Station Rotation Model: Effects on the Achievement Level of Grade 10 Learners in Circles

Ferrylou Guadiario[1], Douglas Salazar[2]
[1,2]Mindanao State University - Iligan Institute of Technology, Iligan City, Philippines

Article Info

Article history:

Received Dec 4, 2025
Revised Jan 10, 2026
Accepted Feb 19, 2026
Online First Feb 21, 2026

Keywords:

Achievement Levels
Blended Learning
Educational Technology
Mathematics Education
Station Rotation Model

ABSTRACT

Purpose of the study: This study aims to determine the effect of the Station Rotation Model on Grade 10 learners' achievement levels in the topic of circles by measuring changes in their pretest and posttest scores and gathering insights from their learning experiences.

Methodology: One-group pretest–posttest pre-experimental design was employed. Tools included a researcher-made 30-item test, interview guide questionnaire, CK-12 Flexbook, Edpuzzle, Quizizz, GeoGebra, and Padlet. Google Classroom managed all materials. Wilcoxon Signed-Rank test, Shapiro-Wilk test, and thematic analysis for qualitative responses were used to analyze the data.

Main Findings: Learners' achievement improved from a "Beginning" mean score of 11.85 to a "Developing" mean score of 21.54 after the intervention. The Wilcoxon Signed-Rank Test revealed a significant difference (p = 0.001), and twenty-five students demonstrated score improvement. Qualitative data emphasized the following: that the model allowed collaborative learning, increased engagement through interactive activities, and valued on the support of teachers in clearing up complex issues.

Novelty/Originality of this study: This study uniquely applies a daily structured Station Rotation Model with clearly defined teacher-led, collaborative, and online stations specifically for Grade 10 circles. It integrates multiple digital tools and immediate peer interaction, offering a detailed model not previously examined in mathematics. It provides more evidence of station rotation model's efficiency in teaching geometry.

Corresponding Author:
Ferrylou Guadiario
Mindanao State University - Iligan Institute of Technology, Andres Bonifacio Ave, Iligan City, 9200 Lanao del Norte, Philippines
Email: ferrylou.guadiario@g.msuiit.edu.ph

1. INTRODUCTION

Due to the widespread availability of the internet and developments in information and communication technology (ICT), modern educational technology is constantly changing. In the modern age of ICT, teachers should take actions to find out innovative ways to fulfil learners' learning needs, because the education system is always transforming. Essentially, the teachers have to put effort into implementing innovative teaching methods in the classroom [1]. According to recent studies, ICT-enhanced learning environments improve learners' engagement and achievement in a variety of subject areas [2], [3].

Blended learning models, which blend traditional in-person instruction with digital resources, have emerged as a result of the rapid introduction of technology into education. Blended learning is defined as an environment which takes the values of both offline traditional face-to-face learning and online learning [4], [5].

It is the new trend in education and instruction of core subjects including math. When compared to traditional instruction, blended learning dramatically boosts academic performance, according to meta-analytic evidence [6], [7]. The Station Rotation Model, a form of blended learning, integrating traditional face-to-face instruction with online learning, allowing learners to engage with content in multiple ways. This approach not only promotes personalized learning but also encourages collaboration and active participation among learners [8], [9]. Among the blended learning models, the Station Rotation Model has gained prominence, particularly in subjects like mathematics, where varied instructional approaches are beneficial for different learning styles [5], [10].

This research is particularly relevant in light of the ongoing shift towards blended learning environments in schools, where technological tools are increasingly being used to support traditional teaching methods [4]. It is crucial to investigate how such approaches can improve student outcomes in challenging subjects like mathematics. The results of this study could provide insightful information for educators looking to optimize their teaching strategies for geometric topics and potentially improve student achievement in circles. Achievement levels are critical indicators of the effectiveness of instructional interventions. By measuring the learners' pretest and posttest scores, this study aims to quantify the impact of the Station Rotation Model on their understanding of mathematical concepts. Studies have shown that blended learning environments significantly improve academic performance compared to traditional methods [11], [12]. Thus, focusing on achievement levels provides a robust framework for assessing the success of the intervention and identifying areas requiring further improvement. However, a large portion of the literature currently in publication concentrates on elementary school implementation, attitudes toward learning, or general mathematics performance.

Despite the growing adoption of blended learning, many educators still grapple with finding the most effective approach to enhance learners' performance in mathematics. This is especially true for geometric topics like circles, where spatial reasoning and conceptual understanding can pose significant challenges for learners [13]. Grade 10 students encounter increasingly abstract and challenging mathematical concepts that demand innovative teaching strategies. Circles, in particular, is one of the areas where many students struggle. Targeting Grade 10 learners allows for addressing these specific difficulties at a crucial stage in their academic progression, as emphasized by studies on geometry education [13], [14]. Existing literature underscores the potential of SRM to illustrate complex geometric concepts by breaking lessons into manageable, interactive stations [15], [14].

Despite these contributions, there are still anumber of gaps in the literature. First lies in the limited empirical research focused specifically on the impact of the Station Rotation Model on learners' performance in circles, particularly at the Grade 10 level, which is generally acknowledged as one of the difficult topics in secondary mathematics. While some studies have explored the benefits of blended learning in general math education [6], [16], few have delved into how different instructional stations—teacher-led, collaborative, and independent—can influence learners' grasp of geometric concepts. Lastly, a lot of SRM studies use weekly or partial rotation schedules and give only a brief explanation of each station's instructional structure. Because of this, there is not enough data to determine how a daily, fully structured station rotation model—which includes clearly defined teacher-led, collaborative, and online stations—affects secondary learners' achievement in geometry. This study aims to address this gap by assessing how the Station Rotation Model affects Grade 10 learners' achievement in learning circles, an area that is underrepresented in existing researches.

