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# The Influence of Mathematics Learning Playlists in Student's Understanding

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**Abstract**

This study examines the influence of Mathematics Learning Playlists on student's understanding of mathematical concepts, specifically in the topic of combinatorics. Utilizing the SAM (Successive Approximation Model) as the framework for development, the learning playlists were designed to provide structured, engaging, and self-paced learning experiences. The researcher-developed learning playlists consisted of researcher-made video lessons, self-learning activities (SLA), exercises, and quizzes. These were evaluated, then implemented among the purposively selected forty-one (41) Grade 10 Junior High School students in one of the public schools in Iligan City. The study employed a descriptive research design, measuring students' performance through pre-test and post-test assessments to determine the influence of the intervention. A paired t-test was conducted to analyze the difference in scores, revealing statistically significant improvement in student's understanding on Combinatorics after using the learning playlists. Students claimed that the Mathematics learning playlists helped them to understand the Combinatorics. The respondents perceived that the learning playlists was easy to follow, offering clear explanations, step-by-step solutions, flexible to revisit lessons anytime, and they overwhelmingly recommend Mathematics learning playlists as a valuable tool in teaching and learning. These findings indicate that Mathematics learning playlists serve as an instructional tool in enhancing conceptual understanding and academic performance. The study recommends the wider adoption of this strategy in mathematics education and further research on its long-term impact across different grade levels and mathematical domains.

**Keywords**: Mathematics Learning Playlists, student understanding, SAM model, combinatorics, self-paced learning

## 1. Introduction

The integration of blended learning in education has revolutionized how instruction is delivered, especially in mathematics—a subject often perceived as abstract and challenging. Blended learning, as defined by Horn and Staker (2015), combines traditional face-to-face instruction with digital technologies, offering students flexible, self-paced learning environments. Among these innovations, educational playlists have emerged as a promising tool to enhance conceptual understanding, promote engagement, and support differentiated instruction. These playlists are structured learning sequences composed of multimedia resources such as video lessons, interactive activities, and assessments designed to cater to diverse student needs (Herold, 2016).

Several studies have highlighted both the potential benefits and challenges of using mathematics learning playlists. For instance, large-scale evaluations of Khan Academy, a platform that employs playlist-style learning, revealed significant improvements in students' mastery of mathematics skills and standardized test performance when integrated with teacher facilitation (Bergstrom & Yamkovenko, 2024; Weatherholtz & Yamkovenko, 2023). Similarly, SRI Education (2014) reported that teachers observed positive effects on student independence and conceptual understanding through playlist use. At the classroom level, Insorio (2022) found that YouTube playlists provided students with accessible explanations and opportunities for review at their own pace, while PowerMyLearning's Family Playlists were shown to enhance both mathematics learning and family engagement (PowerMyLearning, 2023).

Despite these advantages, researchers also note limitations. Studies caution that poorly designed or unsupported playlists may reduce effectiveness, as students often struggle with self-regulation, time management, and equitable access to digital resources (Education Week, 2017 & EdSurge, 2017). Furthermore, playlists alone do not guarantee meaningful personalization; their success largely depends on careful instructional design, teacher guidance, and sustained implementation (Novak Education, 2025). These findings suggest that while mathematics playlists hold promise for improving student understanding, their influence is shaped by how they are structured, implemented, and contextualized in the learning environment.

In connection with these findings, self-paced learning emerges as one of the most important advantages of playlist-based instruction. Playlists allow students to control the speed of their learning, revisit lessons as needed, and master concepts before moving on—features particularly valuable in mathematics, where each new skill often builds on prior knowledge. Studies highlight that self-paced approaches not only enhance mastery but also reduce math anxiety and foster greater confidence in problem-solving (Panadero & Broadbent, 2018; Walkington, 2013). However, research also cautions that without sufficient self-regulation and motivation, students may face difficulties such as procrastination or disengagement (Broadbent & Poon, 2015). This indicates that while self-paced learning through playlists can support differentiated and meaningful understanding, teacher scaffolding and guidance remain essential to ensure its effectiveness.

