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Where Numbers Meet Words: An Integrated Mathematics–English Workbook for Primary School Children

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ABSTRACT

Foundational mathematics and English skills are important for children's learning during the early years of primary education. This pilot study examined changes in the mathematics and English performance of primary-school children after participating in six learning sessions using an integrated mathematics–English workbook. The programme was conducted by KKN Group 93, Period 108, University of Bengkulu, in Gelombang Village, Indonesia. A pre-experimental one-group pretest–posttest design was employed with 10 children predominantly enrolled in Grades 2 and 3. Students' performance was assessed using a 20-item test consisting of 10 English items and 10 mathematics items. Descriptive statistics and an exact two-sided Wilcoxon signed-rank test were used to analyse the paired scores. The mean combined score increased from 39.5 on the pretest to 93.5 on the posttest. The mean English score increased from 44.0 to 95.0, while the mean mathematics score increased from 35.0 to 92.0. All participants obtained higher posttest scores, and the overall pretest–posttest difference was statistically significant, $W = 0.00$, $p = .002$. These findings suggest that the workbook-supported programme has promising potential as a supplementary resource for community-based learning. However, the results should be interpreted cautiously because of the small sample size, absence of a control group, and immediate posttest measurement.

Keywords: Community-Based Learning; English Learning; Integrated Workbook; Mathematics Learning; Primary-School Children

1. Introduction

Foundational literacy and numeracy are essential components of children's educational development. During the early years of primary education, children are expected to learn how to understand simple written information, communicate basic ideas, recognise numerical relationships, and apply elementary mathematical concepts.

These competencies support not only achievement in language and mathematics but also children's ability to participate in learning across the curriculum. Nevertheless, school attendance does not always result in adequate learning. In Indonesia, the continuing prevalence of learning poverty indicates that strengthening foundational learning remains an important educational priority, particularly because many children have not yet acquired the expected level of reading comprehension by the end of primary education (World Bank & UNESCO, 2024).

Mathematics is a central part of foundational learning because it develops numerical reasoning, logical thinking, pattern recognition, and problem-solving. Björklund et al. (2021) explained that elementary arithmetic involves more than memorising number facts or repeatedly performing calculations. Children need to understand different representations of numbers, cardinality, ordinality, part–whole relationships, commutativity, and the inverse relationship between addition and subtraction. Differences in how children understand these aspects can affect the strategies they use and their ability to solve arithmetic problems successfully.

The quality of instructional materials may influence how children encounter and understand these mathematical ideas. In their study of 1,614 first-grade students, Sievert et al. (2021) found that mathematics textbooks differed in the learning opportunities they provided for understanding arithmetic principles. The quality of the textbooks was also associated with the strategies students used when solving addition and subtraction problems. These findings suggest that a textbook or workbook should not be regarded merely as a collection of exercises. Its sequence, examples, explanations, representations, and task structure may shape how students engage with mathematical concepts.

MacDonald (2022) demonstrated that children enter school with mathematical knowledge developed through experiences in their homes and surrounding environments. Activities involving objects, quantities, routines, shopping, time, and interactions with family members can provide children with informal mathematical understandings before they receive formal instruction. Learning materials may therefore become more meaningful when they connect school mathematics with situations that children recognise from everyday life. Cultural and experiential contexts can also support young learners in identifying mathematical structures, recognising patterns, and making generalisations (Hunter & Miller, 2022).

The use of familiar contexts is particularly relevant when children solve mathematical word problems. Such tasks require students not only to perform a calculation but also to interpret the situation, identify relevant information, select an appropriate operation, carry out the solution, and evaluate the answer. Students who solve word problems correctly tend to demonstrate stronger planning, monitoring, and evaluation strategies than students who experience difficulty with the tasks (Kusaka & Ndihokubwayo, 2022). Exercises involving money, food, books, stationery, time, family activities, and other familiar situations may consequently help children connect mathematical procedures with meaningful applications.