A comparison with the study in Ayob et al. [8], it highlights significant methodological differences. In their study, the Station Rotation Model was implemented through alternating weekly formats, where offline traditional face-to-face learning occurred in weeks two and four, and online learning was conducted in weeks three and five. However, the study did not specify the nature of activities at each station, such as whether they were teacher-led, collaborative, or independent. In contrast, this study integrates varied instructional approaches daily, with stations explicitly designated for teacher-led instruction, collaborative learning, and online activities. This daily rotation structure fosters dynamic and diverse engagement within a single session, enabling learners to experience a balanced mix of instructional strategies. Furthermore, while Ayob et al. [8] focused on chemistry, specifically the topic of salts, this study explores the application of the model in mathematics, focusing on the topic of circles. These differences underscore how this study builds upon and extends prior research, offering a more detailed and structured examination of the Station Rotation Model's potential in promoting achievement.

The use of a daily structured Station Rotation Model with clearly defined teacher-led, collaborative, and online stations for teaching circles at the Grade 10 level makes this study unique. This study incorporates several digital tools—like GeoGebra, CK-12 Flexbook, Edpuzzle, Quizizz, and Padlet—within a single instructional framework, in contrast to earlier research that concentrated on general mathematics achievement or non-mathematics subjects. Additionally, the study uses a mixed-methods approach by looking at learners' learning experiences as well as their achievement levels, providing a more thorough understanding of SRM's efficacy in secondary geometry instruction.

This action research focuses only on the effect of station rotation model as a teaching strategy for Grade 10 learners studying circles at Iligan Capitol College in S.Y. 2024-2025, where the intervention will be applied in the second quarter of the school year for a span of two weeks only. Through this study, educators and policymakers could better understand how to tailor instructional models to meet the specific needs of learners, particularly in mathematical areas that demand both conceptual and practical understanding.

The primary objective of this action research was to evaluate the effect of the Station Rotation Model on the achievement levels of Grade 10 learners in the topic of circles. Specifically, it will examine whether the learners demonstrate improved understanding of key concepts in circles, and enhanced problem-solving skills when learning in a structured yet flexible environment. Specifically, this study aimed to: (1) determine the achievement level of the Grade 10 learners before and after the intervention; (2) compare the difference between the pretest and posttest mean scores after the intervention; (3) draw insights from the learner's experience after the intervention

2. RESEARCH METHOD

This part of the paper provides the detailed explanation of the methodology followed in this study.

2.1. Research Design

This study used a pre-experimental design, specifically the one-group pre-test and post-test design, to examine the effects of the Station Rotation Model in blended learning on the achievement level of Grade 10 learners in learning circles. In this design, a single group of learners participated in the study without a comparison or control group because the intervention was implemented in a remedial class only. The design involves measuring learners' achievement levels in circles before and after the intervention to determine if there was a significant change in their understanding and performance due to the implementation of the Station Rotation Model. The study used a quantitative with a qualitative support. The quantitative were obtained from the one-group pretest-posttest to assess the effectiveness of Station Rotation Model application in Grade 10 learners' achievement levels in learning radicals. Using this design, learners were assessed before and after the use of the intervention in order to identify any changes in their understanding and performance in circles. On the other hand, the qualitative data were obtained from the response on the interview guide questionnaire and was analyzed through thematic analysis.

2.2. Participants of the Study

The participants of the study are the Grade 10 learners in Iligan Capitol College which was selected through purposive sampling. Purposive sampling was used to choose these specific learners because the remedial program's goal was to meet their needs and that the participants have meet the same criteria that is; they are enrolled in Grade 10 and is currently studying circles in the second quarter. There were 26 participants of the study, they were the identified learners who required additional support, making them the only appropriate group for the intervention. The selected group of learners underwent both pre-test and post-test assessments to measure the effect of the intervention on their achievement levels. The data gathered during the course of conduct of the study was coded appropriately and there were 26 participants in the study. Since the study is comprised only with one group, it will be coded as "L1" which represents 'Learner 1'.

2.3. Research Instruments

The study used the following research instruments:

2.3.1. Achievement Questionnaire

This is a researcher-made multiple choice test questionnaire following the table of specification. This was used to assess learners' understanding of circles. The coverage of the test includes the topics covered for the duration of the study which are: parts of a circle, CA-IA postulate, minor and major arcs, arc addition postulate, arc length, inscribed angle theorem, semicircle theorem, inscribed angle in the same arc, and inscribed quadrilateral. These topics were given by the resource teacher which was covered for the two weeks discussion. The same test was used in both the pre-test and post-test to reliably measure any improvement in learners' knowledge after the intervention. The test questionnaire was evaluated beforehand by two in-service teachers and the resource teacher. A dry-run was conducted at Acelo C. Badelles, Sr. Due to its availability, it was given to forty (40) grade 11 students at Memorial High School. An item analysis was also carried out. After item analysis and expert validation, the researcher's initial 50-multiple-choice test was reduced to 30 items in the final questionnaire. The researcher used the feedback that was received during the pre-evaluation to polish the instrument and make it prepared for use.

2.3.2. Interview Guide Questionnaire

The interview guide questionnaire was made by the researcher that consists of open-ended questions relevant to the study. This interview questionnaire served as a reference for assessing the learners' experiences with the station rotation model and to get their insights after the implementation. These guide questions were evaluated by two in-service teachers and the resource teacher.

2.4. Intervention

The overall procedure of the study consisted of three parts: Before Intervention, During Intervention, After Intervention.

