

Increasing the Mastery Level of Multiplication Skills of Remedial Education Students Using the Multiplication Circle Template Method (Tapak Bulatan Sifir- Multiplication Circle Template)

Nurain Naquiah Ruslan

sayang_quiah@yahoo.com.my

Abstract

Multiplication is one of the four basic operations in Mathematics. Level 1 students often have difficulty understanding the concept of multiplication and are unable to complete the cipher sequence properly. A study was conducted to address this problem by using the Multiplication Circle Template innovation (Tapak Bulatan Sifir). The research conducted is to improve the students' level of understanding of the concept of the basic operations of multiplication and then forming ciphers. This study began with Remedial Education students at SK Batu Berendam and was later expanded to include students in mainstream classrooms. Based on the results of the analysis, the identified target group has demonstrated encouraging outcomes. The teacher's observations further reveal that the Multiplication Circle Template innovation not only improves students' academic performance in Mathematics, but it may additionally stimulate their interest in learning to master cyphers. This study is expected to be expanded to a higher level in order to assist teachers in providing more exciting teaching materials and learning aids to students.

Keywords: Mathematics, Multiplication Circle Template, Multiplication

Introduction of Best Practices

The concept of multiplication is the concept of repeated addition. The cypher will be formed by this repetitive process of adding. The teacher will introduce the fundamental notion of multiplication at the start of the lesson. The target group will then be introduced to Multiplication Circle Template. Multiplication Circle Template innovations can be used individually and in pairings. Other resources can be used to support the Multiplication Circle Template approach and make it more engaging.

Multiplication Circle Template is an idea of a small circle and a large circle that is created to assist students in constantly calculating the addition and is also used to write the addition to form a list of solutions for each cypher. To make Multiplication Circle Template more user-friendly and easier to erase and reuse, teachers utilise laminated paper. Multiplication Circle Template has also been developed into an innovation approach that can be used through gamification.

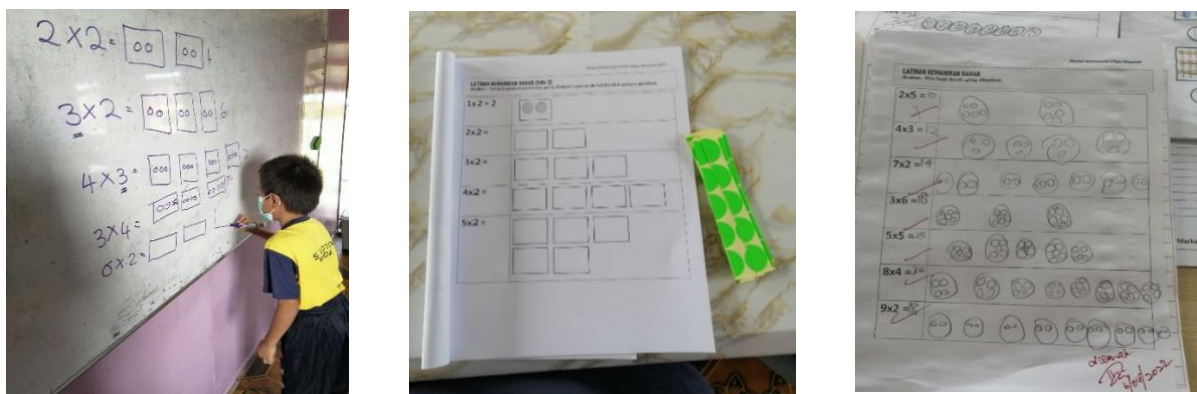
Justification of Best Practices Implementation

Based on my observations, I discovered that the target group does not understand the basic concept of multiplication operations. Furthermore, the document analysis results reveal that students from the identified target group frequently finish multiplication operations as well as addition operations. The teacher discovered that the students were confused between the multiplication and addition symbols based on this observation. According to my observations, the target group does not understand the idea of multiplication, also known as repeated addition. As a result, the target group's marks are significantly lower than those of other students.

Self-reflection also reveals that, as a special education teacher, I do not give engaging teaching and learning content for multiplication skills. I usually use worksheets and ICT material from the internet. In addition, I teach multiplication to my students using 'group' and 'member' approaches. Although this method is simple to learn, it takes a long time for student to draw and count when they arrive at the multiplication solution. Furthermore, the students frequently have difficulty saying their own numbers.

Figure 1

Teacher self-reflection (Students use the 'member' and 'group' method)



So I took the initiative to create relevant teaching approaches to assist students. Multiplication Circle Template innovation is a teaching method invention that has been turned into an instructional tool that can be used both individually and in groups. Furthermore, using the Multiplication Circle Template technique, students can engage in gamification and memory activities for multiplication abilities using digital materials.

This innovation addresses several issues, including:

- Increasing the mastery of basic multiplication concepts among Remedial Education students, as evidenced by improved scores after the intervention.
- Raising the number of Remedial Education students who master basic multiplication skills and reducing the number of students struggling with multiplication.
- Helping students improve their understanding of basic multiplication and addition concepts, which involve repeated addition.

Objective Implementation

The objectives of this innovation implementation are:

1. To enhance the mastery of basic multiplication concepts among Remedial Education students.
2. To increase the number of Remedial Education students who can correctly list basic multiplication facts.

