

Effectiveness of Teacher-Made Learning Package in Teaching Mathematics 4 During the COVID-19 Pandemic

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Abstract

This study determined the effectiveness of a teacher-made learning package in teaching Mathematics 4 during the COVID-19 pandemic among Grade 4 struggling learners at Domnar Lopez-Copada Integrated IP School, Maasim 3 District, Division of Sarangani Province, during the school year 2021–2022. A single-group pre-test–post-test (pre-experimental) design was employed to measure the effects of the intervention by comparing the pre-test and post-test scores of the learners. Total enumeration was applied to determine the 35 respondents, who were selected because they had mathematics grades below 80 and parents able to provide home-based learning support. The teacher-made learning package, which contained simplified lessons, exercises, and guided activities, was validated by master teachers and supported through Radio-Based Instruction (RBI) and parent orientations prior to its implementation. A validated 30-item test was prepared, pilot-tested, and subjected to item analysis to determine the index of difficulty, and the same instrument was administered as both pre-test and post-test before and after the two-month intervention. Frequency counts, percentages, and a t-test for correlated samples were used to analyze the data. Results revealed that the learners obtained a pre-test mean of 16.8 (56%), described as average, which increased to a post-test mean of 21.3 (71%), described as high. The computed t-value of 10.37 exceeded the tabular value of 1.645, leading to the rejection of the null hypothesis and indicating a statistically significant difference between the pre-test and post-test scores. These findings indicate that the teacher-made learning package was effective in improving the academic performance of Grade 4 struggling learners in Mathematics. The study recommends that the Department of Education, school administrators, teachers, and parents strengthen the development and use of teacher-made learning packages to sustain learning continuity during instructional disruptions.

Keywords: Educational Management, Teacher-Made Learning Package, Experimental Single Group, Pre-Test and Post-Test, Philippines

1. Introduction

The COVID-19 pandemic disrupted traditional classroom instruction, making Mathematics 4 difficult to teach due to limited face-to-face interaction and restricted access to learning resources. To ensure continuity of education, teachers developed learning packages for home-based learning; however, their effectiveness in improving students' mathematics achievement remains uncertain (Abdullah, 2020; Çetin & Yüceer, 2023; Silverman & Hoyos, 2018).

This study aims to evaluate the effectiveness of teacher-made learning packages in supporting Mathematics 4 instruction during the pandemic. Findings may provide valuable insights for improving instructional materials, strengthening learning delivery systems, and developing responsive educational strategies during crisis situations (Engzell et al., 2021; Hudson et al., 2021).

Previous studies revealed that pandemic-related disruptions resulted in learning loss in mathematics, with students showing lower preparedness and slower academic progress. Factors such as anxiety, limited learning support, and sudden changes in learning modalities contributed to reduced mathematics proficiency (Antonio & Rommel, 2022; Mahadi & Ariska, 2022; Rosillo & Montes, 2021).

Research emphasizes that well-designed teacher-made instructional materials can improve students' understanding and engagement in mathematics, especially in remote learning environments. These findings support the development of customized learning packages for Mathematics 4 learners during the pandemic (Abdullah, 2020; Çetin & Yüceer, 2023; Silverman & Hoyos, 2018).

In Maasim 3 District, schools adopted modular print learning as the primary mode of instruction during the pandemic. However, many Grade 4 learners struggled to complete mathematics modules independently, highlighting the need for a teacher-made learning package with simplified lessons, interactive activities, and Radio-Based Instruction (RBI) to enhance learning outcomes (Engzell et al., 2021; Hudson et al., 2021).

1.1 Research Objectives

This study determined the effectiveness of the teacher-made learning package in improving the academic performance of Grade 4 struggling learners of Domnar Lopez-Copada Integrated IP School, Maasim 3, Division of Sarangani Province, for the school year 2021–2022.

Specifically, this study sought to determine the pre-test scores of Grade 4 learners in Mathematics before the use of the teacher-made learning package; to determine the post-test scores of Grade 4 learners in Mathematics after the use of the teacher-made learning package; and to determine the significant difference between the pre-test and post-test scores of Grade 4 learners in Mathematics using the teacher-made learning package.