2.4.1 Before Intervention

A letter had been prepared addressed to the Director for Academic Affairs and to the school principal of Iligan Capitol College, asking for permission to conduct the study in Grade 10 level guarantee the credibility of the research process. Consent and assent letters was also given to the learners.

Before the intervention, a pre-test was conducted to assess the initial understanding and achievement levels of the Grade 10 learners in relation to circles. This baseline assessment includes topics such as the parts of a circle, CA-IA postulate, minor and major arcs, arc addition postulate, arc length, inscribed angle theorem, semicircle theorem, inscribed angle in the same arc, and inscribed quadrilateral.

This phase includes an orientation session to introduce the station rotation model to the learners and explain the expectations for each station. This preparation ensures that learners understand the upcoming learning sessions.

2.4.2. During Intervention

During the intervention, it involves the implementation of the station rotation model over several sessions for two (2) weeks only. During which, learners rotated through different stations, each offering a unique mode of learning to support the understanding of circles. The intervention was carried out using Google Classroom which served as the platform for distributing materials, managing assignments, tracking student progress and managing learning activities.

Online Station

At the online station, students accessed a variety of digital resources embedded in Google Classroom. This station utilized tools such as CK-12 Foundation Flexbook, Edpuzzle, and Quizizz to provide interactive and personalized learning experiences. CK-12 Flexbooks offered students access to digital textbooks with embedded videos, simulations, and practice exercises tailored to their individual learning needs. Flexi, an AI tutor within the CK-12 platform, provided personalized feedback and practice problems to help students progress at their own pace. Additionally, Edpuzzle was used to enhance video-based learning by embedding interactive questions at key points in instructional videos, allowing students to actively engage with the content, receive immediate feedback, and track their understanding of concepts related to circles. Quizizz was also used to create engaging, game-based quizzes, allowing students to test their knowledge in a fun, competitive environment. The immediate feedback from Quizizz helped students identify areas for improvement. These tools, integrated through Google Classroom, supported self-paced learning and gave students opportunities to revisit concepts anytime.

Teacher-Led Station

At the Teacher-Led Station, the focus was on direct instruction, where the teacher guided students through key concepts related to circles. The teacher used traditional methods, such as discussions, examples, and Q&A sessions, to ensure clarity and understanding. To enhance the learning experience, Geogebra simulations were used during the discussions, providing dynamic, visual representations of geometric concepts. For example, during the discussion of the parts of a circle, Geogebra was used to illustrate these components interactively, allowing students to manipulate and explore the relationships between them. This integration of technology helped bring abstract concepts to life, promoting a deeper understanding and engagement with the material.

Collaborative Learning Station

At the collaborative learning station, students worked in small groups to tackle problems and explore key concepts related to circles. Each group collaborated on tasks, discussing their approach and solutions to the given problems. To facilitate interaction and peer feedback, Padlet was also used as a digital platform where groups uploaded their completed work. This allowed students to share their solutions and reflections with their peers in real time. Additionally, students were encouraged to critique and comment on the work of other groups, fostering a collaborative environment where they could provide constructive feedback and learn from one another. This use of Padlet not only encouraged teamwork but also promoted critical thinking and deeper engagement with the material, as students actively reflected on and evaluated their peers' work.

Each station was implemented on different days to ensure that students experienced a variety of learning methods throughout the intervention. One day was dedicated to the Teacher-Led Station, where the researcher provided direct instruction and used Geogebra simulations to explain the parts of a circle. On another day, learners participated in the Collaborative Learning Station, where they worked in groups to solve a problem and used Padlet to upload and critique each other’s work. The Online Learning Station was conducted on a separate day, utilizing digital resources like Quizizz where they actively participated as a whole class. Additionally, there was one day where students rotated through all three stations in a single session. Each station was allocated a fixed time of 15 minutes, allowing students to experience a brief yet focused exposure to each type of learning environment before rotating to the next station. For this specific day, one station utilizes the ck-12 flexbook, the other station requires them to answer independently, and lastly, one station where they solved a problem as a group.

2.4.3. After Intervention

A post-test identical to the pre-test was administered; however, the sequence of the questions was shuffled. This is to assess any changes in learners' achievement levels after the intervention and for determining the effect of the station rotation model on learners' understanding of circles.

2.5. Data Analysis

Both qualitative and quantitative methods were used to assess the participants' degree of achievement. The accomplishment test gave the quantitative data, while the results from the interview provided the qualitative data. The table below was utilized for the interpretation of data. This acts as basis to identify and establish the description they belong to.

Table 1. Achievement Level Interpretation

Achievement Test Score	Percentage	Achievement Level Interpretation
26-30	90% above	Outstanding
23-25	85% - 89%	Proficient
21-22	80% - 84%	Approaching Proficient
18-20	75% - 79%	Developing
0-17	Below 74%	Beginning

Note: From https://www.ciit.edu.ph/k-to-12-grading-system/DO_s2015_08

With a passing average of 75 percent, the table indicates the achievement test score ranges, percentages, and achievement level interpretation. This is based on the transmuted K-12 curriculum grading system, DepEd Order No. 8 Series 2015. The score ranges are set based on the number of items on the achievement test given with the lowest interval 0-17 classified as 'Beginning' and the highest interval of 26-30 classified as 'Outstanding'. This table will be used to determine the classification of the learners' achievement level from the result on their achievement test scores.

The researcher employed several statistical tools to examine the acquired data. First, the Mean and Standard Deviation were used to quantify the average accomplishment level of the participants and to identify the index of variability or the dispersion of the learners' scores in the achievement test. Next, the Wilcoxon Signed-Rank Test was utilized to compare the pre-test and post—test scores of the learners and determine whether there is a significant difference in learners' achievement levels in circles before and after the intervention. Thematic analysis was also employed to examine the qualitative data obtained from the learners' insights following the study's execution. In order to find recurring themes—topics, concepts, and patterns of meaning—the researcher carefully reviewed the data.