Maruyama and Kurosaki (2021) found that a package of remedial activities that included mathematics workbooks contributed to improved learning outcomes among primary-school students in Niger, with larger gains observed among students who had lower initial scores. Their later randomised study in El Salvador evaluated an intervention that combined learner-oriented textbooks, workbooks, diagnostic assessment, teacher guidance, and instructional support. Students receiving the intervention demonstrated stronger mathematics learning than those receiving regular instruction (Maruyama & Kurosaki, 2024). Although these interventions contained several components beyond printed materials, their findings indicate that structured workbooks can contribute to learning when they are accompanied by appropriate instruction and opportunities for repeated practice.

The educational value of a workbook also depends on the ways in which it invites learners to interact with its content. According to Nag Chowdhuri (2022), primary mathematics textbooks communicate particular modes of engagement through their language, structure, contexts, examples, and presentation of tasks. Materials that connect mathematical ideas with children's social and everyday experiences can offer more meaningful engagement than materials consisting entirely of decontextualised calculations. However, contextual activities must still be supported by clear explanations and an organised sequence so that students can recognise the mathematical ideas represented by each situation.

Alongside mathematics, English vocabulary is an important starting point for foreign-language learning in primary education. Vocabulary enables young learners to understand basic instructions, identify familiar objects, interpret short texts, and produce

simple sentences. However, recognising the meaning of a word does not automatically enable a learner to use that word independently. Children therefore require repeated opportunities to connect word forms with meanings, retrieve previously learned words, distinguish between related vocabulary, and use words in relevant contexts. These processes are particularly important for children who have limited exposure to English outside structured learning activities (Liu & Reynolds, 2025).

Liu and Reynolds (2025), through a systematic review of English-as-a-foreign-language vocabulary learning activities for primary-school students, identified numerous intentional and incidental activities that can be used with young learners. Their findings indicated that activities requiring learners to notice, retrieve, distinguish, and apply new words provide greater cognitive involvement than passive exposure alone. The selection of vocabulary-learning tasks should therefore account for children's age, existing knowledge, and opportunities to use the target words meaningfully.

Empirical evidence also supports the value of structured, active, and repeated vocabulary learning. In a study involving fourth-grade learners, Sık and Zehır Topkaya (2024) found that students participating in a flipped-classroom programme achieved stronger vocabulary learning and retention than students receiving conventional instruction. Similarly, communicative vocabulary tasks enabled first-grade learners to practise both recognising and producing target vocabulary rather than simply memorising isolated words (Teng, 2025). Although the instructional approaches used in these studies differ from a printed workbook programme, both demonstrate that young learners benefit from multiple opportunities to process, retrieve, and use vocabulary.

Integrating language learning with academic content may provide further opportunities for meaningful language use. Setyaningrum and Khoiriyah (2022), in an exploratory study conducted in Indonesian primary schools, identified multiple learning focuses, active learning, scaffolding, and cooperation as important features of content-and-language-integrated instruction. Their findings also showed that successful implementation depends on suitable learning materials and sufficient support from teachers or facilitators. Simply presenting language and subject content in the same lesson does not guarantee that students will understand either component.

More recent research has strengthened the evidence concerning integrated approaches at the primary-school level. A multilevel meta-analysis by Lee et al. (2025),

which synthesised 28 samples from 21 experimental and quasi-experimental studies, found that Content and Language Integrated Learning generally supported foreign-language development while producing academic-content outcomes comparable to non-integrated instruction. A study of first-grade students also reported that an integrated programme improved English learning performance and interest compared with conventional teaching (Gao et al., 2025). Nevertheless, successful integration requires appropriate sequencing, accessible content, sufficient scaffolding, and clear alignment between activities and intended learning outcomes.

The workbook examined in the present study should not be classified as a complete Content and Language Integrated Learning programme because mathematics is not consistently taught through English as the language of instruction. Instead, it is an integrated printed resource that places foundational mathematics and English activities within one learning programme. The two subjects remain identifiable, but they are organised as complementary components of a shared sequence of learning sessions. Through this arrangement, children encounter vocabulary, reading, sentence completion, arithmetic operations, patterns, comparisons, and contextual problem-solving within the same workbook.

