Research Article

4-in-1 Dictionary: An Intervention for Science 7 Learning

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ABSTRACT

This study, titled "4-in-1 Dictionary: An Intervention for Science 7 Learning", was conducted to investigate the effectiveness of a 4-in-1 dictionary as a learning intervention to enhance science concept comprehension among Grade 7 students of Centro Integrated School. It sought to answer the following questions: What is the performance level of the students before and after the intervention? Is there a significant difference between the mean pretest and mean posttest performance of the experimental group? And what are the experiences of the learners in the utilization of the intervention?

Qualitative and quantitative methods were employed in this study. It utilized pre and post-tests, and a written interview. Twenty-two (22) students served as the respondents of the study. Pre and post-tests were utilized to determine the performance level of the students before and after the intervention and its significant differences. A written interview was conducted to get their experiences in the utilization of the intervention. Paired t-test and percentage are the methods that are used in the research. Thematic analysis was the qualitative research method. The study findings suggest that there was a significant difference in the posttest mean score and the pretest mean score, thus 4 in 1 dictionary is effective on science concepts. According to students' qualitative data, they felt towards the intervention which demonstrates the usefulness of intervention as a pedagogical for teaching science.

Keywords: *4-in-1 Dictionary, Science Intervention, and Linguistic Barriers*

Background

In the rural areas of the Philippines, science education is constantly stunted by linguistic challenges as students who have a strong command of local dialects face difficulty in English-Medium instruction. This causes students to not be able to retain vocabulary or understand some concepts. For instance, in initial tests in science, the Grade 7 students of Centro Integrated School in Brgy. Centro, Uson, Masbate who were primarily Minasbate and Binisaya speakers, only got a mean performance of 26%. This is well below the minimum proficiency level. This gap prevents the scientific literacy needed for informed choice making.

With the foregoing, a 4-in-1 science dictionary for English, Filipino, Minasbate and Binisaya will be given as a culturally responsive intervention that will be embedded on the different phases of the lesson to build vocabulary as well as use during the assessment during the third quarter of school year 2024-2025. This action research evaluated the effectiveness on the science performance of 22 low performing students of Grade 7 through pretest and posttest statistical and learner experience analysis had significantly reported an MPS gain from 26% to 86%. Furthermore, it serves as a guide for the practices of other teachers in a similar context.

Research Questions
This research aims to enhance the performance of Grade 7-Cheetahs students from Centro Integrated School in their Science subject during the school year 2024–2025. This was achieved by employing a 4-in-1 dictionary as an intervention for in-person teaching during the third quarter for this current school year. More precisely, the study attempted to answer these key questions:
1. What is the performance level of the students before and after the intervention?
2. Is there a significant difference between the mean pretest and mean posttest performance of the experimental group?
3. What are the experiences of the learners in the utilization of the intervention?

Methods
A. Participants and/or Other Source of Data and Information
The study centered on twenty-two (22) 7th grade students from Centro Integrated School during the 2024- 2025 school year. These participants have been selected based on their underperformance in Science during the previous school year and their poor results on the first quarter summative test for this school year.

B. Data Gathering Methods
This research used qualitative and quantitative designs. Similarly, the pre-experimental research approach was employed in this study. Under the qualitative design, a written interview among the participants was conducted to get their experiences on the utilization of the intervention. The independent variable, the 4-in-1 dictionary, was launched in pre-experimental study to evaluate how it affects the learners' performance. To measure the impact of the intervention, a researcher-created evaluation that is quality confirmed by a school quality assurance team led by the school principal will be used. This was established baseline data before, during, and after the course of the research. The findings of the evaluations were used to evaluate the effectiveness of the intervention.

These findings were analyzed and tabulated to better illustrate the impact of the intervention. In this research, consent from the participants and their parents has been obtained through a parent-teacher meeting and signed parental consent conducted last August 28, 2024 at Grade 7 room.

C. Data Analysis Plan
The results of the researcher-made assessments under quantitative design were tabulated, and analyzed quantitatively by the researcher using descriptive and inferential statistical tools. On the other hand, the results under qualitative design were analyzed through thematic analysis.