3. RESULTS AND DISCUSSION

This chapter presents and discusses the data analysis and findings of the results based on the order of the objectives of the study.

3.1. Achievement Level

The researcher-made achievement questionnaire was given to the participants as a pretest and posttest to determine the learners' achievement levels. There are a total of 26 participants in the study.

Table 2. Learners' Achievement Level Interpretation

Achievement Test Score	Pretest	Posttest	Achievement Level Interpretation
26-30 *(90% above)*	0	3	Outstanding
23-25 *(85% - 89%)*	0	10	Proficient
21-22 *(80% - 84%)*	0	6	Approaching Proficient
18-20 *(75% - 79%)*	0	1	Developing
0-17 *(Below 74%)*	26	6	Beginning

Table 2 shows the detailed presentation of the learner's achievement level with its corresponding range scores from the learner's pretest and posttest results. It can be seen that the pretest scores of the learners range from 0-21, which means that they are all at the "Beginning" level as stated in the achievement level classification. This indicates that prior to the intervention, all learners were performing below the 74% threshold. For the posttest results, it showed three (3) learners under the "Outstanding" level, ten (10) learners under the "Proficient" level, six (6) learners under the "Approaching Proficient" level, one (1) under the "Developing" level, and six (6) learners under the "Beginning" level. The results show that learners had higher result in the posttest in terms of the achievement levels after the intervention. While progress is evident, there is still a number (6) of learners remain in the Beginning category, indicating the need for continued or differentiated support for struggling learners.

Table 3. Comparison of Pretest and Posttest Results for Learners' Achievement

	Mean	Std. Dev.	Interpretation
Pretest	11.85	2.92	Beginning
Posttest	21.54	4.47	Approaching Proficient
Total	16.70		Beginning

Table 3 presents the learners' achievement levels in circles based on their pretest and posttest scores for a sample size of n=26. The mean pretest score of 11.85, with a standard deviation of 2.92, indicates that most learners had similar low scores, placing them at the "Beginning" achievement level and reflecting limited prior knowledge or skills in circles. In contrast, the posttest results show a marked improvement, with a mean score of 21.54 and a higher standard deviation of 4.47, indicating greater variability in learners' performance. The posttest mean score corresponds to the "Approaching Proficient" achievement level, demonstrating significant progress in learners' understanding and skills. The shift from the "Beginning" to the "Approaching Proficient" level highlights the effectiveness of the instructional intervention in enhancing learners' achievement in circles.

These findings align with previous research on the efficacy of the station rotation model in blended learning. A study from Staker and Horn [17] highlighted that station rotation allows for varied instructional methods, including teacher-led, collaborative, and independent work, which promote deeper understanding and skill acquisition. Additionally, Kazu and Demirkol [18] emphasized that the use of varied teaching strategies and tools in blended learning environments significantly improves learners' achievement levels. The study in Mondragon and Acelajado [19] reported significant increases in Grade 10 learners' mathematics performance after implementing a station-rotation approach, similar to the improvement observed in the present study. These studies collectively support the potential of the station rotation model to positively influence learning outcomes and elevate learners' achievement levels, especially in structured topics like circles.

3.2. Difference between Pretest and Posttest Mean Scores

The Wilcoxon Signed Ranks Test, a nonparametric statistical method, was utilized for data analysis to determine the difference between pretest and posttest mean scores.

Table 4. Wilcoxon Signed Ranks Test on Pretest and Posttest

Posttest-Pretest	N	Mean Rank	Sum of Ranks	Z	Sig.
Negative Ranks	0	.00	.00	-4.382	0.001
Positive Ranks	25	13.00	325.00		
Ties	1				
Total	26				

The Wilcoxon Signed-Ranks Test was conducted to determine whether there was a significant difference in learners' achievement levels between the pretest and posttest scores. The results showed that all 25 learners exhibited positive ranks (improved scores in the posttest compared to the pretest), with a mean rank of 13.00 and a sum of ranks of 325.00. There were no negative ranks, indicating no decline in scores among the learners, while one case was tied. The calculated Z-value was -4.382, and the associated significance level (p) was 0.001, which is less than the standard alpha level of 0.05.

This result indicates a statistically significant difference in learners' achievement levels between the pretest to the posttest, suggesting that the intervention, the station rotation model, may have had a positive effect on their learning outcomes. This finding also aligned with the study where there are significant differences in learners' achievement after the intervention using blended learning type of Station Rotation Model [20]. This shows that there is a positive influence on learners after the engaged learning activities. Similar findings were presented by the study in Akinoso et al. [10], showed that secondary students taught using the station rotation model performed significantly better than those receiving traditional instruction. Recently, Egara and Mosimege [21] reported that blended learning produced substantial gains not only in mathematics achievement but also in retention of knowledge among secondary learners. Further supporting evidence from Mustafa and Cimen [22] showed that structured blended learning environments significantly enhanced students' geometry achievement and retention, demonstrating the strength of scaffolded, station-like instructional designs in conceptual subjects. Comparable results were documented by Mohammed and Abdulrahman [23], whose study revealed that station-based blended learning led to higher mathematics achievement, stronger independence, and improved collaboration skills among learners. Finally, a review by Larsari et al. [24] showed that the Station Rotation Model encourages active learning, engagement, and better performance when used well.

The review of previous studies showed that the station rotation model of blended learning had positive effects on learners' accomplishment, which raises the possibility of employing this model for future research. These findings are quite encouraging, and future research could develop and use this model.