While research has explored the benefits of multimedia and technology integration in mathematics instruction, there remains a notable gap in the literature concerning the use of educational playlists specifically tailored to the topic of combinatorics at the secondary level. Prior studies, such as those by Brown and Wilson (2015), and Green and Thomas (2017), have demonstrated the effectiveness of playlists in improving engagement and performance in broader mathematical contexts. However, few have investigated their impact in a focused and structured format for a specific topic like combinatorics in a Grade 10 setting. This gap is further supported by a needs assessment survey conducted among Grade 10 students, revealing that many find combinatorics particularly difficult and would

benefit from additional resources such as video lessons, worksheets, and interactive quizzes.

In response to this need, the present study aims to design and evaluate Mathematics Learning Playlists grounded in the Successive Approximation Model (SAM), a flexible, iterative design framework suitable for multimedia content. The playlists include video lessons, self-learning activities (SLAs), exercises, quizzes, and exit passes. Implemented among purposively selected Grade 10 students in a public school in Iligan City, this study employs a descriptive design to examine their influence. Pre- and post-test results are used to measure academic performance, while qualitative feedback captures student perceptions of usability and learning impact.

## 2. Methodology

### 2.1 Research Design

The design of the study was a descriptive research design. Its primary objective was to develop and refine Mathematics Learning Playlists in Combinatorics aimed to provide structured, engaging, and self-paced learning experiences among Grade 10 students. Descriptive statistics—particularly the mean—were used to interpret expert ratings and learners' performance.

### 2.2 Research Setting and Participants

This study was conducted in one of the public school in Iligan City, which serves diverse population of junior and senior high school students. The subjects of the study were the forty-one (41) Grade 10 students of one of the public school in Iligan City enrolled during the school year 2024-2025. These students were selected from one of the five sections that the researcher handled, using purposive sampling, a non-random sampling technique where participants are chosen based on specific criteria relevant to the study's objective. The selection was based on relevance of the study, as the students were currently studying combinatorics, the focus of the Mathematics Learning Playlists.

### 2.3 Research Instrument

The study employed two main instruments to gather data.

(1) Mathematics Learning Playlists. These are a set of video lessons, self-learning activities (SLA), exercises and quizzes that the researcher designed based on the learning competencies specified in the Mathematics curriculum guide of the K-12 curriculum.

(2) Rubric for Evaluating Mathematics Learning Playlists. This is a rating scale used to evaluate the Mathematics Learning Playlists. The panels of evaluators was chosen because of their expertise and experience in technology.

### 2.4 Data Gathering Procedure

The first part of the study was to determine the Mathematics learning competencies to be addressed in the Mathematics Learning Playlists by conducting a needs assessment survey titled "Identifying Resource Needs for Grade 10 – 3rd Quarter Mathematics" and conducted interviews with students and teachers. The researcher developed the Mathematics Learning Playlists which include researcher-made video lessons, self-learning activities, exercises, and quizzes following the SAM framework. The designed mathematics learning playlists was evaluated by panel of evaluators using a rubric.

### 2.5 Data Analysis

Descriptive statistics were used to determine the overall mean rating of the Mathematics Learning Playlists based on the evaluations provided by expert validators. Additionally, content analysis was employed to analyze qualitative data gathered from

classroom observations and interview transcripts. This method allowed for the identification of recurring themes, patterns, and categories that emerged from participants' responses.

## 3. Result and Discussion

### 3.1. Development of Mathematics Learning Playlists

The SAM Model (Successive Approximation Model) is a framework commonly used in instructional design and e-learning development (Allen, 2012). It was created by Michael Allen and emphasizes rapid iterations and ongoing enhancements to guarantee that the finished product successfully satisfies the needs of students. The SAM methodology is used in this study to create Mathematics learning playlists that teach combinatorics to students in Grade 10.

