree" category. For statement 1, "I listened carefully in the discussions.", the first group rated it with a mean of 3.80 points, while the second group rated it with a mean of 3.92 points. Statement 2, "I focused and concentrated on all activities.", received a mean rating of 3.71 points from the first group and 3.60 points from the second. Statement 3, "I enjoyed working on the activities given to us by our teacher.", garnered a mean rating of 3.68 points from the first group and 3.96 points from the second. Statement 5, "I worked on the task even without the supervision of the teacher.", was rated with a mean of 3.64 points by the first group and 3.56 points by the second. Both groups gave statement 6, "The activities helped me to understand mathematics better.", with the same mean rating of 4.04 points. Statement 7, "I am interested in learning Mathematics.", received a mean rating of 3.92 points from the first group and 3.88 points from the second. In statement 9, "I like doing all the tasks in groups/individually.", the first group rated it with a mean of 3.56 points, while the second group rated it with a mean of 4.19 points. Lastly, in statement 10, “I enjoyed sharing my knowledge while doing the activities with my groupmates.”, the first group rated it with 3.64 points while the second group, “I enjoy working the activities alone.”, rated it with 3.92 points. Meanwhile, the mean ratings of the two groups of students fall under different categories for statements 4 and 8. Particularly, in statement 4, “I asked questions that go with the discussions.”, the first group rated it at 3.20, falling under “Neutral” while the second group rated it at 3.68, which is categorized as “Agree”. Also, in statement 8, “I am able to learn from the activities after each lesson.”, the first group rated it at 3.63, indicating “Agree”, while the second group rated it at 4.24, signifying “Strongly Agree”.

To sum up, the Grade 10 Aristotle students provided a mean rating of 3.68 points, whereas the Grade 10 Newton students averaged 3.90 points. Despite the slight 0.22-point difference favoring the latter group, both still fell within the student’s “High” level of participation. This reflects a common perception of both groups of students in terms of how they participated during the learning sessions of teaching and learning combinatorics concepts of Grade 10 Mathematics.

4. The performance level of each group of students after teaching and learning combinatorics concepts of Grade 10 Mathematics

The performance of the students in Grade 10 Aristotle and Grade 10 Newton were determined and analyzed after they were taught of the combinatorics concepts. Tables 5-a and 5-b show the statistical basis and analysis for the mean gain scores and the post-test results of the two groups of students.

Table 5-a shows that Grade 10 Aristotle students obtained a mean gain score of 7.000, while Grade 10 Newton students obtained 8.034. Their standard deviations were 3.690 and 3.365, respectively. The t-computed value for Grade 10 Aristotle students was 10.045, while for Grade 10 Newton students, it was 13.087. At a significance level of 0.05, these values resulted in the rejection of the null hypothesis, with critical t-values of 2.056 and 2.048 for the first and second groups, respectively, indicating a significant difference between the pre-test and post-test scores in the performance levels of both groups of students. Cohen’s d values were also calculated for each group to measure the extent of the learning sessions' effect. Grade 10 Aristotle had a Cohen’s d value of 1.897, while Grade 10 Newton had 2.388. Both values are interpreted as large, though it was observable that the latter had a higher value of Cohen’s d.

Table 5-a: Mean Gain Scores of the Two Groups of Students

Statistical Basis	Statistical Analysis	
	Grade 10 Aristotle	Grade 10 Newton
Number of students	27	29
Mean gain score	7.000	8.034
Standard deviation	3.690	3.365
t-critical value	2.056	2.048
t-computed value	10.045	13.087
Decision on H_o	Reject H_o	Reject H_o
Conclusion	Significant	Significant
Cohen's d	1.897	2.388
Effect size	Large	Large
Level of significance	0.05	

The table also shows how the learning sessions positively impact the performance of the students as reflected in their mean gain scores. The result is an affirmation of how direct instruction works to student learning. A similar result has been found by Hermawan et al. (2020) in their studies about the effectiveness of the direct instruction model in mathematics. Moreover, the use of technology, PowerPoint, could have helped boost the effect of direct instruction learning. Throughout the entire duration of the learning sessions, it was observed that the students showed attentive behavior and remained focused on what was being presented by the teacher through PowerPoint. These notable behaviors of students contributed in establishing a sense of formality inside the classroom.

To determine which between individualized and collaborative formative assessments would yield a better performance of learners, the post-test results were analyzed as presented in the table below.

Table 5-b: The Performance Level of the Two Groups of Students After Teaching and Learning Combinatorics Concepts of Grade 10 Mathematics

Statistical Basis	Statistical Analysis	
	Grade 10 Aristotle	Grade 10 Newton
Number of students	27	29
Mean score	17.926	18.517
Standard deviation	2.968	2.062
degree of freedom	54	
Level of significance	0.05	
t-critical value	2.009	
t-computed value	-0.871	
Decision on H_o	Accept H_o	
Conclusion	Not Significant	

Based on the data shown in the table, the post-test mean score of Grade 10 Aristotle students is 17.926 with a standard deviation of 2.968, while Grade 10 Newton students have a mean score of 18.517 with a standard deviation of 2.062. The calculated t-value is -0.871, which is lower than the critical t-value of 2.009 at a significance level of 0.05, with 54 as the degree of freedom. Therefore, the null hypothesis was accepted, indicating that there is no significant difference in the performance levels between the two student groups after teaching and learning combinatorics concepts in Grade 10 Mathematics.

The transmuted mean percentage scores of the Grade 10 Aristotle students and Grade 10 Newton students are 82 and 83, respectively. Both scores are described as "Satisfactory" as per DO No. 8, s. 2015. The results revealed that both groups were able to attain the expected standards in learning the combinatorics concepts of Grade 10 Mathematics. Meanwhile, a formative assessment in the teaching and learning process, be it done individually or by groups, is one of the important aspects to be considered in checking the progress of the learners. Along with direct instruction and the use of PowerPoint in facilitating learning sessions, this study has confirmed that formative assessments impact learning positively.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, it can be concluded that collaborative formative assessments result in a higher mean score gain of students and post-test results compared to individualized formative assessments. The difference between the results, however, is not significant. To further validate, it is recommended that studies similar to this research be conducted while considering other groups of students according to their diversity. A third group of students which will be exposed to a researcher-designed combination of individualized and collaborative formative assessments may also be added to the respondents.

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