3.3. Insights from the Learners' Experience after the Intervention

The qualitative data gathered in this study provide meaningful insights into the participants' experiences following the implementation of the station rotation model. Participants shared their insights on the effectiveness of the model, its effect on their understanding of the concepts, and their overall learning experience. This section presents the key themes that emerged from their responses, highlighting both the benefits and challenges encountered during the process.

Table 5. Overall Experience with the Station Rotation Model

Themes	Sample Responses
Positive Experiences with Group Collaboration	*"It was a great feeling when we all worked together and shared what we know about the topic to help each individual in the group to learn more." (L9)* *"I found that working with others as a group is beneficial as it allowed us to discuss our interpretations of the problems/activities." (L19)*
Benefit of Understanding and Analyzing Problems	*"In my experience, the most beneficial for my learning is the improvement of my confidence in answering some of the question, even though sometimes its incorrect I find it really useful because each wrong or incorrect answer I get, I always learn." (L1)* *"I believe that the 2nd station helped me significantly, as it clarifies some points of the topic that I wasn't able to understand." (L19)*
Positive Learning Experience through Different Activities	*"It helped my understanding of the topic when we moved to the 2nd and 3rd stations because we faced hard questions and discussed it as a group and learned on how to solve the problem." (L13)*
Teacher Support	*"It impacted my understanding because our teacher always checks the group to help us understand the question and keep us on track. I understand it better because of her explanation." (L21)*
Enjoyment and Motivation	*"It was fun and enjoyable. At the same time, it is challenging which makes it more fun." (L2)* *"It helped me to understand it clearly because the more I participate in that quizziz it motivates me to study and understand." (L24)*

Table 5 shows the insights of the learners on the overall experience of the station rotation model. The learners reflected positively on the station rotation model, with many highlighting the importance of group collaboration as a key benefit. Working together allowed learners to share knowledge, clarify concepts, and deepen their understanding, making learning more effective. The benefit of understanding and analyzing problems was another significant theme, as learners felt the model improved their problem-solving skills and boosted their confidence, even when they encountered incorrect answers. learners appreciated the variety of activities in the model, including discussions, quizzes, and hands-on problem-solving, which kept them engaged and motivated. Teacher support and explanations were also crucial, as they helped learners correct mistakes and solidify their understanding. Overall, the model provided a fun and interactive learning environment, increasing student motivation and engagement in the learning process.

Table 6. Likes or Dislikes about the Structure of the Station Rotation Model

Themes	Sample Responses
Positive Experience with Station Rotation	*"The moment where we play the quizizz in the TV, I learn many things even the wrong ones. So overall, the two weeks experience was really great, I liked every single activity that ma'am Ferry provided." (L1)* *"The station rotation affected me greatly and helped me get a better understanding of the topic. I liked that fact that I was able to answer activities immediately based on the material that was provided for us, as a way of testing my understanding." (L19)*
Flexibility and Access to Resources	*"I think I like the way that you can always watch or see it again in app but dislike is if you don't have a phone, you cannot watch or see." (L17)* *"I think I like that you can access the resources again in the google classroom." (L2)*

Table 6 shows the learner's responses on what they like or dislike about the Structure of the Station Rotation Model. The positive experience with station rotation was highlighted by the majority of learners, with many appreciating the engaging and interactive activities at each station. The model made learning more enjoyable and effective by using different types of materials, such as videos and online resources, which helped learners better understand topics. However, some learners mentioned the challenges with flexibility and access to resources, noting that without proper devices, they couldn't fully benefit from the online resources. Despite this, most learners found the ability to revisit content through videos and online tools a major advantage. This matches what the study in Freiermuth and Ito [25] found. They discovered that students saw station-rotation learning as enjoyable, motivating, and useful for grasping complex topics because of the different activities included.

Table 7. Challenges Faced and How They Overcome Them

Themes	Sample Responses
Difficulty in Understanding Problems	*"My inability to understand the questions, I overcome it with the help of my peers. They explained it in a matter that I could understand which I am very thankful for." (L7)* *"Well, the problems were difficult but we found the solution and answered it through discussions and teamwork and with the help of our teacher." (L9) "*
Time Constraints	*"The challenge was the time limit given by the teacher. We overcome it by solving quickly." (L15)*
Need for Collaboration and Teamwork	*"When our group forgot something to our solution and the main reason we are close on getting the answer incorrectly, but we analyzed it and were able to correct our answer." (L12)* *"Trying to understand the problem. I shared my thoughts with my group by telling them what I don't understand." (L13)*
Access to Devices	*"The links online are really good but if you don't have cellphone or PC, you can't open them." (L2)*

Table 7 shows the learners' challenges faced during the implementation and how they overcome them. Learners faced various difficulties in understanding problems, particularly when encountering those tricky and difficult problems. However, many overcame these challenges by relying on teamwork and peer support, which was critical in solving problems. Teacher explanations and guidance were also highly valued in helping learners understand challenging problems. Some learners felt the time pressure at each station was a significant challenge, requiring them to solve problems quickly, but they overcame this by working more efficiently. Additionally, another issue identified was the reliance on devices such as cellphone to access resources, which could create limitations for learners without access to such devices. This aligns with the findings of the study in Vo et al. [26], whose meta-analysis showed that collaborative learning within blended environments significantly enhances students' understanding and problem-solving abilities.