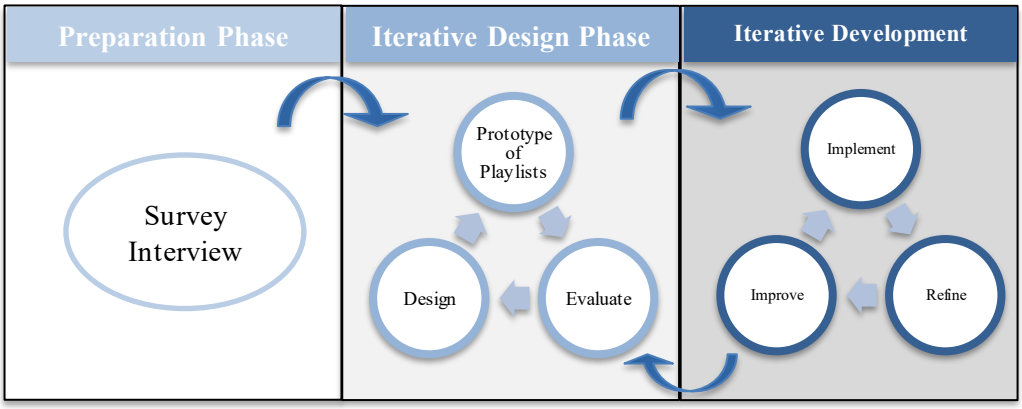



Figure 1. Framework in Developing the Mathematics Learning Playlists

Figure 1. shows the framework used in developing the playlists following the SAM model. The process consists of three main phases: Preparation, Iterative Design, and Iterative Development. This structure approach ensures that the developed learning playlists effectively support Grade 10 students in understanding combinatorics.

*3.1.1 Preparation Phase*

In this phase, the primary goal was to identify the specific challenges and resource gaps faced by the Grade 10 students specifically in studying the 3rd Quarter Mathematics curriculum. Triangulation was conducted to validate the findings from different sources, including the survey results from Grade 11 students, interview responses from students, and interview responses from teachers.

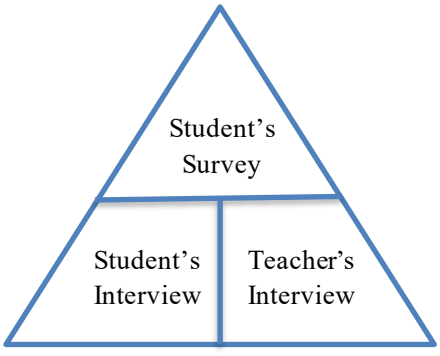



Figure 2. Three Sources for the Triangulation Process

A survey was designed and conducted to gather insights directly from Grade 11 students. The goal of the survey was to identify the topics in the 3rd Quarter in Mathematics 10 where students struggle the most and preferred methods of instruction or tools to support their learning. The responses from the need's assessment were analyzed to pinpoint the most critical areas for intervention.

Based on the survey results, students identified permutations as a difficult topic, while combinations was challenging. Students expressed the need for additional learning resources for permutations, and requested more materials for combinations. Also, students preferred video lessons, printable worksheets, and detailed solution guides as the most beneficial learning materials.

In addition to this, based on student interviews, many students expressed confusion about when to use permutations versus combinations. The primary challenge involved remembering formulas, especially factorials, and distinguishing between ordering and selection. For instance, one student shared, "I get confused about when to use permutation and when to use combination" (S7), while another stated, "The formulas are hard to remember, especially when to use factorials" (S8). Several students also noted the complexity of the steps involved in solving problems, which often led to errors; as one respondent put it, "There are too many steps, and I sometimes miscalculate" (S9). These insights highlight the cognitive demand students face in mastering combinatorics concepts.

Also, based on teacher interviews, teachers confirmed that students struggle with differentiating between permutations and combinations, particularly in word problems. One teacher noted, "Many students find it difficult to distinguish between permutation and combination, especially in word problem" (T1). The use of factorials and large numbers was also overwhelming for students, as highlighted by another teacher: "The concept of factorials and large numbers can be overwhelming for students" (T2). Moreover, teachers observed that students often memorize formulas without grasping their logic or application, leading to mistakes in problem-solving. As one teacher explained, "Students tend to memorize formulas of permutation without fully understanding their logic, leading to errors in application" (T4), while another emphasized, "They often struggle with applying the formulas correctly in different scenarios for permutation and combination" (T3). These reflections underscore the need for instructional strategies that promote deeper conceptual understanding rather than rote learning.