1.2 Theoretical Framework

This study is anchored on Abdullah's (2020) theory, which emphasizes that Supplemental Learning Materials (SLMs) can improve students' achievement and attitudes in mathematics through simplified and contextualized learning experiences. Supporting this theory is Vygotsky's Sociocultural Theory, which suggests that learning is enhanced through instructional tools and scaffolds that guide learners' understanding. Bruner's Constructivist Theory further explains that students learn best through active exploration using organized and meaningful learning materials. Likewise, Bandura's Social Learning Theory highlights the role of observation, modeling, and reinforcement in developing learners' mathematical skills and confidence. Together, these theories provide a strong foundation for the study by suggesting that well-designed teacher-made learning packages can enhance Mathematics 4 learners' achievement, engagement, and motivation.

2. Material and methods

2.1 Research Design

This study employed a quantitative experimental single-group pre-test and post-test design to determine the effectiveness of a teacher-made learning package in Mathematics 4. The design involved administering a pre-test to establish learners' baseline performance, implementing the intervention, and conducting a post-test to measure changes in achievement. Quantitative research was used because it provides objective and systematic collection and analysis of numerical data, allowing the effectiveness of educational interventions to be measured accurately. Through statistical comparison of pre-test and post-test scores, the study assessed whether the learning package contributed to improvements in learners' mathematical performance (Badaruddin et al., 2018; Gutstein, 2018). Although the design has limitations, such as the absence of a control group, it remains a practical approach for evaluating instructional interventions in educational settings (Ardales, 2008).

2.2 Locale of the Study

The study was conducted at Domnar Lopez-Copada Integrated IP School in Datal Colon, Lumasal, Maasim, Sarangani Province, which serves 441 learners from Kinder to Grade 9 and is staffed by 14 teachers. The school is situated in a rural indigenous community where the residents are predominantly Tboli and primarily depend on agriculture, particularly the production of coconuts, corn, and bananas, for their livelihood. During the COVID-19 pandemic, the school implemented teacher-made learning packages and modular learning approaches to address limited access to digital resources and ensure continuity of education. These interventions were essential in supporting learners with varying levels of academic readiness and home-based learning support. The community's strong parental involvement and close collaboration with teachers provide a suitable environment for evaluating the effectiveness of teacher-made learning packages in improving Mathematics 4 learning outcomes.

2.3 Respondents of the Study

The subjects of the study who underwent the experimental procedures were the selected 35 Grade 4 struggling learners of Domnar Lopez-Copada Integrated IP School, Maasim 3 District, Division of Sarangani, who had mathematics grades below 80 and whose parents were able to read and write. All of them were chosen for this study, and the census or total enumeration sampling technique was applied. According to Lavrakas (2018), total population sampling is a type of purposive sampling in which the whole population of interest (i.e., a group whose members all share a given characteristic) becomes the subject of the study. Total population sampling is used when the target group is small and set apart by an unusual and well-defined characteristic.

2.4 Research Instrument

The instrument employed in this study consisted of a pre-test and post-test, which were specifically constructed by the researcher based on the teacher-made learning package. The assessment comprised 30 items administered to a total of 35 learners. These instruments were designed to evaluate the learners' knowledge and skills before and after the implementation of the intervention, allowing for a systematic measurement of academic improvement.

The study also addressed methodological considerations related to pretest-posttest designs, particularly issues involved in comparing groups and measuring change. Such designs are presented in a manner that can assist educational and

rehabilitation professionals in understanding and determining the effects of selected interventions. Moreover, the reliability of gain scores in pretest-posttest measurements was examined within the context of research and practice, underscoring its importance in accurately assessing the outcomes of instructional interventions (Dimitrov & Rumrill, 2003).

2.5 Research Mechanics

This study utilized an experimental single-group pre-test and post-test design involving purposively selected Grade 4 struggling learners from Domnar Lopez-Copada Integrated IP School. A pre-test was administered to determine the learners' baseline knowledge in Mathematics before the implementation of the validated teacher-made learning package. The learning package, which contained structured lessons, exercises, and guided activities, was distributed to parents and supported through Radio-Based Instruction (RBI) and parent orientations. Throughout the two-month intervention period, learners' progress was monitored through regular communication and feedback from parents. After the intervention, a post-test was conducted, and the results were analyzed using frequency counts, percentages, and a t-test for correlated samples to determine the effectiveness of the teacher-made learning package.