The English section introduces numbers, family members, school objects, animals, food and drinks, and daily activities. It also includes word-meaning exercises, sentence-completion tasks, a short reading passage, and comprehension questions. The mathematics section covers addition, subtraction, multiplication, division, word problems, money, time, number patterns, and numerical comparisons. Several tasks are situated in familiar contexts, such as counting classroom objects, describing family members, calculating the prices of everyday items, interpreting daily schedules, and solving problems involving books, fruit, sweets, and stationery. Review sections and mixed exercises are also included to provide repeated exposure to previously introduced material.

The workbook was developed and implemented as part of a community service programme conducted by KKN Group 93, Period 108, University of Bengkulu, in Gelombang Village. The programme consisted of six learning sessions involving primary-school children who were predominantly enrolled in Grades 2 and 3. Its purpose was to provide an additional learning opportunity in which children could practise foundational

mathematics and English through short explanations, guided activities, examples, and exercises.

However, the presence of explanations and exercises does not by itself demonstrate that the workbook supports children's understanding. Students' performance may also be influenced by their initial ability, attendance, facilitator guidance, repetition, concentration during testing, and the developmental appropriateness of individual tasks. The learning outcomes should therefore be evaluated through direct measurements of academic performance rather than inferred solely from students' participation, enjoyment, or apparent enthusiasm during the programme.

Previous research has separately examined early arithmetic, mathematics textbooks, contextual mathematical tasks, remedial workbooks, English vocabulary instruction, and content-and-language integration. Limited evidence, however, is available regarding the use of a single printed resource combining foundational mathematics and English activities for lower-grade children in a short community-based learning programme. Evidence is particularly limited concerning changes in students' mathematics and English scores after participating in a structured sequence of sessions using such a workbook.

Accordingly, this pilot study aims to examine changes in the mathematics and English understanding of Grade 2 and Grade 3 primary-school children after six learning sessions using an integrated mathematics–English workbook. Students' understanding will be measured using a pretest administered before the first session and a comparable posttest administered after the sixth session. Mathematics and English outcomes will be analysed separately and as a combined achievement score.

This study therefore asks to what extent the mathematics and English scores of Grade 2 and Grade 3 primary-school children change after six learning sessions using an integrated mathematics–English workbook. The findings are expected to provide preliminary evidence regarding the workbook's potential as a supplementary resource for community-based learning; however, because the study involves only 10 participants and does not include a control group, the results will be interpreted as an initial evaluation of score changes rather than definitive evidence that the workbook alone caused the observed improvement.

2. Methods

2.1 Study Design

Following the quantitative research framework described by Creswell and Creswell (2023), this pilot study employed a pre-experimental, one-group pretest–posttest design. The same group of children completed an achievement test before and after participating in six learning sessions using an integrated mathematics–English workbook. The design was represented as $O_1 - X - O_2$, where O_1represented the pretest, Xrepresented the six-session learning programme, and O_2represented the posttest.

This design was selected to document within-participant changes during a small-scale community service programme rather than to establish a causal effect. Bierer et al. (2025) emphasised that a one-group pretest–posttest design cannot rule out alternative explanations, such as maturation, testing effects, external learning experiences, or facilitator influence. The findings were therefore interpreted as preliminary evidence of score changes following the programme rather than definitive proof that the workbook alone produced those changes.

2.2 Study Setting and Participants

This study was conducted as part of the Community Service Programme (KKN) implemented by Group 93, Period 108, University of Bengkulu, in Gelombang Village, Semidang Alas Maras Subdistrict, Seluma Regency, Bengkulu Province, Indonesia. The programme ran from 20 June to 20 July 2026 and included a pretest, six learning sessions, and a posttest. The first two sessions were conducted on 20 and 22 June 2026, followed by four weekly sessions held every Monday on 29 June, 6 July, 13 July, and 20 July 2026.

The participants consisted of 10 primary-school children who were predominantly enrolled in Grades 2 and 3. Because all eligible children who participated in the learning programme were included in the study, total sampling was used. Lakens (2022) identified the inclusion of an entire finite and accessible population, together with the transparent consideration of practical resource constraints, as a defensible approach to sample-size justification in small empirical studies. Nevertheless, the sample was not intended to represent all primary-school children, and the findings were limited to an initial evaluation of the participating group.