Descriptive statistics was used in gauging the performance level of the learners before and after the utilization of the intervention, specifically the percentage. Furthermore, inferential statistics was used in analyzing the significant difference between the pretest and post-test of a learner's performance through a T-test for paired two samples. The paired t-test also known as the correlated t-test is a parametric test applied to one group of samples, just like in this study, which only involved one group of participants. This was used to determine whether there is a difference between the before and after. If there is a difference in favor of the posttest, then the intervention, which is the 4-in-1 dictionary, is effective.

Percentage was used in gauging the performance level of the learners before and after the utilization of the intervention.
Formula:

$$\% = \frac{f}{N} \times 100$$

Where:
% = percentage
f = total scores of the learners who took the test
N = number of learners who took the test
100 = constant

Paired T-test was used in analyzing the significant difference between pre-test and post-test of a learner's performance. This is used to find out if a difference that exists between the before and after means.
Formula:

$$t = \frac{\overline{D}}{\sqrt{\dfrac{\sum D^2 - (\sum D)^2}{n(n-1)}}}$$

Where:
$\vec{D}$ =   the mean difference between the pretest and posttest
$\sum D^2$ =   the sum of the squares of the difference between the pretest and posttest
$\sum D$ =   the summation of the difference between the pretest and posttest
n   =   sample size

Results and Discussion

The results of the study on the utilization of 4-in-1 Dictionary: An Intervention for Science 7 Learning are tackled in this chapter. The data gathered from the conduct of the pre and post-tests and written interview are presented, analyzed and interpreted herein.

Performance Level of the Students Before the Intervention

A preliminary assessment of Grade 7 students in science revealed a Mean Percentage Score (MPS) of 26%, clearly indicating a significant deficiency in their comprehension of core scientific concepts. The underperformance of this level necessitates prompt and focused intervention to prevent further backward motion as well as the establishment of basic science knowledge. As seen from the data, the learners are facing a linguistic barrier due to which they have trouble understanding the medium of instruction- the English language. The students, especially low-performing ones, in Brgy. Centro, Uson, Masbate speak a variety of dialects which serve as a dominant language. These dialects are what they use to communicate with others. In addition, since the students are dominant in these dialects, they also communicate and learn better in those dialects. The science subject, like the other subjects, is taught in English, on the other hand. Students face difficulty in conceptualization of the process as they do not understand the complicated sounding scientific words especially as there is no one to one translation for these scientific terms in their dialects. To help break this language barrier, and also achieve a greater and meaningful understanding of science, the researchers worked towards the compilation of a complete English to dialect dictionary. Furthermore, it was incorporated into classroom activities so they can actively communicate using their native language and at the same time, develop their English science vocabulary. As a result, they focus on committing to memory rather than grasping the lessons and implementing them in their everyday activities.

Performance Level of the Students After the Intervention

The implementation of the intervention which included the use of the comprehensive English-to-dialect science dictionary by the Grade 7 increased the MPS in science to 86% from 26%. Moreover, the students now show a better understanding of the concepts of science.

Table I. Pre and Post Tests Total Scores

Pre-Test Total Scores	MPS	Post-Test Total Scores	MPS
172	26%	570	86%

The language needs of Grade 6 learners in Brgy. Centro, Uson, Masbate was made possible by this accomplishment. In this barangay, speakers have a variety of mother tongue dialects. It also shows the great learning they can achieve with a little intervention. Using a science dictionary that translates from English to dialect was an efficient intervention for enhancing understanding. In addition, the dictionary was also utilized during classroom and review activity. In addition, it was used during reading and studying too. By enabling a more frequent use of the dictionary, the students were able to find out the meaning of the science words and phrases in their own dialects. As such, this was surely helpful in understanding their science classes. The dictionary was effective since it provided meaning in the students' mother tongue which made the usage easier for them. It also included examples that were based on the real-life experiences of residents in Brgy. Centro Uson Masbate As the Scientific

Terms were correlated with real life contexts, it helped. Moreover, the dictionary tailored the definitions and descriptions to fit the students' local dialects. Thus, translators interpreted scientific terms in a relevant context. Crucially, the dictionary helped understand abbreviations as it was made from the students' dialect as well as the English language. So, it can be a very good complementary tool in science learning.