From the three sources, a strong agreement was found regarding the difficulty of permutations and combinations and the need for enhanced learning materials. The survey and student interviews highlighted confusion in applying formulas and solving problems, which was reinforced by teacher observations. The need for video lessons, worksheets, and solution guides was also evident across the data sources. These findings justify the development of Mathematics learning playlists focusing on permutations and combinations, incorporating step-by-step explanations, visual representations, and interactive exercises to address students' challenges.

*3.1.2 Iterative Design Phase*

In this phase, the Mathematics learning playlists was design based on the results from the preparation phase.

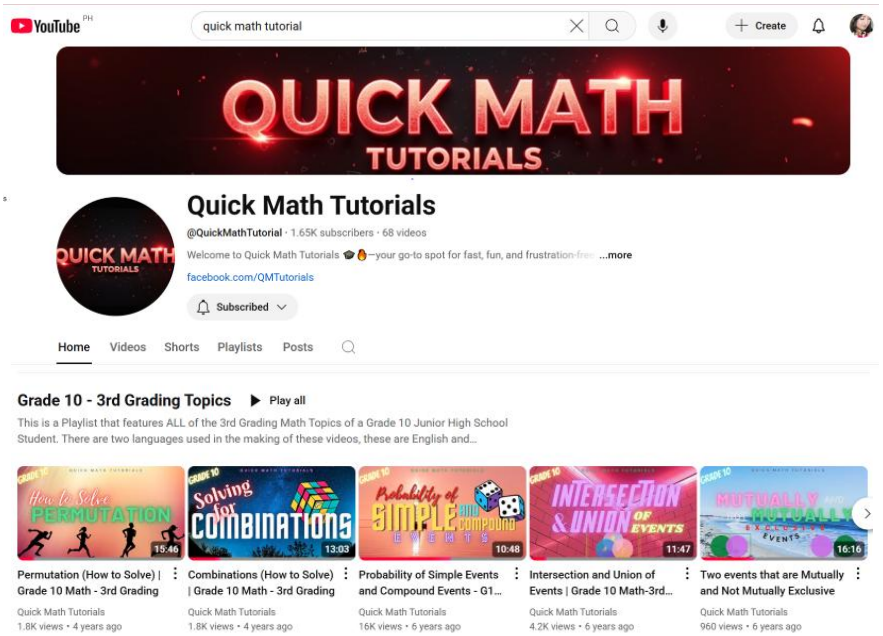



Figure 3. YouTube Channel: Quick Math Tutorials

It all started by uploading instructional video lessons on the researcher's YouTube channel, Quick Math Tutorials as shown in Figure 3. The full lesson on permutations lasted approximately 15 minutes, while the lesson on combinations took about 13 minutes.

To better support students' learning and attention span, these longer videos were segmented into shorter, more focused video clips. Each clip targeted specific subtopics or examples, allowing for easier comprehension and review. It provided students with a more manageable and self-paced learning experience, enabling them to revisit difficult parts of the lesson as needed and engage with the content in a flexible, learner-friendly format. Aside from the video lessons, self-learning activities were also included in the playlists, unlike on YouTube where you can only upload videos and not supplementary learning materials.