Participants were included in the paired analysis if they were enrolled in Grade 2 and Grade 3, participated in the community learning programme, completed both the pretest and posttest, and received permission from a parent or guardian. All 10

participants completed both assessments and were included in the final analysis. Attendance at each learning session was recorded, and no missing scores were estimated or replaced.

2.3 Learning Material

The intervention used an integrated printed workbook developed by KKN Group 93, Period 108, University of Bengkulu. The workbook combined foundational English and mathematics activities within a single learning resource while maintaining separate and identifiable content for each subject.

The English section covered numbers, family members, school objects, animals, food and drinks, daily activities, word meanings, simple sentence completion, and short reading comprehension. The mathematics section covered addition, subtraction, multiplication, division, word problems, money, time, number patterns, and numerical comparison.

The workbook also included subject-specific review activities and mixed exercises intended to provide repeated exposure to previously introduced material. During the programme, facilitators used the workbook as the primary learning resource and provided explanations, examples, guided practice, and feedback.

2.4 Learning Procedure

The programme consisted of six learning sessions. Before the first session, participants completed the pretest without using the workbook or receiving assistance with the answers. After the sixth session, they completed the posttest under conditions that were kept as similar as possible to those of the pretest.

The planned content of each session is presented in Table 1.

Session	English Content	Mathematics Content
Pre-intervention	English pretest	Mathematics pretest
Session 1	Numbers	Addition
Session 2	Family members and school objects	Subtraction
Session 3	Animals, food, and drinks	Multiplication and division
Session 4	Daily activities	Money and time
Session 5	Simple sentences and short reading	Number patterns and comparisons
Session 6	Review and mixed exercises	Review and word problems
Post-intervention	English posttest	Mathematics posttest

***Table 1**. Planned Content of the Six Learning Sessions*

Each session followed a shared learning structure consisting of an opening activity, facilitator explanation, guided workbook practice, discussion of the exercises, and a closing review. Members of the KKN group followed the same session plan to reduce unnecessary differences in the delivery of the learning materials. Attendance, material coverage, and difficulties encountered during implementation were documented after each session.

Figure 1. *Participants holding the integrated Mathematics–English workbook used during the community learning programme in Gelombang Village.*

The pretest answers were not discussed with the participants before the posttest had been completed. This procedure was intended to reduce the possibility that posttest performance resulted merely from remembering answers that had previously been corrected.

2.5 Research Instrument

Students' understanding was measured using researcher-developed pretest and posttest instruments based directly on the workbook content and learning indicators. Each assessment contained 20 four-option multiple-choice items consisting of 10 English questions and 10 mathematics questions.

The English items assessed number vocabulary, family members, school objects, animals, food and drinks, daily activities, sentence completion, and short-text comprehension. The mathematics items assessed addition, subtraction, multiplication, division, money, time, number patterns, numerical comparison, and contextual word problems.

The pretest and posttest used different but parallel questions. Both forms measured the same learning indicators, contained the same number of items, used the

same response format, and had the same maximum score. This approach was intended to reduce direct recall of the pretest answers while preserving comparability between the two assessments.

Each correct response received 1 point, whereas each incorrect or unanswered response received 0 points. Three scores were calculated for each participant:

$$\text{English score} = \frac{\text{correct English answers}}{10} \times 100$$

$$\text{Mathematics score} = \frac{\text{correct Mathematics answers}}{10} \times 100$$

$$\text{Combined score} = \frac{\text{total correct answers}}{20} \times 100$$

The combined score was treated as the primary outcome, whereas the English and mathematics scores were examined separately as secondary outcomes. Because the tests were specifically developed for this pilot programme and had not undergone extensive psychometric validation, the results were interpreted as measures of performance on workbook-aligned content rather than as standardised measures of general English or mathematics ability.

