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Enhancing the Scientific Skills of Grade 6 Learners through Guided Experimental Activities on Human Body Systems and Animal Classifications

Shella Marie U. Ashton

Author Information:
Department of Education, Surcoc Integrated School, Naguilian, Isabela, Philippines

Correspondence:
shellamarie.ashton0214@gmail.com

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Abstract. Science education plays a vital role in developing learners' scientific understanding, inquiry skills, and ability to apply concepts to real-life situations. However, limited mastery of Science competencies and insufficient opportunities for meaningful hands-on learning may hinder learners' academic performance. Addressing these concerns, this action research aimed to determine the effectiveness of contextualized and localized Science worksheets integrated with guided experimental activities in enhancing the scientific skills of Grade 6 learners, particularly in human body systems and animal classification. The study employed a one-group pretest-posttest research design involving 33 Grade 6 learners at Surcoc Integrated School during School Year 2025–2026. Data were gathered through pretest and posttest assessments and analyzed using the mean, standard deviation, paired-samples t-test, and Cohen's effect size to determine the extent and significance of improvement. Results revealed a substantial increase in learners' mean scores from 15.50 in the pretest to 27.40 in the posttest, with a mean gain of 11.90 points. The paired-samples t-test indicated a statistically significant improvement in performance, $t(32) = -16.70$, $p < .001$, while the effect size of 2.91 demonstrated a very large intervention effect. These findings indicate that integrating contextualized and localized instructional materials with guided experimental activities can significantly enhance learners' Science performance. The intervention provided opportunities for active participation, hands-on exploration, and meaningful connections between scientific concepts and real-life experiences. The study concludes that experiential and context-responsive instructional approaches can serve as effective strategies for addressing learning gaps and strengthening Science instruction. Future classroom-based studies may explore their applicability across other Science competencies, grade levels, and learning contexts.

Keywords: Contextualized Science Instruction; Grade 6 Learners; Guided Experimental Activities; Localized Learning Materials; Scientific Skills

Introduction

Science education plays a vital role in developing learners' scientific literacy, critical thinking, problem-solving abilities, and capacity to understand and explain real-world phenomena. At the elementary level, Science provides opportunities for learners to explore their surroundings, investigate natural processes, and develop an understanding of scientific concepts through observation and experimentation. However, teaching Science in public elementary schools, particularly in resource-limited communities, continues to face challenges such as insufficient laboratory equipment, limited instructional resources, and the use of predominantly textbook-based teaching approaches. These conditions may restrict learners' opportunities to engage in hands-on investigations and develop essential scientific inquiry skills. When scientific concepts are presented primarily through lectures and theoretical discussions, learners may find it difficult to relate abstract ideas to their everyday experiences, resulting in limited participation, interest, and conceptual understanding.

The development of scientific inquiry skills requires learning experiences that allow learners to observe phenomena, ask questions, formulate explanations, conduct investigations, gather and interpret evidence, and communicate conclusions. Guided experimental activities provide opportunities for learners to actively participate in the scientific process while receiving appropriate instructional support from teachers. Through these activities, learners can explore scientific concepts, manipulate materials, observe results, and

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establish connections between theoretical knowledge and actual experiences. In this regard, contextualized and localized instructional materials can make experimental learning more accessible by incorporating familiar situations, locally available resources, and practical examples from learners' immediate environment.

The Philippine basic education curriculum recognizes the importance of contextualization and localization in making instruction relevant and responsive to learners' diverse backgrounds and experiences. Republic Act No. 10533, or the Enhanced Basic Education Act of 2013, provides the policy foundation for a curriculum that is contextualized and flexible enough to allow schools to localize and indigenize learning content. In Science education, this approach enables teachers to integrate familiar materials, community resources, and real-life situations into classroom activities. Bello et al. (2023) investigated the use of contextualized and localized Science teaching and learning materials among Grade 10 learners in Agusan del Sur. Their experimental study involving 40 students demonstrated significant improvements in learning performance following the use of localized and contextualized instructional materials. The findings emphasized the value of making Science instruction relevant to learners' immediate environment and experiences.

Similarly, Plaza (2024) developed and evaluated Localized and Contextualized Learning Activity Sheets for Science 6 based on identified least-learned competencies. Using diagnostic assessment results from School Year 2021–2022, the study identified three least-learned competencies in the third quarter and developed activity sheets incorporating localized materials, inquiry-based activities, and contextualized content and assessments. The materials received a very satisfactory evaluation from qualified experts. The study demonstrated the potential of locally available resources and inquiry-oriented activities to address learning difficulties, particularly in schools with limited instructional facilities. However, its primary focus was the development and evaluation of instructional materials rather than the direct measurement of learners' scientific inquiry skills following guided experimental instruction.