Table 8. Activities They Find Effective

Themes	Sample Responses
Online Resources and Videos	*"The website that was provided to us was very helpful since it has all the information we needed when we don't know something, and flexi is there to help." (L9)* *"Being provided with learning materials (video), was of great help since it has examples and many other teachings." (L3)*
Simulations and Visual Tools	*"The simulation on the first day of discussion was interesting and easier for me because it showed clear representation of the parts of a circle." (L15)* *"It gave us a clear visual of the lessons." (L8)*
Interactive Activities (Quizzes and Flexbook)	*"It helps me to understand it clearly because the more I participate in that quizziz, it motivates me to study and understand to get the right answer." (L21)* *"Katong quiz nga murag game and katong murag AI nga kuan, kay nindot siya ma challenge ka and ma-answer sa AI imong wala na understand." (L18)*
Collaborative Activity	*"It was a great feeling when we all worked together and shared what we know about the topic to help each individual in the group to learn more." (L9)* *"I feel really refreshed because finally I can ask someone for help. The collaboration is really effective because we helped each other out." (L1)*

Table 8 shows the activities that the learners' find effective. Learners found online resources and videos to be highly effective in enhancing their understanding of mathematical concepts, as they allowed them to learn at their own pace and revisit the material as needed. Simulations and visual tools provided clear representations of abstract concepts, such as the parts of a circle, which made them easier to grasp. Interactive activities, such as Quizizz and math apps, were particularly engaging and helped learner's practice concepts in a fun, gamified format. Many learners expressed positive emotions, such as happiness and excitement, when working with peers, appreciating the supportive and enjoyable atmosphere. Collaboration was seen as an effective way to clarify concepts, learn new things, and share knowledge within the group. Overall, these resources contributed to improving comprehension, application, and problem-solving skills, making learning both enjoyable and effective.

Table 9. Learners' Comparison between Station Rotation and Traditional Learning Methods

Themes	Sample Responses
Interactivity and Engagement	*"The station rotation was more fun and exciting than the traditional ones. What stood out was that we were able to move around the classroom and open other materials besides the book unlike the traditional method." (L15)* *"They are both good, but station rotation model is enjoyable and much better." (L6)*
Collaborative Learning	*"It encouraged us to work together and be closer as a team. I personally think this kind of activities will teach us a lot better because it's also fun and exciting." (L8)*
Unique Learning Experience	*"The station rotation model was more exciting since it is unique and fun." (L9)* *"In traditional learning methods, I find that it is more difficult to understand topic as it first teaches you the lesson before immediately letting you answer activities, whereas in station rotation, you are able to compare your answers based on the activity from before you were taught the lesson." (L19)*
Preference for Traditional Learning	*"Traditional learning method is great because it helps you gain more knowledge but station rotation model is also good." (L24)* *"Maybe, or maybe not. While this station rotation was fun, it was very time-consuming." (L11)*

Table 9 shows that most learners found the station rotation model to be more interactive and engaging compared to traditional learning methods. The ability to move between stations, use different materials, and collaborate with peers made the model stand out as a more enjoyable and dynamic way to learn. Collaborative learning was highlighted as a major difference, with Learners valuing the teamwork and peer support that helped them understand complex topics. The unique learning experience provided by the station rotation model, which combined other activities with online resources, made it a memorable and impactful learning experience. However, a small group of learners still preferred traditional learning methods for their structured approach and concern with the time.

Similar results were observed in a study in Yılmaz and Açıkgül Fırat [27], where the learners expressed positive sentiments, stating that they learned better in the teaching process, found the lessons enjoyable, acquired independent learning skills, gained different perspectives, improved their peer teaching and collaboration skills, and experienced increased interest in the subjects. Similarly, Tanjung and Fahmi [28] discovered that by enabling students to collaborate and work independently across stations, SRM enhanced students' conceptual understanding and promoted active learning. Additionally, Sari and Sutopo [29] noted that rotation-based blended learning improved participation, raised student motivation, and made the classroom more engaging. The study in Aksak Kömür et al. [30] found that station-rotation environments encourage learners' autonomy, engagement, and meaningful dialogue, despite potential difficulties like space constraints, time management, and station transitions. However, they also reported negative experiences, such as limited classroom space, issues during station transitions, and insufficient time. This comparison suggests that while the station rotation model has the potential, careful attention is needed to address practical issues. The mixed responses emphasize the need for continuous refinement and adaptation of the model to meet the diverse needs of students.

The improvememt in learners' achievement as a result in this study is consistent with research showing that structures blended learning environments enhance lmathematical understanding by combining multiple instructional modalities. According to Clark-Wilson et al. [31], blended learning environments that purposefully incorporate technology, peer interaction, and teacher guidance foster better learning outcomes and deeper cognitive engagement. Visualization and dynamic representations are essential for promoting conceptual understanding in geometry education [32]. Using dynamic geometry software greatly enhances students' capacity for geometric relationship reasoning. In a comparable manner, Sinclair and Yerushalmy [33] argued that technology-enhanced geometry learning environments enable students to explore abstract concepts more meaningfully especially when directed by structured instructional design. By making geometric relationships more explicit and manipulable, the integration of GeoGebra and interactive online tools in the current study probably aided learners' conceptual development in circles.

Additionally, it has been demonstrated that collaborative learning integrated into blended learning environments improves students' mathematical communication and problem-solving abilities. Cooperative learning structures encourage higher achievement when students participate in peer explanation and shared problem-solving [34]. This reinforces the qualitative results of the current study, in which students stated that peer support and group discussions enabled them to overcome challenges in comprehending complicated problems. The observed improvement in learner achievement could also be explained by the Station Rotation Model's structured nature. Effective mathematics instruction demands a clear task structure, prompt feedback, and opportunities for active engagement, all of which are present in well-designed station rotation environments [35]. Students are more likely to show sustained engagement and conceptual growth when learning activities are purposefully organized and in line with instructional objectives.