Best Practices Implemented

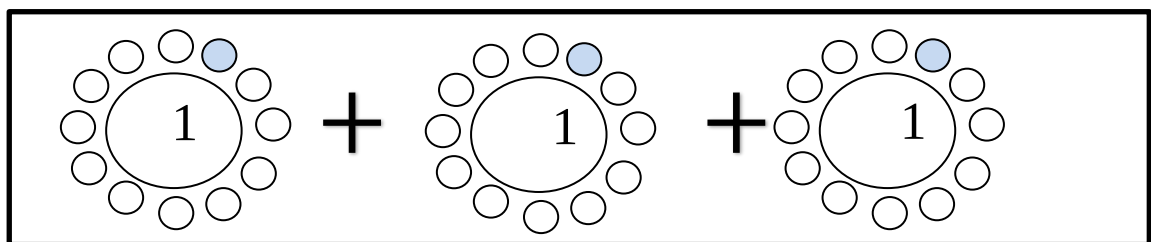
Target Group

The target intervention group consists of Year 4 Remedial Education students at SK Batu Berendam. A total of 15 students from Year 3 and Year 4 Remedial Education at SK Batu Berendam were selected as the target group. The selected students include 2 female students and 13 male students. This target group was chosen based on previous document analysis observations, which indicated that the students were struggling to master basic multiplication skills.

Innovation Guidelines

Various guidelines for using Multiplication Circle Template have been provided by teachers. Multiplication Circle Template can be used as a template for repeated calculations and a space to create complete ciphers. Below are guidelines for using Multiplication Circle Template, focusing on repeated addition for the number 1.

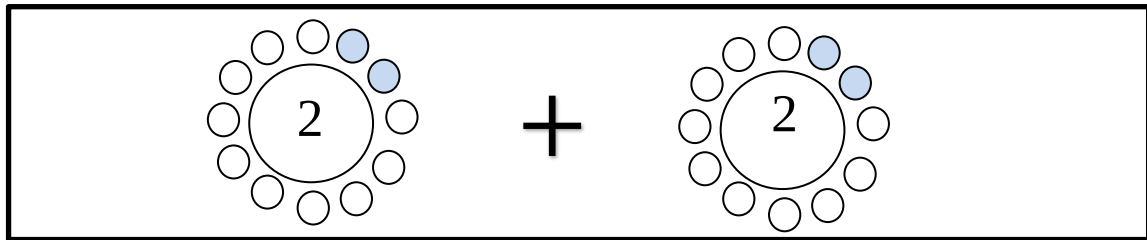
Figure 2
Repeated Addition Concept Using Multiplication Circle Template



Result of repeated addition: $1 + 1 + 1 = 3$. Therefore, the repeated addition is equivalent to $1 \times 3 = 3$

Similarly, repeated addition for the number 2 using Multiplication Circle Template can be explained:

Figure 3
Repeated Addition Concept Using Multiplication Circle Template for 2



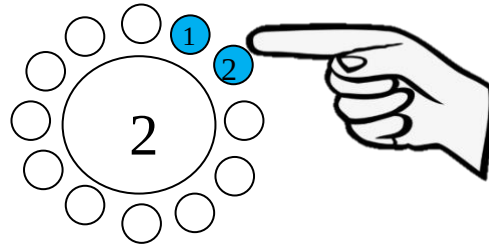
Result of repeated addition: $2 + 2 = 4$. Therefore, the repeated addition is equivalent to $2 \times 2 = 4$.

Teachers also introduce students to performing repeated addition using Multiplication Circle Template. Here are complete guidelines for using Multiplication Circle Template:

Table 1
Steps for Using the Multiplication Circle Template Innovation

Step	Description	Image
Step 1	Color the small circles according to the designated number.	
Step 2	Write the numerator in the large circle.	
Step 3	Calculate the sum of the colored circles in the small circle and write the answer in the large circle.	
Step 4	Use the sum in the large circle to add to the next circle.	

Step 5 To solve a given multiplication problem, place your finger or pen on the colored circle while counting.

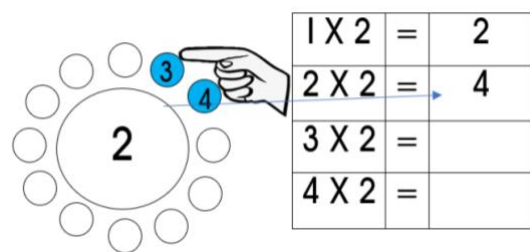


Step 6 Write the answer in the designated multiplication answer box.

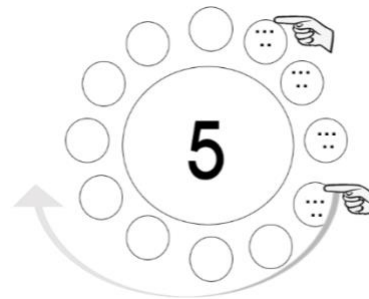
1 X 2	=	2
2 X 2	=	
3 X 2	=	
4 X 2	=	



Step 7 Use the same Multiplication Circle Template to calculate the next addition result. Write it in the provided multiplication answer box. Repeat and perform repeated addition until all multiplication facts are completed.



Step 8 Use Multiplication Circle Template for practice and mental math in the self-assessment section. Draw dots as numerators based on the given number. Complete the small circles with dotted numerators while Memorize the dot values for each small circle.



The Multiplication Circle Template innovation includes various support materials to make it more engaging and user-friendly.