Students have noticed remarkable improvement in MPS. It's a better example of culturally responsive pedagogy.

Difference Between the Mean Pre-Test and Mean Post-Test Performance of the Experimental Group

The analysis of the pre and post-test scores showed that there is a positive impact on the participants of the dialect based intervention of the Grade 7 students of Brgy. Centro Uson Masbate. The table below shows the change in Mean Percentage Scores (MPS):

Table II. MPS Result of Pre and Post-Tests

Pre-Test (30-item Test)	Post-Test (30-item Test)
26%	86%

The numbers indicate that the usage of English-to-dialect science dictionary and using it in classroom instruction raises the students' MPS by a remarkable 60 points. The 60% increase from 26% to 86% in performance is proof of the intervention' effectiveness.

Table III. Paired T-Test

Mean (Pre-test)	Mean (Post-test)	Computed Value	Critical Value	Interpretation
7.81	25.90	-20.11	2.07	Significant

The paired t-test results indicate that the t-computed value of 20.11 exceeds the critical value of 2.07, leading to the rejection of the hypothesis, which is interpreted as SIGNIFICANT. Before the intervention, respondents in the pre-test possessed 7.81 levels of understanding on science concepts. The low score means that the students' understanding of the subject was weak before the use of the 4-in-1 Dictionary. The score of 25.90 in post-test reflects high performance. This shows that the intervention was effective to improve students' knowledge and understanding. The significant increase in the mean score is a strong indication that the implementation of the 4-in-1 Dictionary assisted in enhancing the science learning performance of the Grade 7 learners.

The score on the pre-test which was 26% shows that there is a big gap in students' understanding of basic concepts in science and as they get use to science which is taught in English and their main mode of communication is local dialect. The post-test score 86% shows a considerable change in their understanding and application of science concepts.

The morphing of figures does not only mean that the students are doing numerically better but rather, they possess a heightened capacity to cite and internalize complicated scientific terminology between their own dialects and

the English-language curriculum. The essential skills facilitated by the intervention include:

Vocabulary Acquisition: Students gained a deeper understanding of scientific terms through culturally relevant translations and contextual explanations.

Conceptual Understanding: The dictionary helped students understand abstract scientific ideas by relating them to things in their lives.

Critical Thinking: Students were taught how to analyze and synthesize various pieces of information, as they were able to do so in their own dialects.

Gaining confidence: Understanding and explaining science topics through their native dialects and English developed confidence in students and increased their involvement in science.

The substantial enhancement in MPS illustrates the effectiveness of teaching strategies in Brgy. Centro, Uson, Masbate.This intervention has improved students' academic performance and has created a more inclusive and supportive learning environment for them as per their linguistic needs.

Experiences of the Learners in the Utilization of the Intervention

The data tackles the experiences of Grade 7 learners in the 3rd quarter of the school year 2024-2025 specifically on the use of a 4-in-1 Dictionary intervention. Data was collected through written interviews as transcribed texts.

Created to assist in the learning of science, the dictionary featured English, Filipino, Minasbate, and Binisaya.

Participants answered a question on the use of the intervention.

Question: What is/are your experience/s using the 4-in-1 Science Dictionary?

Their responses focused on three factors which contributed into their science development.

Vocabulary Acquisition and Application

Students have always conveyed that the dictionary helps them define the unknown scientific words. "*Nakakabulig sa akon ini na dictionary kay dede ko gina kita ang mga salita na dili ko pa aram*", stated by SP3 on the utilization of the dictionary. SP6 also said that *"dili na kami molisod pag mo hanap kami san word na gina pahanap kay bokionon nalang ang dectioanry"*. Accessing the definitions in different languages proved to be instrumental in the understanding of the complex concepts just like from the realization of SP17. She said that, *"hindi napo ako nahihirapan mag hanap kung ano ang tagalog o English"*.

The dictionary helped students to quickly learn the meanings of scientific words that could be useful in answering questions taught in class or exam. According to SP7, with the use of the dictionary, *"mapadali ang pag sabut sa mga litra"*. SP2 also believed that *"ang Dictionary ay nakakatulong sa akin at saakin mga kaklase pagmay t-araling ay poydika makakuha sa dictionary ng answer"*. Students showed better expertise in the use of vocabulary significantly representing their understanding of the concept.