The results of this study have significant implications for curriculum designers, school administrators, and math teachers. The findings imply that structured station rotation can be a useful teaching method for geometry concepts. The study highlights that rather than relying solely on technology, schools should use clear instructional models to guide blended learning. The results emphasize how crucial it is for curriculum designers to incorporate teacher-led instruction, collaborative activities, and digital tools into a cohesive framework.

Despite its contributions, this study has limitations. It is more difficult to determine causal relationships when a one-group pretest-posttest design is used. The results' generalizability may also be affected by the intervention's brief duration and small sample size. Furthermore, the study was limited in its applicability to other settings because it was carried out in a single school.

Future research may use experimental or quasi-experimental designs with control groups to support causal conclusions. It is also recommended to conduct research with bigger sample sizes, longer intervention times, and several schools. The implementation of AI-supported tools into station rotation models and their effects on other mathematics topics may also be explored in future research.

4. CONCLUSION

The findings of this action research show that there is an improvement in the achievement levels of Grade 10 learners in the topic of circles after the implementation of the station rotation model as an instructional intervention implying that the intervention strengthened conceptual understanding and contributed to learning gains. This is an indication of a remarkable improvement in their knowledge and ability to solve problems, further supported by a statistically significant result ($p = 0.001$) in the Wilcoxon Signed-Rank Test. This shows that incorporating technology-based learning, collaborative tasks, and teacher-led instruction into a structured framework can improve students' academic performance.

Learners' experiences further showed positive perceptions of the Station Rotation Model. Qualitative data also emphasized that the model allowed collaborative learning, increased engagement through interactive activities, and valued on the support of teachers in clearing up complex problems. Students liked group discussions and receiving individualized feedback, as these made them feel more confident and better understand. It was the diversity of methods that the station rotation model incorporated, such as online resources, simulations, and group activities, which would appeal to different preferences in learning and make the process more enjoyable.

Despite these positive results, there are also challenges faced during the intervention. Among them are time constraints, resources not accessible due to limited access on devices, indicating areas for improvement in the implementation of the station rotation model. In light of these results, math teachers are encouraged to consider about utilizing the Station Rotation Model, especially for subjects requiring for a deep conceptual understanding. Adequate instructional time, flexible station design, and improved device access should be taken into consideration to address issues like time constraints and limited accessibility to digital resources. Future studies could look at how this model can be utilized to various mathematical topics, grade levels, and learning environments, as well as how it affects student engagement, critical thinking, and self-regulated learning.

ACKNOWLEDGEMENTS

The authors extend their deepest gratitude to their professor for the invaluable guidance, encouragement, and professional insights provided throughout the conduct of this study. Sincere appreciation is also given to DOST-CBPMSE for the funding and support that made this research possible. The authors likewise express their heartfelt thanks to Iligan Capitol College for serving as the participating school and for their cooperation during the implementation of the study.

REFERENCES

[1] F. Z. Azizan, "Blended Learning in Higher Education Institution in Malaysia," in *Proc. Regional Conf. on Knowledge Integration in ICT*, 2010, pp. 454–466.

[2] G.-J. Hwang and C.-L. Lai, "Facilitating and bridging out-of-class and in-class learning: An interactive e-book-based flipped learning approach for math," *Educ. Technol. Soc.*, vol. 20, no. 1, pp. 184–197, 2017.

[3] A. Sahin, N. Top, and I. Delen, "Impact of interactive technology tools in mathematics classrooms," *J. Comput. Math. Sci. Teach.*, vol. 35, no. 3, pp. 219–239, 2016.

[4] C. R. Graham, "Emerging practice and research in blended learning," in *Handbook of Distance Education*, M. G. Moore, Ed. New York, NY: Routledge, 2013, pp. 333–350.

[5] M. B. Horn and H. Staker, *Blended: Using Disruptive Innovation to Improve Schools*. San Francisco, CA: John Wiley & Sons, 2014.

[6] S. Samritin, A. Susanto, A. Manaf, and J. Hukom, "A meta-analysis study of the effect of the blended learning model on students' mathematics learning achievement," *J. Elemen.*, vol. 9, no. 1, pp. 15–30, 2023.

[7] A. Alammary, "Blended learning models for introductory programming courses: A systematic review," *PLOS ONE*, vol. 14, no. 9, p. e0221765, 2019.

[8] N. F. Ayob, N. D. Halim, N. N. Zulkifli, N. M. Zaid, and M. Mokhtar, "Overview of Blended Learning: The Effect of Station Rotation Model on Learners' Achievement," *Journal of Critical Reviews*, vol. 7, no. 6, 2020. doi: 10.31838/jcr.07.06.56.

[9] C. Dziuban, C. R. Graham, P. Moskal, A. Norberg, and N. Sicilia, "Blended learning: The new normal and emerging technologies," *Int. J. Educ. Technol. High. Educ.*, vol. 15, no. 1, p. 3, 2018.

[10] S. O. Akinoso, A. A. Agoro, and O. M. Alabi, "Effect of station rotation mode of instructional delivery for mathematics in the era of advancing technology," *J. Int. Soc. Teach. Educ.*, vol. 24, no. 2, pp. 60–72, 2020.

[11] B. Means, Y. Toyama, R. Murphy, M. Bakia, and K. Jones, "The Effectiveness of Online and Blended Learning: A Meta-Analysis of the Empirical Literature," *Teachers College Record*, vol. 115, no. 3, pp. 1–47, 2013.

[12] M. Saritepeci, "The effect of blended learning environments on academic achievement, learning motivation, and retention," *Educ. Inf. Technol.*, vol. 24, no. 2, pp. 1331–1352, 2019.