Supporting Materials Include:

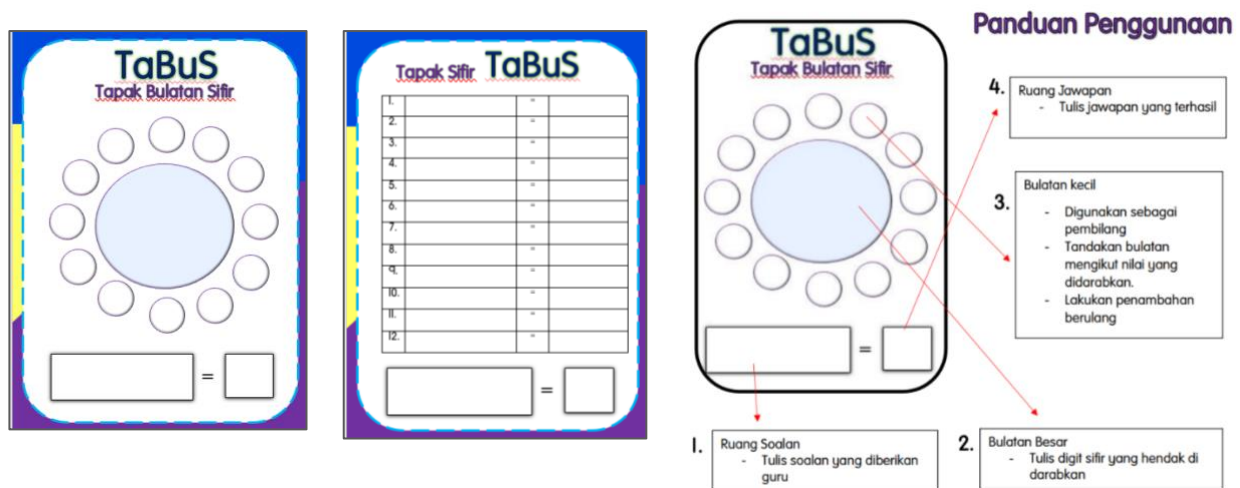
- a) Basic Multiplication Circle Template Concept Manipulative Set: This set includes colorful foam balls used to engage students in learning repeated addition concepts. It also stimulates their fine and gross motor skills to create Multiplication Circle Template circles. This manipulative set helps students grasp the basic multiplication concept using Multiplication Circle Template hands-on.

Figure 4
Basic Multiplication Circle Template Concept Manipulative Set



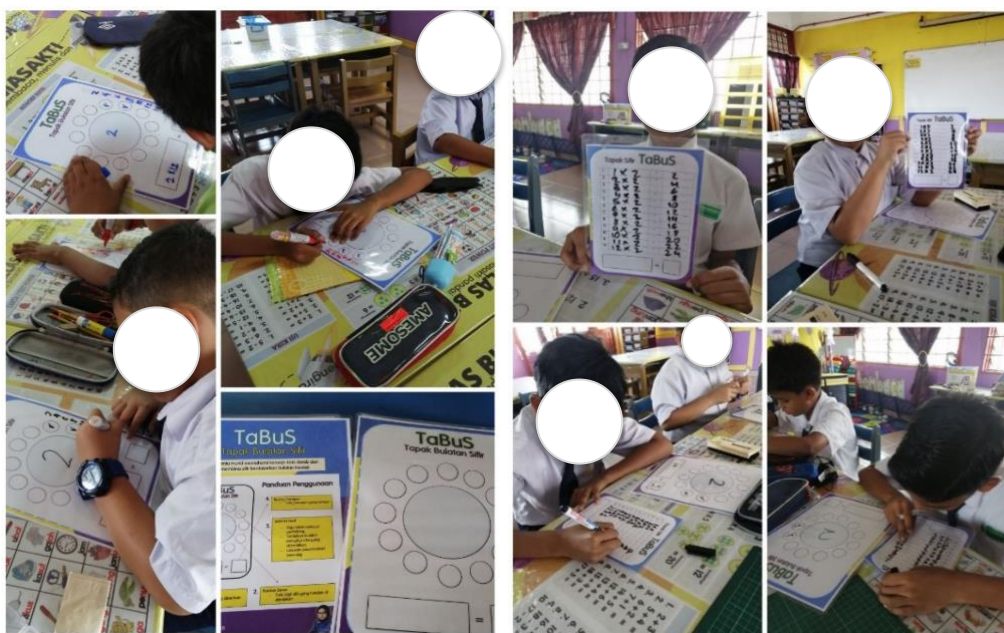
- b) Multiplication Circle Template Cards: After students understand the basic multiplication concept and how to use Multiplication Circle Template, they are given laminated Multiplication Circle Template cards. These cards are used to list multiplication answers.

Figure 5
Multiplication Circle Template Card



The small circles on the Multiplication Circle Template cards serve as numerators for students to calculate repeated addition and list answers for each multiplication fact. During teaching and learning sessions, students receive A4-sized Multiplication Circle Template cards and half A4-sized cards for activities. The teacher provides instructions, and then students work individually or in pairs.

Figure 6
Students' Activities Using Multiplication Circle Template Cards



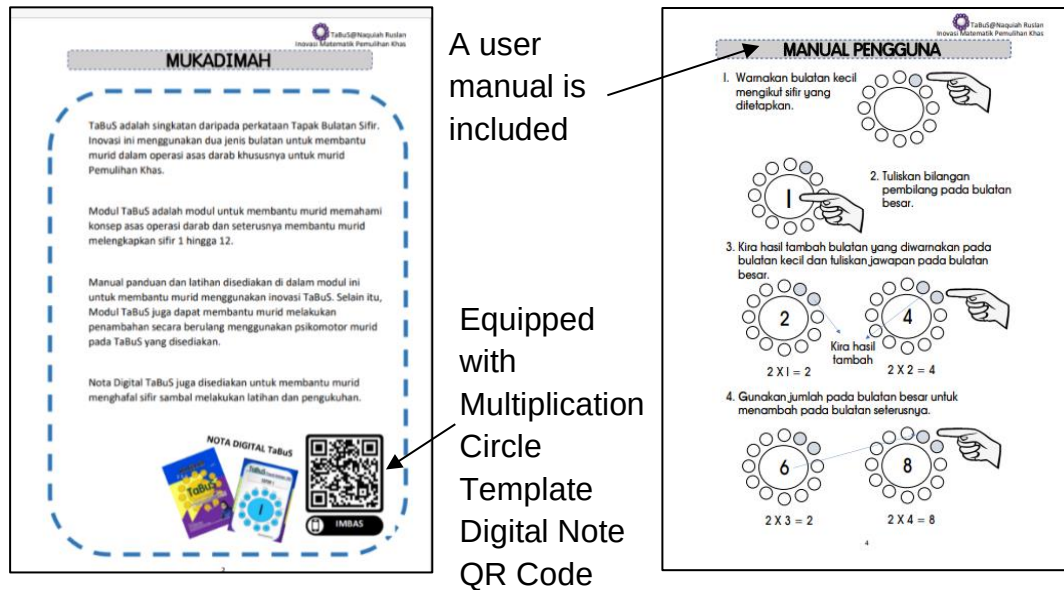
a) Module Multiplication Circle Template