2.6 Procedures for Conducting the Experimental Study

The study began with the development of teacher-made learning packages for Grade 4 Mathematics, containing lessons, objectives, exercises, and activities appropriate for home-based learning. These materials were validated by five master teachers to ensure their accuracy, clarity, and suitability for learners. A validated 30-item pre-test was then administered to determine the participants' baseline performance in Mathematics. Afterward, the learning packages were distributed to parents, and orientations were conducted to guide them in assisting their children during the learning process. For two months, learners used the learning packages at home with support from Radio-Based Instruction (RBI), while their progress was monitored weekly through two-way radio communication. Upon completion of the intervention, the same 30-item test was administered as a post-test to measure learning gains. Finally, the pre-test and post-test scores were analyzed using frequency counts, percentages, and a t-test for correlated samples to determine the effectiveness of the teacher-made learning package.

2.7 Data Collection

After securing permission from the school head of Domnar Lopez-Copada Integrated IP School and obtaining parental consent, the validated 30-item test was reproduced and administered as a pre-test to the identified Grade 4 struggling learners (Zheng, 2021). The pre-test was distributed in printed form and completed at home with parental assistance following the orientation conducted by the researcher. During the two-month experimental period, validated teacher-made learning packages were distributed weekly, supported by Radio-Based Instruction (RBI) and regular monitoring through two-way radio communication. Parents served as facilitators to ensure learners consistently engaged with the instructional materials and activities. After the intervention, the same 30-item test was administered as a post-test, and the pre-test and post-test results were used as the primary data for determining the effectiveness of the teacher-made learning package in improving learners' Mathematics performance (Alwell et al., 2023; Kircher & Zipp, 2022).

2.8 Ethical Consideration

The study adhered to established ethical standards throughout its conduct. Participation of the Grade 4 learners was voluntary, and written informed consent was obtained from their parents after explaining the study's objectives, procedures, benefits, and the right to withdraw at any time without penalty. The privacy and confidentiality of respondents were protected in accordance with the Data Privacy Act of 2012 by ensuring anonymity in all research instruments and safeguarding all collected data for research purposes only. The study posed minimal risk to participants, as health and safety protocols were observed during the distribution and retrieval of learning packages, while potential benefits included improved mathematics learning and valuable insights for teachers, parents, and school administrators. Furthermore, the researcher upheld academic integrity by avoiding plagiarism, fabrication, falsification, deceit, and conflicts of interest, ensuring that all data were accurately reported, all sources were properly acknowledged, and all necessary permissions were secured from the school authorities and concerned stakeholders before the conduct of the study.

3. Results and Discussion

3.1 Pre-test Score of Grade 4 Learners in Mathematics

The table presents the pre-test scores of the 35 Grade 4 learners in Mathematics prior to the implementation of the teacher-made learning package. Results showed that only four learners achieved very high scores, while thirteen obtained high scores, indicating that a limited number of learners demonstrated strong mastery of the Mathematics concepts. Meanwhile, six learners attained average scores, eleven obtained low scores, and one learner received a very low score, suggesting that a considerable number of pupils experienced difficulties in the subject. The overall mean score was 16.8 out of 30, equivalent to 56 percent, which falls within the average performance level. This finding indicates that learners possessed only moderate mastery of the Mathematics competencies before the intervention, highlighting the need for instructional support to improve their academic performance.

Table 1. *The Pre-Test Scores of the Subjects*

Pupil	Score	Percentage	Description
1	14	46.6%	Average
2	12	40%	Low
3	15	50%	Average
4	24	80%	High
5	8	26.6%	Low
6	7	23.3%	Low
7	10	33.3%	Low
8	8	26.6%	Low
9	5	16.6%	Very Low
10	21	70%	High
11	23	76.6%	High
12	26	86.6%	Very High
13	11	36.6%	Low
14	20	66.6%	High
15	11	36.6%	Low
16	19	63.3%	High
17	8	26.6%	Low
18	17	56.6%	Average
19	13	43.3%	Low
20	20	66.6%	High
21	21	70%	High
22	24	80%	High
23	25	83.3%	Very High
24	18	60%	Average
25	21	70%	High
26	22	73.3%	High
27	14	46.6%	Average
28	25	83.3%	Very High
29	20	66.6%	High
30	22	73.3%	High
31	18	60%	Average
32	13	43.3%	Low
33	26	86.6%	Very High
34	21	70%	High
35	9	30%	Low
Mean	16.8	56%	Average

3.2 Post-test Score of Grade 4 Pupils in Mathematics

The table presents the post-test scores of 35 Grade 4 learners in Mathematics after the implementation of the teacher-made learning package, showing a clear improvement in performance. Results revealed that 14 learners obtained very high scores, 10 achieved high scores, 7 attained average scores, and only 3 obtained low scores, while no learner fell under the very low category. The overall mean score was 21.3 out of 30, equivalent to 71 percent, which is described as high performance. This indicates that most learners improved significantly from their pre-test results, shifting from lower performance levels

to higher categories. The findings suggest that the teacher-made learning package was effective in enhancing learners' understanding and engagement in Mathematics.