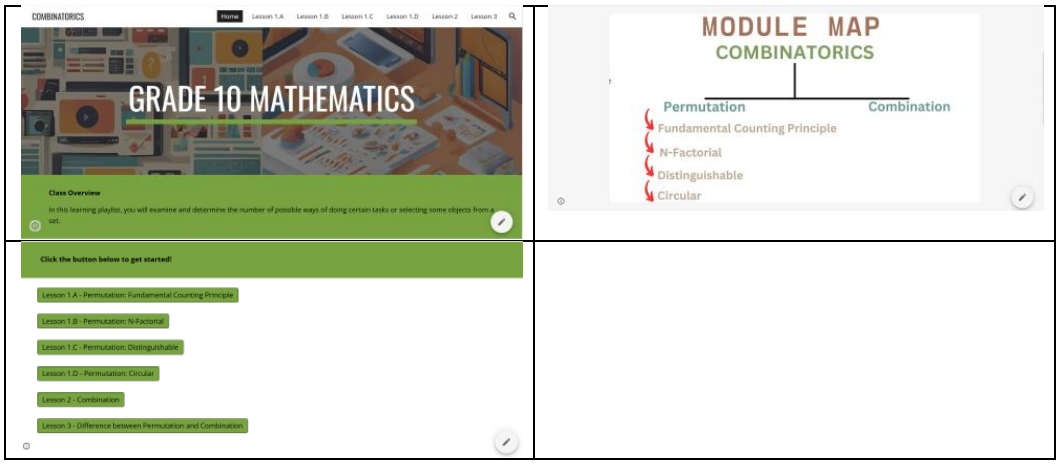



Figure 4. Mathematics Learning Playlists Home Page

Figure 4. shows the home page of the Mathematics Learning Playlists. Each playlist was broken down into specific topics such as Permutation: Fundamental Counting Principle, n-factorial, Distinguishable Permutation, Circular Permutation, Combinations,

and Difference between Permutations and Combinations. Initial prototypes of the playlists were created and tested.

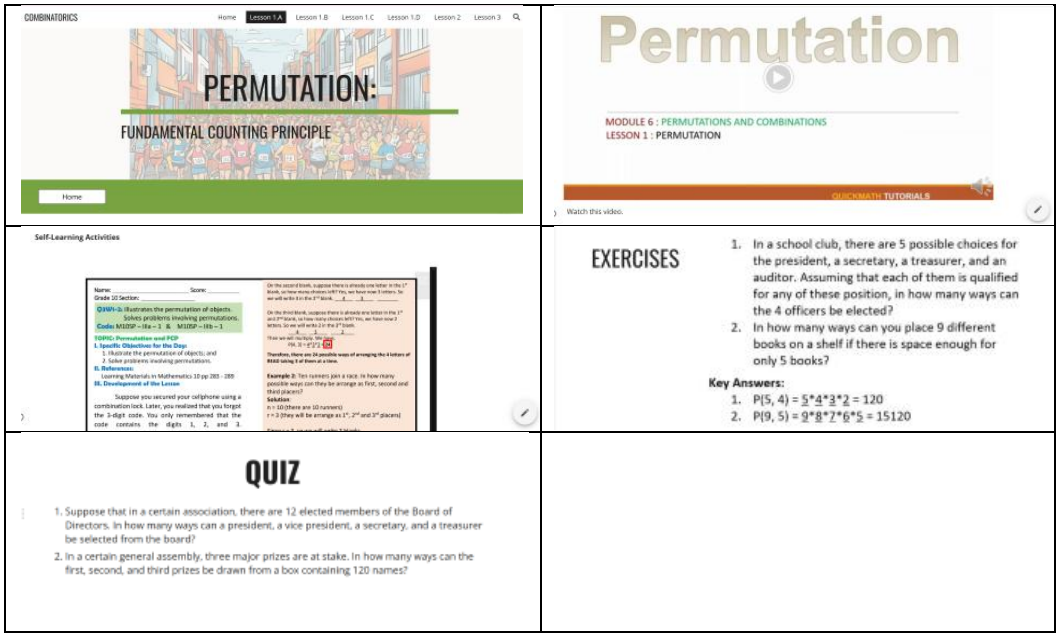



Figure 5. Mathematics Learning Playlists (Lesson 1.A)

As shown in Figure 5., the playlists include structured sequences of multimedia resources such as five (5) researcher-made video lessons, six (6) researcher-made self-learning activities, exercises, and quizzes (see Appendix H).

The summary of ratings of the selected Mathematics educators who composed the panel to evaluate the developed playlists using the rubric. They rated the playlists based on the criteria of the rubrics as excellent, good, satisfactory, and needs improvement.