The Multiplication Circle Template innovation also includes a module to facilitate practice and reinforce students' understanding after learning with Multiplication Circle Template.

Figure 7
Module Multiplication Circle Template



Figure 8
Usage Guidelines and QR Codes in the Multiplication Circle Template Module



Introduction to the basic concept of multiplication using Multiplication Circle Template

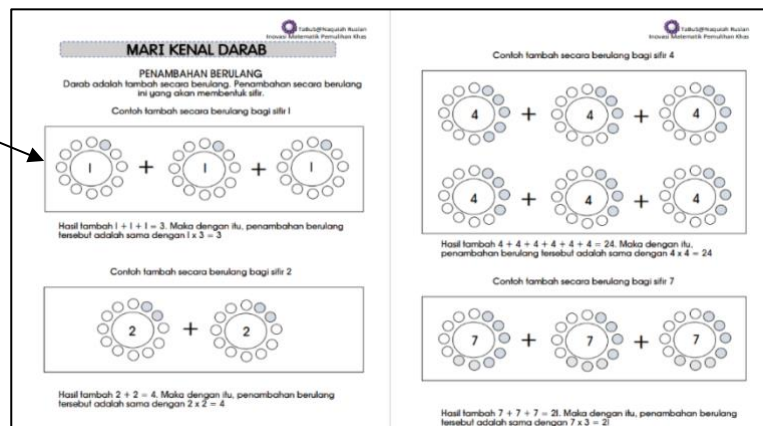
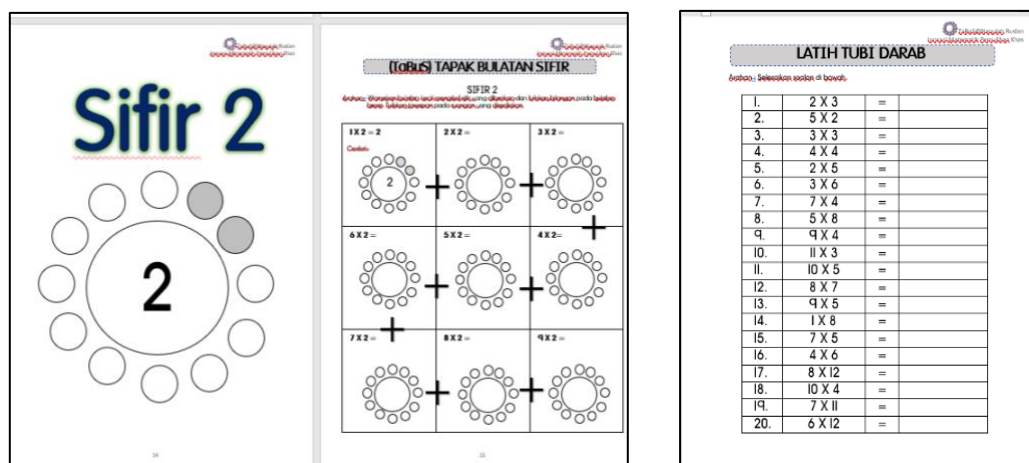


Figure 9
Activity Sheets and Practice Exercises in the Multiplication Circle Template Module



- b) Digital Multiplication Notes: The digital multiplication notes included in the Multiplication Circle Template module can be accessed online through QR codes. Students can scan the QR codes to access multiplication lists and practice materials.

Figure 10

QR Code and Multiplication Circle Template Digital Notes



- c) Implementing Multiplication Circle Template Gamification
Innovation in Multiplication Circle Template can also be applied in the form of gamification. Students are provided with Multiplication Circle Template cards and a set of number cards containing circular-shaped numeral cards. This activity is conducted in pairs and groups. The student who can correctly and accurately complete the sequence of numbers is counted as the winner.

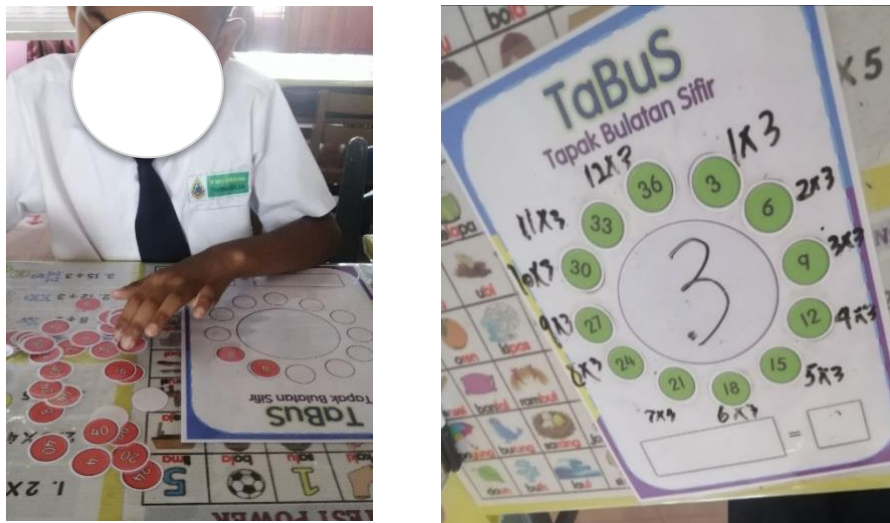
Figure 11

Multiplication Circle Template Gamification Set



Dice are used for multiplication activities based on the result of two rolled dice. Students arrange number cards on the small Multiplication Circle Template circles in the order of the multiplication facts they have learned.