Table 2. *The Post-Test Scores of the Subjects*

Pupil	Score	Percentage	Description
1	18	60%	Average
2	15	50%	Average
3	19	63.3%	High
4	28	93.3%	Very High
5	12	40%	Low
6	12	40%	Low
7	14	46.6%	Average
8	15	50%	Average
9	11	36.6%	Low
10	25	83.3%	Very High
11	27	90%	Very High
12	29	96.6%	Very High
13	16	53.3%	Average
14	25	83.3%	Very High
15	18	60%	Average
16	21	70%	High
17	19	63.3%	High
18	22	73.3%	High
19	21	70%	High
20	22	73.3%	High
21	25	83.3%	Very High
22	28	93.3%	Very High
23	22	73.3%	High
24	29	96.6%	Very High
25	25	83.3%	Very High
26	25	83.3%	Very High
27	19	63.3%	High
28	30	100%	Very High
29	27	90%	Very High
30	26	86.6%	Very High
31	21	70%	High
32	18	60%	Average
33	30	100%	Very High
34	23	76.6%	High
35	10	33.3%	Low
Mean	21.3	71%	High

3.3 Significant Difference between Pre-Test and Post-Test Scores of Grade 4 Learners in Mathematics

The results of the study revealed a significant difference between the pre-test and post-test scores of Grade 4 learners in Mathematics after the implementation of the teacher-made learning package. Using a t-test, the computed t-value of 10.37

exceeded the tabular value of 1.645, leading to the rejection of the null hypothesis. This indicates that the intervention had a statistically significant effect on improving learners' academic performance. The findings suggest that structured and home-based learning materials effectively enhance learners' understanding of mathematical concepts. Furthermore, the use of teacher-made learning packages supports self-paced learning, reduces learner frustration, and promotes a more positive attitude toward Mathematics.

Table 3. *Effectiveness of Teacher-Made Learning Package among Grade 4 Learners*

Variable	Df	t-value		Description	Decision ($\alpha = 0.05$)
		Computed	Tabular		
Pre-test Score versus Post-test Score	n-1 = 34	10.37	1.645	Significant	Reject H0

3.4 Discussion

This section presents the discussion of the findings based on the data gathered.

3.4.1 The Pre-Test Scores of the Subjects

The pre-test results of the subjects revealed varying levels of performance, indicating differences in pupils' prior knowledge and understanding of Mathematics. Some learners scored at low to very low levels, suggesting gaps in foundational skills and limited mastery of the concepts, while others demonstrated higher levels of prior understanding. Pupils with average scores represented a transitional group with partial and inconsistent comprehension, showing the need for further reinforcement and guided instruction. Overall, the mean score indicated an average level of performance, reflecting moderate mastery of the subject before the intervention and establishing a baseline for instruction.

The variation in scores highlights the need for differentiated teaching strategies to address diverse learning needs within the classroom, as pupils with lower performance require foundational support while higher-performing learners benefit from enrichment activities. This aligns with Popham's view that pre-tests are essential diagnostic tools for identifying learners' prior knowledge and guiding responsive instruction, although their effectiveness depends on proper interpretation and application of results (Abdullah, 2020; Çetin & Yüceer, 2023; Popham, 2024). Similarly, Brookhart emphasized that heterogeneous pre-test performance reflects diverse learning backgrounds and abilities, requiring flexible and differentiated instruction to ensure progress for all learners, despite challenges in balancing varied needs (Brookhart, 2023; Engzell et al., 2021). In addition, Gamage (2025) supports the use of pre-tests as a means of identifying learning gaps and informing instructional planning, stressing that meaningful use of results enhances teaching effectiveness and student outcomes.

3.4.2 The Post-Test Scores of the Subjects

The post-test results of the subjects showed a marked improvement in learners' overall performance compared to their pre-test scores. Many pupils who initially performed at low to average levels progressed to average, high, and very high categories, indicating that the intervention effectively supported learning and improved understanding of Mathematics concepts. Pupils who were previously average also demonstrated advancement, with several moving into higher performance levels, reflecting better conceptual mastery and application of skills. The overall mean score indicated a high level of achievement, suggesting substantial academic growth and improved engagement with the learning materials.