From the computed mean, the evaluators rated 'Excellent' for the content quality, clarity of explanation, engagement, accessibility, differentiation, visual design, technical quality, assessment integration, and time efficiency. Overall, the panel of evaluators gave the developed playlists an 'Excellent' rating (M=3.83, SD=0.49). This implies that the playlists were well-received and considered effective, with minimal variation in evaluator's perceptions. Thus, refinements were done according to their comments and suggestions like "Do not display all the quizzes for each topic so that they will only answer them on the scheduled day." (E1), "Enhance the visual appearance to make it more attractive and motivated to students.", "Add a button that will allow the students to message the author for more in depth or follow up questions regarding the lessons being discussed.", and "Add a button where they can submit their exercises online if possible." (E2)

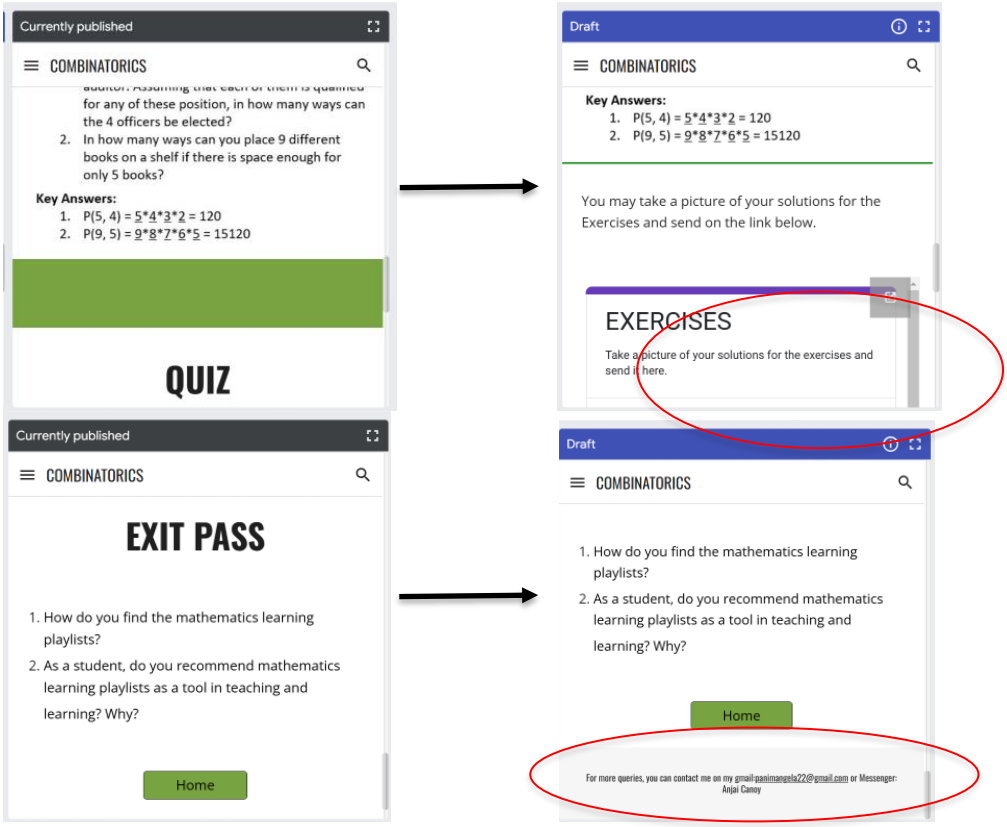
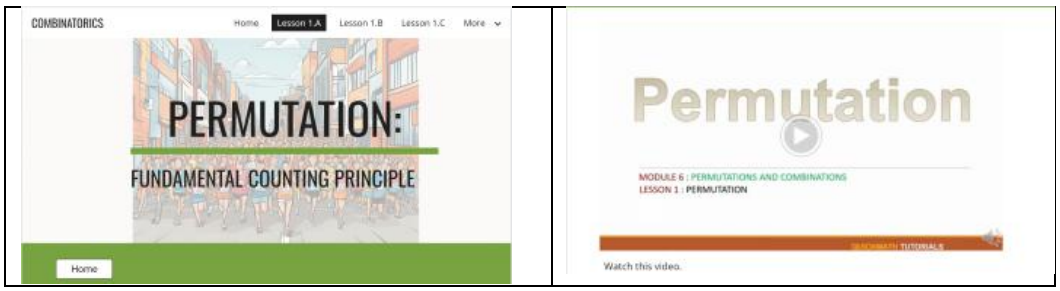



Figure 6. Refinements Done Based on the Evaluator's Suggestions

Pilot testing was conducted to test the efficacy, clarity and engagement level of the playlists. It also helped the researcher to ensure that the playlists are aligned with leaners' needs and allow adjustments based on real-time data. It was conducted in one of the public schools in Iligan City and the pilot testing was lasted for 2 weeks. The try-out respondents were composed of 42 students in one section and 39 respondents in the other section.