Figure 12
Gamification Activity Using Multiplication Circle Template



d) Liveworksheets Multiplication Circle Template

The Multiplication Circle Template innovation is also supplemented with ICT-based exercises. These exercises are easily accessible anywhere, and students can easily receive scores after completing their answers. Students can also repeat the activities to get a full score.

Figure 13
QR Code and Liveworksheet Multiplication Circle Template Link

<https://www.liveworksheets.com/7-mj214744kk>

Step 1: Student should simply click the URL or scan the Multiplication Circle Template Liveworksheet QR Code.



Figure 14
Steps to Use Liveworksheet Multiplication Circle Template

Step 2: Students type the answer in each cipher's little circle.

Step 3: Students finish all sets of coded answers by pressing the 'Finish' button.

Step 4: After pressing the 'Finish' button, the student can check the answer or email it to the teacher using the information displayed on the student's gadget screen.

Step 5: If the student clicks the 'check my answer' button, the system will generate a score for the student.

In addition, the Multiplication Circle Template innovation is actively expanding into mainstream classes to assist Level 1 students, especially Year 1 and Year 2 students who have not yet mastered the basic multiplication concepts. Among the activities implemented to strengthen Multiplication Circle Template are as follows:

a. Multiplication Circle Template Craft Activity

Figure 15
Students' Creating Multiplication Circle Template Craft Plates



b. Multiplication Circle Template Zine Competition

Zine refers to a small magazine produced by an individual. The Zine activity is conducted to help students create pocket-sized multiplication books at a low cost, thereby sparking their interest in memorizing multiplication facts. Teachers provide Multiplication Circle Template Zine multiplication templates. Students are given guidance on creating Multiplication Circle Template Zines, and the student who creates the most beautiful Zine is awarded a prize.

Figure 16
Multiplication Circle Template Zine Competition and Prize Presentation



c. Speed 12 Multiplication Circle Template

Speed 12 Multiplication Circle Template is a competition and league activity that has been conducted in mainstream and Special Remedial classes. In the first round, students arrange multiplication fact answers on the provided Multiplication Circle Template. The student who can arrange the answers correctly and the fastest is considered the winner. In the subsequent rounds, the winning student arranges more challenging multiplication fact answers, and the ultimate winner is the one who can arrange all the multiplication facts the fastest and accurately.

Figure 17

Speed 12 Multiplication Circle Template Competition in Special Remedial Class



Figure 18

Speed 12 Multiplication Circle Template Competition been tested in Main Stream Class



Impact of Best Practices Implemented

Effectiveness of Innovation on Teaching and Learning

The effectiveness of the innovation on Teaching and Learning (T&L) is analyzed from four aspects: analysis of student worksheet results, observation of student behavior, and teacher comments. The target group selected has shown a change in their understanding of multiplication concepts after teachers implemented Multiplication Circle Template in their teaching. Before the intervention, teachers had given worksheets to the students, which included multiplication facts (Multiples of 1-6) and (Multiples of 1-12). The implementation period of Teaching and Learning with Multiplication Circle Template for multiplication skills lasted for 8 weeks. Each week, teachers spent 1 hour teaching multiplication skills in the Special Remedial class. The 1-hour period was scheduled in the Special Remedial class timetable. The selected group consist of 2 female and 13 male students.

Figure 19
Analysis of Student's Answers Before Intervention

The figure shows two student worksheets titled 'DARAB (Sifat 1-12)' and 'S.K. 2.0 Operasi Asas 2.3 Darab dalam Lingkungan 1000'. Each worksheet has a grid of multiplication problems. The left worksheet shows problems like $7 \times 2 = 14$, $3 \times 8 = 24$, $9 \times 3 = 27$, $7 \times 7 = 49$, $10 \times 5 = 50$, $5 \times 12 = 60$, $11 \times 4 = 44$, $3 \times 9 = 27$, $2 \times 10 = 20$, $11 \times 1 = 11$, $7 \times 3 = 21$, and $8 \times 9 = 72$. The right worksheet shows similar problems with some errors, such as $7 \times 2 = 14$, $3 \times 8 = 25$, $9 \times 3 = 27$, $7 \times 7 = 60$, $10 \times 5 = 50$, $5 \times 12 = 39$, $11 \times 4 = 44$, $3 \times 9 = 27$, $2 \times 10 = 20$, $11 \times 1 = 11$, $7 \times 3 = 21$, and $8 \times 9 = 72$. Both worksheets have a 'Menguasai' (Mastered) and 'Tidak Menguasai' (Not Mastered) section at the bottom, with a score of 12.

The results of teacher observations showed that students used grouping and counting methods to answer multiplication questions. They took a long time to draw circles and many dots, resulting in mistakes and an inability to complete the questions within the time limit.