2.6 Data Collection

Before the programme began, each participant was assigned an anonymous identification code ranging from S01 to S10, and no names were included in the analysis dataset. The pretest was administered before any workbook-based instruction was provided. Participants received standardised instructions and completed the assessment independently. Facilitators could clarify how answers should be recorded, but they did not translate the items, explain the content being tested, or indicate whether a response was correct.

After the six learning sessions had been completed, the posttest was administered using procedures comparable to those applied during the pretest. To ensure consistency, the testing location, instructions, time allocation, level of facilitator assistance, and restriction on workbook use were kept as similar as possible across both assessments.

In addition to the pretest and posttest scores, the researchers recorded each participant's grade level, attendance across the six sessions, and number of correct responses in the English and mathematics sections. Brief field notes were also maintained to document circumstances that may have affected participation or test performance,

including late arrival, absence, illness, fatigue, difficulty understanding the instructions, or interruptions during testing. These records provided contextual information for interpreting individual changes in scores.

2.7 Data Analysis

Data analysis began with a verification process to ensure that each participant's pretest score was correctly matched with the corresponding posttest score. The dataset was then processed and analysed using Python. Descriptive statistics were calculated to summarise the participants' scores, followed by an exact two-sided Wilcoxon signed-rank test to examine differences between the paired pretest and posttest results.

Descriptive analysis included individual pretest and posttest scores, together with summary measures such as the mean, median, standard deviation, interquartile range, minimum, and maximum values. Individual change scores were calculated for each participant, and the average change across all participants was also reported. In addition, the analysis identified the number and percentage of participants whose scores increased, remained unchanged, or decreased between the pretest and posttest. The change score for each participant was calculated by subtracting the pretest score from the posttest score:

$$Change\ score = posttest\ score - pretest\ score$$

Because the measurements were obtained from the same participants at two time points, the observations were treated as paired data. Ranganathan (2021) explained that the selection of a statistical test should consider the type of outcome, number of measurements, pairing of observations, and distribution of the data. An exact two-sided Wilcoxon signed-rank test was therefore used as a nonparametric procedure to compare the paired pretest and posttest scores.

The combined achievement score constituted the primary inferential analysis, while the English and mathematics scores were analysed separately as exploratory outcomes. Statistical significance was assessed at $p < .05$. The Wilcoxon test statistic, exact p-value, and rank-biserial correlation were reported together with the descriptive results.

Given the limited sample size, statistical significance was not used as the sole basis for interpreting the findings. Greater emphasis was placed on individual score patterns, the direction and magnitude of score changes, and the effect-size estimate. This approach was consistent with Lakens's (2022) recommendation that the informational

value and detectable effects of a small study should be considered rather than relying exclusively on whether a *p*-value crosses a fixed threshold.

2.8 Ethical Considerations

Before data collection, parents or guardians received information about the purpose of the programme, learning activities, assessments, documentation procedures, confidentiality protections, and voluntary nature of participation. Permission was obtained from the participants' parents or guardians, and the children received an age-appropriate explanation of the activities before participating.

Participation or withdrawal did not affect the children's school grades or their access to other KKN activities. Participants were identified only by anonymous codes in the dataset and article. Photographs were taken or used only with prior permission, and no personal information that could identify an individual child was disclosed.

Because the participants were minors, administrative permission was also obtained from the relevant authority in Gelombang Village. Participation remained voluntary, and the children's identities were protected throughout the study.

3. Results

3.1 Participant Score Changes

All 10 participants had complete pretest and posttest score pairs and were therefore included in the analysis. Every participant obtained a higher overall posttest score than pretest score. Individual improvements ranged from 20 to 80 percentage points, with an average increase of 54.0 points. No participant demonstrated an unchanged or decreased overall score.