[13] D. H. Clements and M. T. Battista, "Geometry and spatial reasoning," in *Handbook of Research on Mathematics Teaching and Learning*, D. A. Grouws, Ed. New York: Macmillan, 1992, pp. 420–464.

[14] A. A. Truitt, "A case study of the station rotation blended learning model in a third-grade classroom," *Dissertations*, Univ. of Northern Colorado, 2016.

[15] M. Tremmel, "The effects of a station-rotation model of blended learning on student engagement," *Graduate Research Papers*, Univ. of Northern Iowa, 2018.

[16] D. Indrapangastuti, H. D. Surjono, Sugiman, and B. E. Yanto, "Effectiveness of the blended learning model to improve students' achievement of mathematical concepts," *J. Educ. e-Learn. Res.*, vol. 8, no. 4, pp. 423–430, 2021.

[17] H. Staker and M. B. Horn, *Classifying K–12 Blended Learning*. Innosight Institute, 2012.

[18] I. Y. Kazu and M. Demirkol, "Effect of blended learning environment model on high school learners' academic achievement," *The Turkish Online Journal of Educational Technology*, vol. 13, no. 1, pp. 78–87, 2014.

[19] M. C. Mondragon and M. J. Acelajado, "Blended learning station-rotation model: Effects on Grade 10 students' performance in and attitude toward mathematics," in Proc. Asian Technol. Conf. Math., 2018.

[20] N. F. Ayob, N. D. Halim, and N. N. Zulkifli, "Effect of Blended Learning Using the Station Rotation Model Towards Learners' Achievement in Learning Chemistry," *Innovative Teaching and Learning Journal*, vol. 4, no. 1, pp. 29–40, 2020.

[21] F. O. Egara and M. Mosimege, "Effect of blended learning approach on secondary school learners' mathematics achievement and retention," *Educ. Inf. Technol.*, 2024. doi: 10.1007/s10639-024-12651-w.

[22] M. Mustafa and O. Cimen, "Effects of blended learning environment on students' geometry achievement and retention," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 15, no. 8, pp. 1–12, 2019.

[23] Z. Mohammed and K. Abdulrahman, "Effect of station-based blended learning on students' mathematics achievement and engagement," *Int. J. Emerg. Technol. Learn.*, vol. 16, no. 5, pp. 112–127, 2021.

[24] V. N. Larsari, R. Dhuli, and H. Chenari, "Station rotation model of blended learning as generative technology in education: An evidence-based research," in *Digital Technologies and Applications*, LNNS 668, Springer, 2023, pp. 441–450.

[25] M. Freiermuth and M. Ito, "Student perceptions of station rotation learning," *Educ. Technol. Res. Dev.*, vol. 68, no. 5, pp. 2347–2365, 2020.

[26] H.-X. Vo, C. Zhu, and A. N. Diep, "The effect of blended learning on student performance: A meta-analysis," *Educ. Technol. Res. Dev.*, vol. 65, no. 3, pp. 593–611, 2017. doi: 10.1007/s11423-016-9484-2.

[27] Y. Yılmaz and E. Açıkgül Fırat, "Station-rotation blended learning model in science education: A case study for rural classrooms," *International Journal of Science Education*, pp. 1–28, 2024. doi: 10.1080/09500693.2024.2394707.

[28] R. Tanjung and S. Fahmi, "Implementing rotation model-based blended learning in mathematics: Effects on students' conceptual understanding," *J. Phys. Conf. Ser.*, vol. 1882, p. 012058, 2021.

[29] D. R. Sari and H. Sutopo, "The effect of blended learning using rotation model on student learning outcomes," *J. Educ. Learn.*, vol. 12, no. 4, pp. 643–650, 2018.

[30] S. Aksak Kömür, G. Aksoy, and S. Demir, "Evaluation of station rotation model as a blended learning approach in secondary education," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 19, no. 8, pp. 1–15, 2023.

[31] A. Clark-Wilson, O. Robutti, and N. Sinclair, *The Mathematics Teacher in the Digital Era: An International Perspective on Technology-Focused Professional Development*. Dordrecht, The Netherlands: Springer, 2014, doi: 10.1007/978-94-007-4638-1.

[32] R. M. Bernard, E. Borokhovski, R. F. Schmid, R. M. Tamim, and P. C. Abrami, "A meta-analysis of blended learning and technology use in higher education: From the general to the applied," *J. Comput. High. Educ.*, vol. 26, no. 1, pp. 87–122, 2014, doi: 10.1007/s12528-013-9077-3.

[33] N. Sinclair and M. Yerushalmy, "Digital technology in mathematics teaching and learning," in *The Second Handbook of Research on the Psychology of Mathematics Education: The Journey Continues*, A. Gutiérrez, G. C. Leder, and P. Boero, Eds. Rotterdam, The Netherlands: Sense Publishers, 2016, pp. 235–274, doi: 10.1007/978-94-6300-561-6_7.

[34] D. W. Johnson and R. T. Johnson, "Cooperative learning in the 21st century," *Anales de Psicología*, vol. 30, no. 3, pp. 841–851, 2014, doi: 10.6018/analesps.30.3.201241.

[35] I. Carneiro de Sousa and A. Pablo, "Is ICT contributing to a novel education quality? Report review: OECD (2015). *Students, Computers and Learning: Making the Connection*," *EWIAS Viewpoints*, vol. 2, 2015.

[36] M. Bond, K. Buntins, S. Bedenlier, O. Zawacki-Richter, and M. Kerres, "Mapping research in student engagement and educational technology in higher education: A systematic evidence map," *Int. J. Educ. Technol. High. Educ.*, vol. 17, no. 1, pp. 1–30, 2020, doi: 10.1186/s41239-019-0176-8.