Figure 20
Analysis of Student's Answers After Intervention

The figure shows two student worksheets titled 'DARAB (Sifat 1-12)' and 'S.K. 2.0 Operasi Asas 2.3 Darab dalam Lingkungan 1000'. Each worksheet has a grid of multiplication problems. The left worksheet shows problems like $3 \times 2 = 6$, $5 \times 4 = 20$, $6 \times 3 = 18$, $7 \times 4 = 28$, $5 \times 3 = 15$, $6 \times 5 = 30$, $3 \times 4 = 12$, $4 \times 6 = 24$, $7 \times 5 = 35$, $6 \times 7 = 42$, $4 \times 4 = 16$, and $6 \times 6 = 36$. The right worksheet shows similar problems with more correct answers, such as $7 \times 3 = 21$, $4 \times 8 = 32$, $9 \times 5 = 45$, $7 \times 2 = 14$, $10 \times 4 = 40$, $5 \times 12 = 60$, $11 \times 5 = 55$, $6 \times 9 = 54$, $6 \times 10 = 60$, $11 \times 5 = 55$, $8 \times 3 = 24$, and $8 \times 8 = 64$. Both worksheets have a 'Menguasai' (Mastered) and 'Tidak Menguasai' (Not Mastered) section at the bottom, with a score of 12.

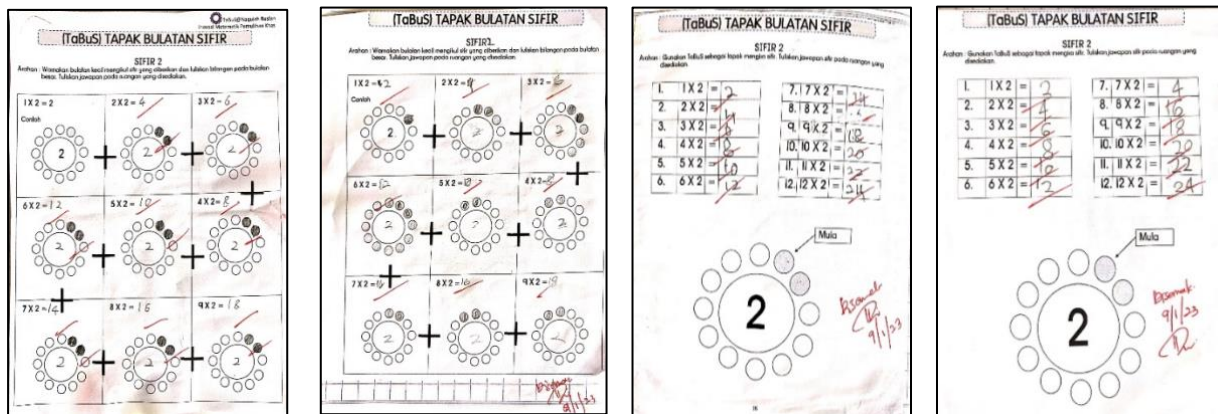
Students used the Multiplication Circle Template method in the answer space provided for Multiples (1-6). They no longer needed to draw multiple counters as in the given questions. In the case of Multiples (1-12), students were guided by teachers to answer multiplication questions using Multiplication Circle Template, mentally, without drawing. The results on these worksheets clearly show that Multiplication Circle Template can help students answer questions more accurately and save time.

Additionally, teachers also analyzed documents from student workbooks. These workbooks are part of the Multiplication Circle Template Module. The following is the result of student work for multiplication by 2.

Besides that, the teacher has also analyzed the documents on the students' worksheets. These worksheets are one of the items found in the Multiplication Circle Template Module. The following is the work result for multiplication of 2

Figure 21

Analysis of Student's Workbook Results in the Multiplication Circle Template Module



The images show that students understood the multiplication concept, which involves repeated addition, and used Multiplication Circle Template for repetitive counting. During the Teaching and Learning with Multiplication Circle Template, students provided several positive responses. Some of these responses are recorded in the table below:

Table 2

Student's Responses and Teacher Observations/Reflections

No	Response/Feedback Teacher	Observation/Teacher Reflection
1.	My dad asked me to memorize multiplication facts. I find it fun to memorize using these (Multiplication Circle Template) cards. (Gamification Multiplication Circle Template Activity)	Students enjoy memorizing multiplication facts using circular number cards during the gamification activity with Multiplication Circle Template. Teachers provide students with time to memorize multiplication facts that they haven't mastered individually to improve their performance.
2.	My teacher has taught me how to use Multiplication Circle	During Teaching and Learning with Multiplication Circle Template, students who quickly grasped the