The improvement across performance levels highlights the effectiveness of differentiated instructional strategies in addressing learners' varying needs and promoting academic progress. This aligns with Dunn and Marshman, who emphasized that post-test results are useful indicators of instructional effectiveness and student learning gains, although they should be interpreted alongside other assessment data for accuracy (Dunn & Marshman, 2020; Kircher & Zipp, 2022). Similarly, Mahadi and Ariska noted that variations in post-test performance reflect differences in learner readiness and engagement, stressing the importance of targeted interventions and differentiated instruction to support all learners (Mahadi & Ariska, 2022; Soyly et al., 2018). In addition, Wahedatul and Sopandi (2019) highlighted that post-test assessments are essential for evaluating teaching effectiveness, guiding remedial instruction, and improving future learning outcomes when used in combination with formative assessments and classroom observations.

3.4.3 Significant Difference between Pre-Test and Post-Test Scores of Grade 4 Learners in Mathematics

The results of the study revealed a significant difference between the pre-test and post-test scores of Grade 4 learners in Mathematics, indicating that the teacher-made learning package effectively improved learners' academic performance. The increase in post-test scores showed that pupils were able to better understand mathematical concepts, address prior learning gaps, and apply skills more accurately after the intervention. Learners across different performance levels demonstrated improvement, suggesting that the instructional materials effectively supported varied learning needs and promoted meaningful engagement. Overall, the findings confirm that the structured and targeted activities in the learning package contributed to measurable academic gains and enhanced conceptual understanding.

The improvement further highlights the effectiveness of aligning instructional materials with learners' abilities, as it enabled both low- and average-performing pupils to progress to higher achievement levels. This aligns with Mosquera Núñez (2023), who emphasized that teacher-made learning materials enhance learning outcomes by providing contextualized and learner-responsive support that improves understanding and retention. Similarly, Tajeddin and Asadnia (2025) found that teacher-developed instructional resources increase learner engagement and achievement by addressing diverse abilities through interactive and differentiated tasks. In addition, Antonio and Rommel (2022) and Ekmekci et al. (2019) emphasized that teacher-made materials promote active learning, scaffold instruction, and improve academic performance by addressing individual learning gaps and strengthening student motivation.

4. Conclusion & Recommendations

Based on the data gathered, it can be concluded that the pre-test scores of Grade 4 learners in Mathematics reflected low to average levels of proficiency, indicating only moderate mastery of the subject prior to the intervention. After the implementation of the teacher-made learning package, the post-test scores showed significant improvement, with many learners moving from low and average levels to higher levels of achievement. The comparison of pre-test and post-test scores further revealed a significant difference in performance, confirming that the teacher-made learning package was effective in enhancing the Mathematics skills and overall academic performance of the Grade 4 struggling learners at Domnar Lopez-Copada Integrated IP School.

Based on the findings of the study and the importance of teacher-made learning packages in addressing learning challenges during the COVID-19 pandemic, it is recommended that the Department of Education, school administrators, and teachers may strengthen the development and use of these instructional materials. Support may include providing training for teachers to design engaging and user-friendly learning packages, allocating resources for reproduction and distribution, and encouraging collaboration among educators to improve the overall quality of instructional tools. Such measures may enhance learners' performance in Mathematics and ensure continuity of learning despite disruptions to face-to-face classes.

Consequently, parents can support their children in using teacher-made learning packages at home by reinforcing concepts and guiding practice, while students can use them for self-directed learning to build independence and deeper understanding. Active engagement with these materials may improve academic performance, confidence, and resilience in modular or remote learning. Future research could examine the long-term effects of these packages across subjects and grade levels, as well as explore integrating digital tools to enhance adaptive and sustainable learning strategies.

Compliance with ethical standards

The study strictly adhered to established ethical standards for research involving human participants. Because the respondents were minors, participation was voluntary, and written informed consent was obtained from the parents or guardians of all Grade 4 learners after the objectives, procedures, benefits, and the right to withdraw at any time without penalty had been fully explained.

The privacy and confidentiality of the respondents were protected in accordance with the Data Privacy Act of 2012. Personal identifiers were removed during data processing, all responses were reported in aggregate form to maintain anonymity, and the data gathered were used exclusively for academic research purposes and stored securely. The study posed minimal risk to participants, and the researcher upheld academic integrity by avoiding plagiarism, fabrication, falsification, and conflicts of interest, ensuring that all sources were properly acknowledged and all necessary permissions were secured from the school authorities and concerned stakeholders prior to the conduct of the study.

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