Participant	English Pretest	English Posttest	Mathematics Pretest	Mathematics Posttest	Overall Pretest	Overall Posttest	Change
S01	50	100	20	80	35	90	55
S02	70	100	80	90	75	95	20
S03	30	100	50	80	40	90	50
S04	60	100	40	100	50	100	50
S05	50	90	50	80	50	85	35
S06	20	100	20	100	20	100	80
S07	40	90	10	90	25	90	65
S08	30	100	30	100	30	100	70
S09	50	90	40	100	45	95	50
S10	40	80	10	100	25	90	65

***Table 2**. Individual Pretest and Posttest Scores*

3.2 Descriptive Results

The mean overall score increased from 39.5 in the pretest to 93.5 in the posttest, representing an average improvement of 54.0 percentage points. The median overall score similarly increased from 37.5 to 92.5. In addition to the increase in central tendency, the variability of the scores decreased. The standard deviation declined from 16.41 in the pretest to 5.30 in the posttest, indicating that participants' posttest scores were more closely clustered near the upper end of the scoring range.

Outcome	Test	Mean	Median	SD	IQR	Minimum	Maximum
English	Pretest	44.0	45.0	15.06	17.5	20	70
English	Posttest	95.0	100.0	7.07	10.0	80	100
Mathematics	Pretest	35.0	35.0	21.73	27.5	10	80
Mathematics	Posttest	92.0	95.0	9.19	17.5	80	100
Overall	Pretest	39.5	37.5	16.41	22.5	20	75
Overall	Posttest	93.5	92.5	5.30	8.75	85	100

***Table 3.** Descriptive Statistics for Pretest and Posttest Scores*

English scores increased from a pretest mean of 44.0 to a posttest mean of 95.0, resulting in an average improvement of 51.0 points. Mathematics scores showed a slightly greater increase, rising from a mean of 35.0 to 92.0, with an average improvement of 57.0 points. All 10 participants showed positive changes in both subject areas.

3.3 Inferential Results

An exact two-sided Wilcoxon signed-rank test was conducted to compare the paired pretest and posttest scores. The overall posttest scores were significantly higher than the pretest scores, $W = 0.00$, $p = .002$. The rank-biserial effect size was 1.00, reflecting the fact that all participants' score changes occurred in a positive direction.

Exploratory subject-specific analyses produced similar findings. English posttest scores were significantly higher than English pretest scores, $W = 0.00$, $p = .002$, and Mathematics posttest scores were also significantly higher than Mathematics pretest scores, $W = 0.00$, $p = .002$. These findings indicate consistent positive score changes following the six-session programme. Nevertheless, because the study employed a small one-group design without a comparison group, the observed changes should not be interpreted as definitive evidence that the workbook alone caused the improvement.

4. Discussion

The findings showed substantial improvements in the participants' mathematics and English performance after the six-session learning programme. The mean combined score increased from 39.5 on the pretest to 93.5 on the posttest, representing an average increase of 54.0 percentage points. All 10 participants obtained higher posttest scores, and the exact two-sided Wilcoxon signed-rank test indicated a statistically significant difference between the two assessments, $W = 0.00$, $p = .002$. The rank-biserial correlation of 1.00 further reflected that all observed changes occurred in a positive direction. These findings provide preliminary evidence that participation in the workbook-supported programme was associated with improved performance on the English and mathematics content covered during the six sessions.

The improvement was evident in both subject areas, although the mean increase was slightly greater in mathematics. The mean mathematics score increased from 35.0 to 92.0, representing a gain of 57.0 points, whereas the mean English score increased from 44.0 to 95.0, representing a gain of 51.0 points. The larger mathematics increase may partly be explained by the lower initial mathematics scores, which provided more room for improvement. Therefore, the difference between the two gains should not be interpreted as evidence that the programme was necessarily more effective for mathematics than for English. Instead, the results indicate that the participants improved their ability to answer questions aligned with the material taught in both subject areas.

The mathematics improvement may have been supported by the structured organisation of the workbook and the guided nature of the learning sessions. The workbook did not function as an independent learning material because facilitators explained concepts, demonstrated examples, assisted students during practice, discussed answers, and provided feedback. Maruyama and Kurosaki (2021) found that a package of remedial activities involving mathematics workbooks improved primary-school students' mathematics learning, with larger gains among students who initially obtained lower scores. Their later study similarly demonstrated that carefully sequenced textbooks and workbooks could contribute to mathematics achievement when combined with teacher preparation, diagnostic assessment, and instructional assistance (Maruyama & Kurosaki, 2024). These findings support the interpretation that the improvement observed in the present study resulted from the combination of the workbook, facilitator guidance, and repeated practice rather than from the printed material alone.