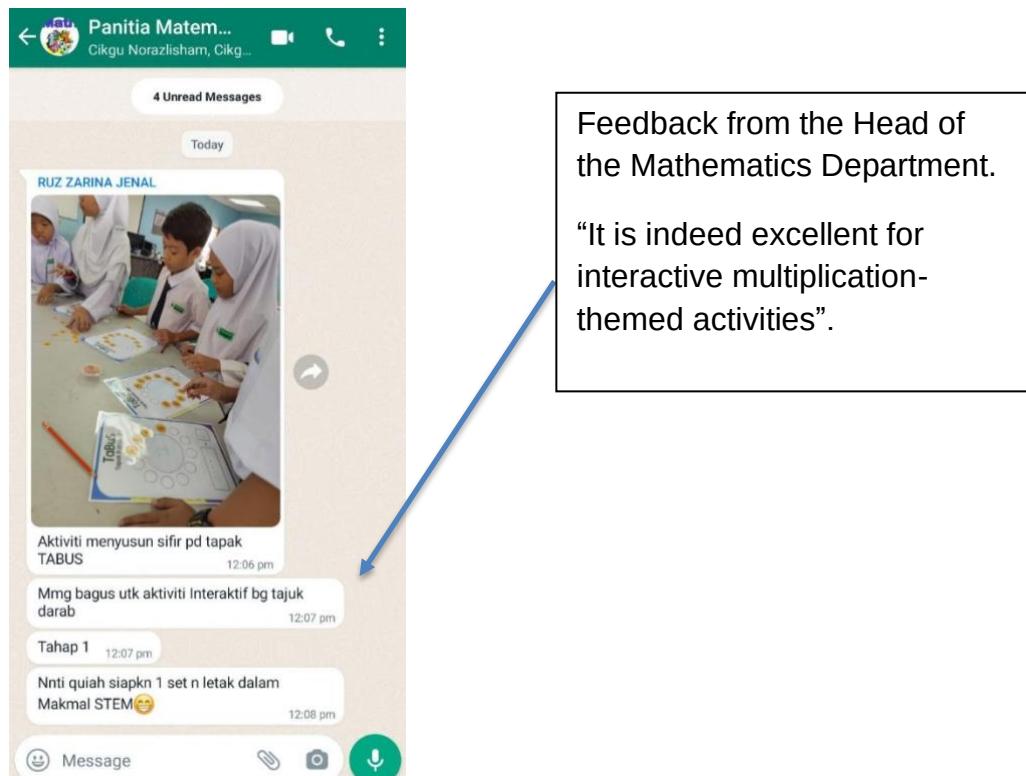
	Template. Let me teach you. (During Teaching and Learning with Multiplication Circle Template)	concept using Multiplication Circle Template guided their weaker peers and played the role of junior teachers. Students also showed an increased interest in learning.
3.	Teacher, I want to move to multiplication 5, can we get to multiplication 6 quickly? (Speed 12 Multiplication Circle Template Activity)	During the Speed 12 Multiplication Circle Template competition, the student who won in a particular round would advance to the next round. Students eagerly looked forward to more challenging multiplication facts. Learning became enjoyable, and active participation was demonstrated by all students.
4.	Teacher, I'm done! Teacher, I'm done! Done!! (Speed 12 Multiplication Circle Template Activity)	Students rushed to complete multiplication facts in each round and shouted to inform the teacher when they were ready to proceed to the next set of answers.
5.	Oh teacher, is this a pocket-sized multiplication book? It's so cute. I want to keep it. (Zine Multiplication Circle Template Activity)	The small size of the multiplication book attracted students to keep these Zine-shaped books for daily memorization.

In addition, some teachers also stated that the Multiplication Circle Template innovation greatly facilitated student learning of multiplication operations. These responses were obtained from experienced math teachers and the Head of the Math Department.

Figure 22
Feedback 1

Tabus can stimulate the mind, make learning relaxed and enjoyable. Tabus is one of the effective techniques for mastering multiplication tables and solving multiplication math problems. Tabus helps students feel how easy multiplication operations can be.

Figure 23
Feedback 2



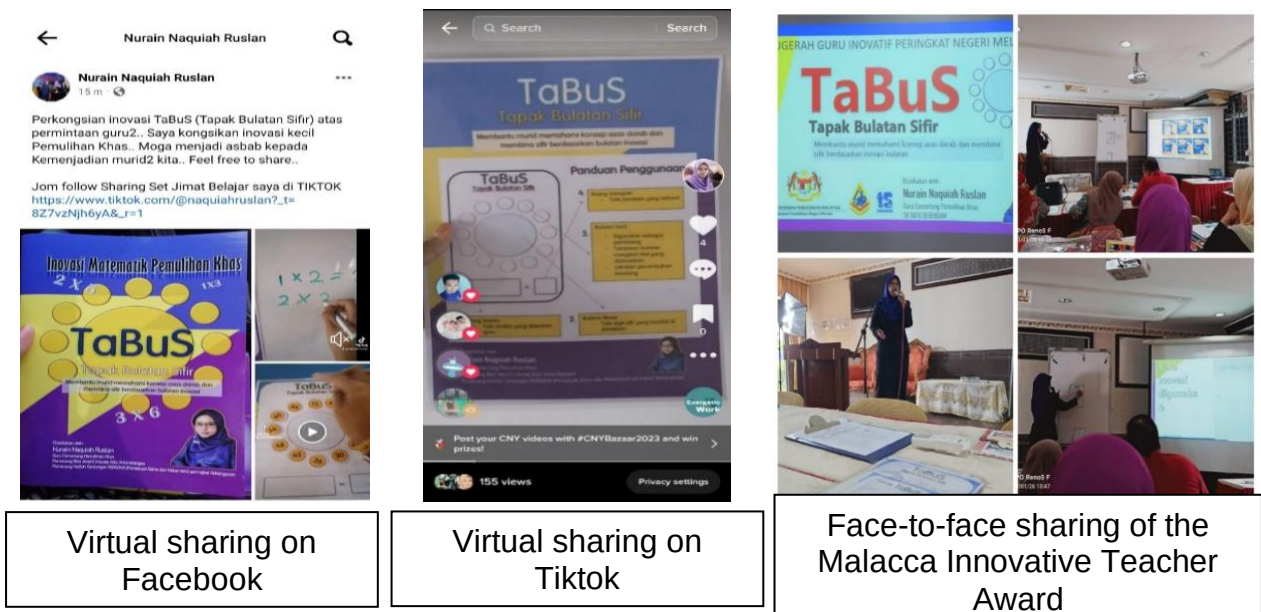
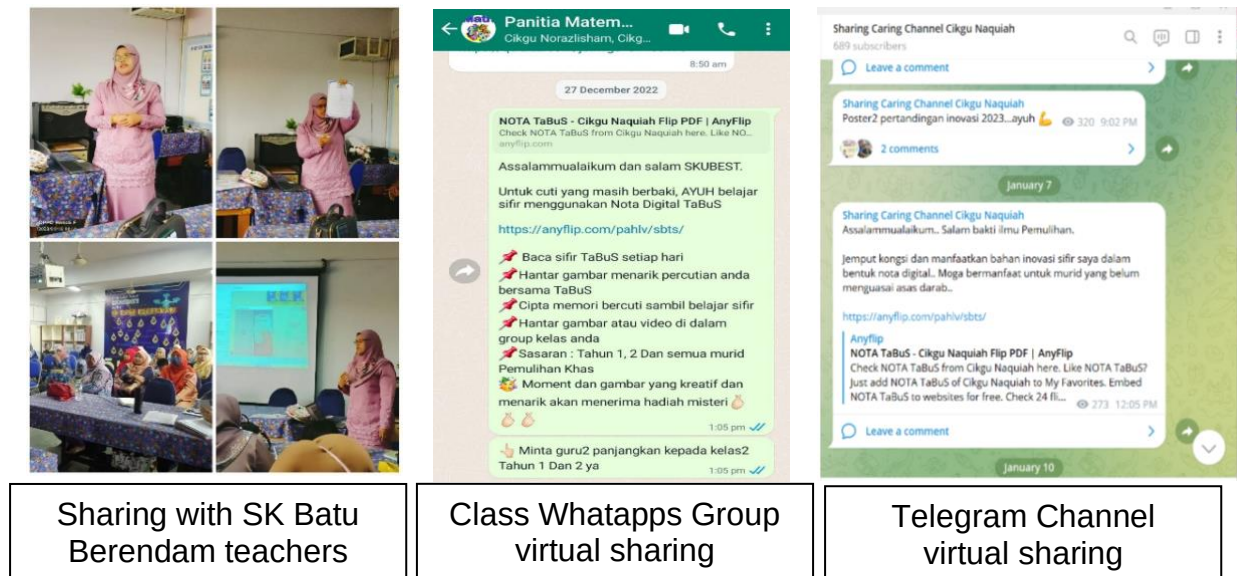
Summary and recommendations