*3.1.3 Iterative Development Phase*

After gathering feedback, the playlists were refined in several iterations to improve content delivery and user experience.



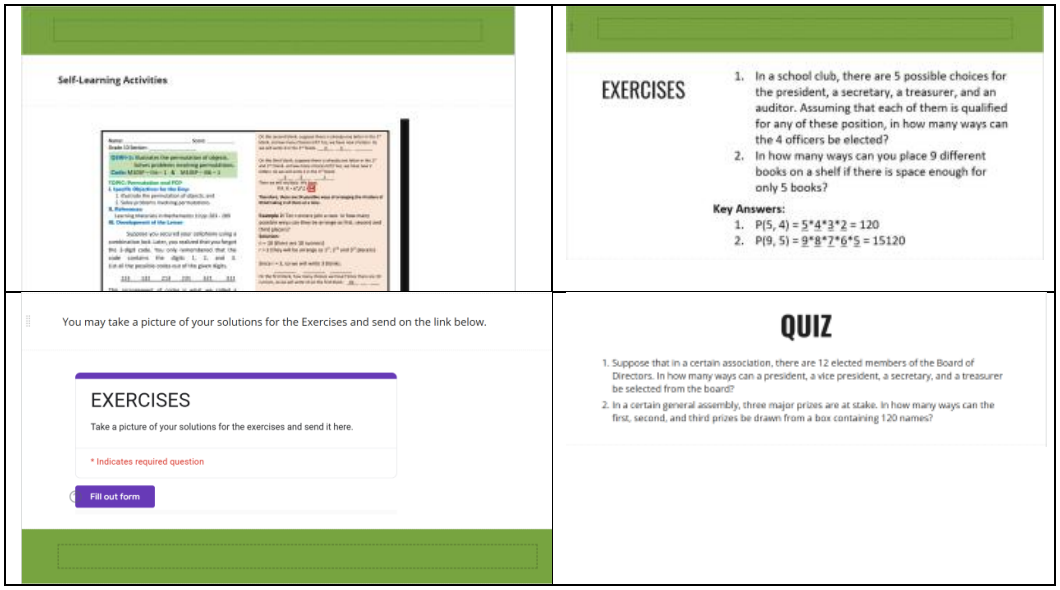



Figure 7. Mathematics Learning Playlists (Final Version)

Figure 7. shows the final version of Mathematics Learning Playlists that was implemented in one section of one of the public schools in Iligan City during the 3rd quarter. There were 41 students as the respondents to this research. The respondents can access the playlists on the Google site. The researcher tracked the respondents how the students used the playlists during their regular class schedule in mathematics. There were 6 topics so it lasted for 6 days. Every day, the respondents must answer the quizzes and the exit pass. After completing the 6 topics, the respondents had their achievement test.

Finally, for the evaluation phase, the researcher assessed the overall feedback of the playlists by analyzing the pre- and post-test and exit pass (perception questions) to determine the influence of Mathematics learning playlists in student's understanding.

## 4. Conclusion and Recommendation

In developing the Mathematics learning playlists, the SAM model was utilized as the main framework in the development process. The learning playlists developed following the framework gained excellent ratings from the panel evaluators. With results showing an excellent rating, it also indicates that the idea of integrating learning playlists was ready to be applied as the new teaching strategy. Future researches with similar topic may be conducted in a broader range of classrooms, including other grade levels and mathematical topics, to maximize their impact on student performance. Expanding their use can provide more students with structured and engaging resources that facilitate improved learning outcomes.

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