Active participation during the sessions may also have strengthened the learning process. Although the present programme was not specifically designed as a play-based intervention, the children participated in explanations, guided exercises, discussions, and review activities rather than completing written tasks without support. Murtagh et al. (2022) reported that primary-school students taught through participatory and play-based mathematics approaches achieved higher mathematics test scores than students receiving conventional instruction. Their study highlights the potential value of guided and active participation in primary mathematics learning. In the present programme, interaction between the facilitators and participants may therefore have helped students understand the concepts represented in the workbook exercises.

The use of familiar situations may have further supported students' understanding of mathematics. The workbook included problems involving school objects, books, sweets, fruit, money, time, food, and daily routines. Such contexts may have enabled the participants to connect numerical operations with experiences encountered at home, at school, and in the community. Hunter et al. (2022) emphasised the importance of recognising children's existing knowledge and strengthening connections between home, community, and mathematics education. Contextual problems, however, still require learners to understand the situation, identify relevant information, select an appropriate operation, carry out a plan, and evaluate the answer. Kusaka and Ndihokubwayo (2022) found that students who solved mathematical word problems successfully demonstrated stronger planning, monitoring, and evaluation processes. The familiar contexts in the workbook may thus have made the situations more accessible, while facilitator guidance assisted participants in recognising the underlying mathematical operations.

The English results also demonstrated considerable improvement. The English activities introduced vocabulary related to numbers, family members, school objects, animals, food and drinks, and daily activities. Students also completed word-meaning exercises, simple sentences, and short reading-comprehension tasks. These activities allowed the target words to be encountered repeatedly through recognition, retrieval, sentence completion, and reading. According to Liu and Reynolds (2025), effective vocabulary activities for primary-school learners require meaningful cognitive engagement with new words rather than passive exposure alone. Repeated opportunities

to recognise and retrieve the vocabulary presented in the workbook may consequently have contributed to the improvement in English scores.

The findings are also consistent with research concerning printed vocabulary-learning resources. Lei and Reynolds (2022), in their synthesis of 32 studies, reported that word-card activities generally supported vocabulary learning and that more of the reviewed studies showed larger effects for paper-based cards than digital cards. They also emphasised that learners require guidance in using vocabulary materials and opportunities to retrieve word meanings repeatedly. Although the workbook used in the present programme was not organised as a collection of word cards, its pairing of English words with meanings and its repeated exercises may have encouraged similar form–meaning connections. Evidence from an Indonesian elementary-school setting further showed that students' vocabulary scores increased significantly after learning basic words through flashcards, although that study also involved a very small group and a different learning medium (Suryani et al., 2022).

Nevertheless, presenting words through several forms does not automatically guarantee effective or lasting vocabulary learning. Li et al. (2022) found that providing multiple visual and verbal forms of input could support vocabulary learning, but excessive or redundant information could also increase learners' cognitive load and divide their attention. Their study additionally reported a substantial decline between immediate and delayed vocabulary scores, highlighting the distinction between immediate learning and longer-term retention. The present study administered the posttest immediately after the programme and therefore measured short-term performance rather than long-term retention. Future evaluations should include a delayed posttest several weeks after the final session to determine whether the English and mathematics gains are maintained over time.

The combination of English and mathematics may have provided a varied learning experience in which students moved between language-based and numerical tasks. The programme should not be considered a full Content and Language Integrated Learning intervention because mathematics was not consistently taught through English as the instructional language. Nevertheless, it reflected several elements associated with integrated learning, including multiple learning focuses, active participation, scaffolding, and the use of a shared instructional resource. In Indonesian primary schools,

Setyaningrum and Khoiriyah (2022) identified multiple foci, active learning, scaffolding, and cooperation as important features of content-and-language-integrated teaching. Their findings also emphasised that suitable materials and facilitator competence are required for successful implementation. A recent meta-analysis similarly found that CLIL generally benefited foreign-language development at the primary-school level, although its effects on academic-content learning were comparable to non-CLIL instruction (Lee et al., 2025). These findings reinforce the need to avoid assuming that combining two subjects alone will automatically produce learning improvement.