The Multiplication Circle Template innovation is a method developed to help teachers diversify teaching methods in the classroom. The findings in this report clearly show that Multiplication Circle Template can enhance students' interest in learning mathematics. Furthermore, the improvement in students' mastery of basic multiplication skills, particularly multiplication operations, assures me that this innovation should be widely disseminated and further implemented nationwide. The increase in students' mastery levels in basic operation skills, especially multiplication operations, will also help improve students' academic performance during in-class assessments.

Multiplication Circle Template has the potential for widespread dissemination because it is easy to use and does not involve high costs. Teachers only need to download and print the Multiplication Circle Template innovation materials for classroom use. These materials can be widely shared through online platforms. If teachers or parents want to use the Multiplication Circle Template innovation to help students master basic multiplication concepts, they can obtain the materials from the provided Google Drive link. The digital content in this innovation also has the potential to enhance Multiplication Circle Template's nationwide reach. User guides distributed through infographic videos help facilitate the use of Multiplication Circle Template.

Furthermore, Multiplication Circle Template has been shared online and in-person on teacher social media platforms such as Tiktok, Facebook, and Telegram channels, as well as with Special Remedial teachers in the state of Melaka.

Figure 24
Sharing Multiplication Circle Template



Sharing Multiplication Circle Template with Expert



Multiplication Circle Template
Module sharing with teachers
and SISC+ Officers



Sharing with UTEM
lecturers

Improvement Suggestions

Several improvement suggestions can be made to enhance the teaching method using Multiplication Circle Template:

- The Multiplication Circle Template innovation should be used widely for primary school students as early as Year 1 to facilitate their understanding of basic multiplication concepts.
- Multiplication Circle Template can be further developed with the use of ICT to make learning basic multiplication operations more engaging for students.
- Additionally, Multiplication Circle Template can be applied across subjects. Other subject teachers can use the Multiplication Circle Template method by incorporating the subtopics they want to teach into the existing circles.

REFERENCES

Book

National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. NCTM.

National Council of Teachers of Mathematics. (2014). *Principles to Actions: Ensuring Mathematical Success for All*. NCTM.

Program Pemulihan Khas. (2019). *Buku Panduan Pengajaran dan Pembelajaran Matematik; Program Pemulihan Khas*. Bahagian Pendidikan Khas. Kementerian Pendidikan Khas.

Journal

Dewhurst, J. (2010). Understanding and teaching the multiplication of fractions: A new model. *The Journal of Mathematical Behavior*, 29(1), 69-80.

Hinton, V., & Fischer, D. (2012). Making Multiplication More Meaningful. *Teaching Children Mathematics*, 19(4), 226-234.

Jannah R. et. Al. (2020). Understanding Concepts of Multiplication Number for Slow Learner Student Through Meaningful Learning at Inclusion School.

Proceedings of the 2nd International Conference on Innovation in Education and Pedagogy (ICIEP 2020). Advances in Social Science, Education and Humanities Research, volume 619.

Rittle-Johnson, B., & Alibali, M. W. (1999). Conceptual and procedural knowledge of mathematics: Does one lead to the other? *Journal of Educational Psychology*, 91(1), 175-189.

Zazkis, R., & Liljedahl, P. (2002). General and g conjectures in algebra: A method of posing problems. *Journal of Mathematical Behavior*, 20(4), 423-433.

Zhang, Dake; Xin, Yan Ping; Harris, Karleah; Ding, Yi (2014). Improving Multiplication Strategic Development in Children With Math Difficulties. *Learning Disability Quarterly* [2014.10.1177/0731948713500146](https://doi.org/10.1177/0731948713500146). Vol 37(1) 15–30