Comprehension Development

The 4-in-1 Dictionary has proved helpful for students studying science lessons. SP20 said that *"mas naiintindihan ko din ang mga tinatanong ng aking guro"*. Moreover, SP18 also believed that *"sa dictionary lang po ako madali nakakaalam at madali ko po na maintindihan ang mga ibinigay mu po ma'am sa amin namalisud"*. In addition, SP6 also said that, *"napadali ang pag itendi ko sa science"*. By offering translations in their mother tongues, the dictionary narrowed the gap between formal English and common usage in those languages.

According to their responses, the students were more confident in their ability to understand and interpret scientific texts as the dictionary was multi-lingual. SP7 said that *"dili na ako na galisod sapag sabut tag dali na ako kaintindi tag nakakaintindi na ako kung ano ang ginatukdo ni Maam"*. SP3 also said that, *"madali ako maka intindi san dili ko aram na salita kag dali kula maaraman ko nano ibig sabihon sani na salita"*. The students were able to understand better the nuances of the English language when it is coupled with the other languages.

Academic Performance and Skill Development

Students reported their use of the dictionary positively impacted their assessment marks. SP7 said that, "*dili na mababa ang akon mga iskor*". SP8 also proved that using the intervention, "*na peperfect ko dahil andyan ang dictionary*". SP11 also said that, "*tumaas ang mga iskor ko*". Likewise, SP20 said that "*tumaas din ang aking grade*". The ability to understand scientific terminology and concepts directly contributed to their academic success.

There was more engagement and participation in the class. Almost the entire class (99%) participated in the recitation indicating that the dictionary made learning more comfortable.

Based on the factors that emerged from their answers, students have acquired skills to use a dictionary as a learning material that maximizes their ability toward independent study and self-learning. The four languages gained a better understanding of their structures and the effective use of a dictionary.

Conclusion

Using the 4-in-1 dictionary for teaching learning purposes was proved to be effective as is evident from the increase in Mean percentage score from 26% before the intervention to 86% after. The researcher pointed out that beside the quantitative results, the qualitative results from the students provided significant insight into the dictionary's impact on learning.

The researcher noted that many students responded that it helped them overcome the language barriers that are often met in learning science. One student remarked, "*Nakakabulig sa akon ini na dictionary kay dede ko gina kita ang mga salita na dili ko pa aram*" (SP3), highlighting how the dictionary enabled them to identify and understand unfamiliar words. Another student shared, "*dili na kami molisod pag mo hanap kami san word na gina pahanap kay bokionon nalang ang dictionary*" (SP6), which illustrated the ease the dictionary brought in searching scientific terms.

The researcher said dictionary usage did not just help improve vocabulary but also helped the students understand science lessons better and boosted their confidence. A participant expressed, "*mas naiintindihan ko din ang mga tinatanong ng aking guro*" (SP20), reflecting their heightened understanding and engagement. Several students also reported improved academic performance, with comments such as, "*tumaas ang mga iskor ko*" (SP11) and "*tumaas din ang aking grade*" (SP20).

The researcher noted an increase in class participation. The recitation also went up to 99%. These trends further show that the students felt confident and empowered when they used the dictionary for class activities.

The results revealed that the dictionary served as a culturally responsive learning resource that sufficiently catered to the varied linguistic needs of learners in Brgy. Centro, Uson, Masbate. The dictionary taught students the necessary skills to succeed academically while bridging native dialects of students with English-language science instruction.

To enhance the effectiveness of the dictionary further and cater to picture smart learners, the next editions of the 4-in-1 dictionary must feature illustrations for all words. Having the adjustment would help visual learners as they get clues and visual cues that would assist them in understanding and remembering the scientific terms in English, Filipino, Minasbate and Binisaya. By using illustrations, some students may understand the gap that verbal explanations miss and vice versa.

In general, the researcher thinks that the intervention teaches the students to learn in science more effectively. The language that often hinders their understanding is now used to explain and understand in a meaningful way.

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