Another notable result was the reduction in score variability. The standard deviation of the combined scores decreased from 16.41 on the pretest to 5.30 on the posttest, indicating that the participants' posttest scores were more closely concentrated near the upper end of the scoring range. Participants with relatively low initial scores, including S06, S07, S08, and S10, demonstrated some of the largest improvements. This pattern suggests that the programme may have helped lower-performing participants reach a level closer to that of participants with stronger initial performance. However, the reduction in variability cannot be interpreted as definitive evidence that the programme reduced achievement gaps because the group was very small and no information was collected about the individual processes through which each participant learned.

The concentration of posttest scores near the maximum also indicates a possible ceiling effect. Six participants achieved a score of 100 in English, five achieved a score of 100 in mathematics, and three obtained an overall score of 100. These results indicate that the posttest may not have been sufficiently challenging to distinguish between participants who reached different levels of higher understanding. Although the instrument successfully detected change from relatively low pretest scores, it provided limited information about differences among students at the upper end of performance. Future assessments should remain aligned with the workbook content while incorporating several more challenging questions to improve sensitivity and reduce the likelihood of a ceiling effect.

The findings must also be considered in relation to the limitations of the research design. A one-group pretest–posttest design cannot fully separate the influence of the workbook-supported programme from maturation, repeated testing, facilitator influence, external learning experiences, or familiarity with the test format. Bierer et al. (2025)

emphasised that a change between pretest and posttest scores in a single group does not, by itself, demonstrate that the intervention caused the change. Consequently, the significant difference and large effect-size estimate in the present study indicate consistent positive changes within this group but do not prove that the workbook alone was responsible for the improvement.

The small sample size further restricts the generalisability and precision of the findings. Only 10 children from one village participated, and each participant represented 10% of the sample. As a result, the performance of one child could noticeably influence the descriptive statistics. Lakens (2022) explains that sample size may be justified by the finite population and resources available to a study, but researchers must remain transparent about the effects such limitations have on the conclusions that can be drawn. The present study should therefore be interpreted as a pilot evaluation of a specific community learning programme rather than as evidence applicable to all Grade 2 and Grade 3 students.

Despite these limitations, the findings have practical relevance for community-based educational programmes. The workbook provided a shared and structured resource through which KKN facilitators could organise six learning sessions covering foundational mathematics and English topics. Its explanations, familiar examples, guided exercises, review sections, and mixed activities may make it useful as supplementary material for tutoring, small-group instruction, KKN activities, and similar community education programmes. The results also demonstrate the value of evaluating community service activities using direct learning assessments rather than relying exclusively on attendance, enthusiasm, or facilitator impressions. Overall, the programme showed promising potential to support workbook-aligned mathematics and English learning among the participating children, although further research involving larger samples, comparison groups, more sensitive assessments, and delayed posttests is necessary.

5. Conclusion

This pilot study examined changes in the mathematics and English performance of 10 Grade 2 and Grade 3 primary-school children after six learning sessions using an integrated mathematics–English workbook. The mean combined score increased from 39.5 on the pretest to 93.5 on the posttest, while all participants demonstrated positive score changes. The exact two-sided Wilcoxon signed-rank test also indicated a

statistically significant difference between the pretest and posttest scores, $W = 0.00, p = .002$. Improvements were observed in both subject areas, with mathematics scores increasing from a mean of 35.0 to 92.0 and English scores increasing from 44.0 to 95.0.

These findings suggest that the workbook-supported learning programme has promising potential as a supplementary resource for community-based mathematics and English instruction. However, the results should be interpreted cautiously because the study involved a small sample, did not include a control group, and measured performance immediately after the programme. The observed improvement may therefore reflect the combined influence of the workbook, facilitator guidance, repeated practice, and other learning experiences. Further studies involving larger samples, comparison groups, longer implementation periods, and delayed posttests are needed to evaluate the effectiveness and retention of learning outcomes more comprehensively.

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