In another Philippine study, Lagua (2025) examined the effect of an experiential learning strategy on the Science performance of Grade 6 pupils at Ripang Elementary School in Apayao. Using a two-group pretest-posttest experimental design involving 26 learners, the study found that pupils exposed to experiential learning achieved significantly higher posttest performance than those who received traditional instruction. The findings supported the integration of active and experiential approaches in elementary Science instruction. Furthermore, Arroco (2021), in a study involving 728 students and 18 teachers from selected schools in the Schools Division of Albay, investigated the educational outcomes of guided inquiry lessons in Physics. The findings revealed significant improvements in learners' inquiry skills and scientific attitudes, with large effects. The study also highlighted learners' ability to connect scientific concepts with real-life experiences. These findings reinforce the importance of guided inquiry and experiential approaches in developing scientific competencies.

Despite these encouraging findings, opportunities remain to examine the combined application of contextualized and localized Science worksheets with guided experimental activities, particularly in addressing both academic performance and scientific inquiry skills among Grade 6 learners. Previous Philippine studies have investigated localized instructional materials, contextualized activity sheets, and experiential or guided inquiry approaches. However, these studies have generally examined these interventions separately, involved different grade levels or Science topics, or focused primarily on material development and academic achievement. There remains a need for classroom-based evidence examining how the integration of contextualized and localized worksheets with guided experimental activities can enhance learners' Science performance while providing opportunities to develop scientific inquiry skills. Moreover, the application of this approach to specific elementary Science topics, particularly human body systems and the classification of vertebrates and invertebrates, provides an opportunity to address this gap.

The need for the intervention was further established by the Science performance records of Grade 6 learners at Surcoc Integrated School. During School Year 2023–2024, the percentage of pupils demonstrating low mastery of Science competencies was 28.3% in the first quarter, 33.8% in the second quarter, 21% in the third quarter, and 22.7% in the fourth quarter. In School Year 2024–2025, the corresponding percentages were 35%, 24%, 25%, and 16%, respectively. Although these figures indicated some improvement, learning difficulties persisted. During the last quarter of School Year 2025–2026, five competencies remained least mastered, with an average rate of 36.7%. These results indicated continuing gaps in learners' conceptual understanding and mastery of Science competencies, emphasizing the need for more engaging, relevant, and experiential instructional approaches.

In response to these concerns, the present action research implemented contextualized and localized Science worksheets integrated with guided experimental activities using accessible, low-cost, and locally available materials. The intervention focused on selected Grade 6 Science lessons involving human body systems and the classification of vertebrates and invertebrates. Through guided experiments, structured learning tasks, observation, and hands-on exploration, learners were provided with opportunities to

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investigate scientific concepts and connect classroom discussions with practical experiences. The intervention was designed not only to improve learners' academic performance but also to strengthen their participation in scientific inquiry processes.

Specifically, this study aimed to determine the effectiveness of contextualized and localized Science worksheets integrated with guided experimental activities in enhancing the Science performance and scientific inquiry skills of Grade 6 learners at Surcoc Integrated School during School Year 2025–2026. It also sought to provide classroom-based evidence on the contribution of experiential and context-responsive instructional approaches to elementary Science education. The findings may serve as a basis for developing similar instructional interventions and provide insights for future classroom-based research on improving Science learning outcomes and scientific inquiry skills.

Research Questions

To guide the direction of this study and determine the effectiveness of the proposed intervention, the following research questions were formulated;

1. What are the pre-test and post-test scores in Science of the Grade VI pupils before and after the utilization of contextualized and localized Science worksheets?
2. Is there a significant improvement in the Science performance of the pupils after the utilization of contextualized and localized Science worksheets?
3. What is the magnitude of improvement in the Science performance of the Grade VI pupils, as reflected in their gain scores?

Scope and Delimitation of the Study

This study was conducted at Surcoc Integrated School, Surcoc, Isabela. It was limited to the thirty-three (33) Grade 6 pupils during the school year in which the study was implemented. The study focused on enhancing the scientific skills of learners through guided experimental activities in Science. In particular, it examined the learners' academic performance as reflected in their Science grades and their performance in a pre-test and post-test administered during the second quarter of the school year. These data were obtained from the sdy was further delimited to the use of the first to fourth quarter Science grades, as well as the second quarter pre-test and post-test results, as the primary measures of academic performance. Other variables that may influence learner achievement were not included in the scope of the study.

Literature Review

Guided Experimental Activities and the Development of Scientific Inquiry Skills

Scientific inquiry is a fundamental component of science education because it enables learners to develop the ability to investigate phenomena, gather evidence, analyze information, and construct explanations based on observations. Rather than simply memorizing scientific facts, learners need opportunities to engage in activities that reflect the actual processes of scientific investigation. Guided experimental activities provide a structured learning environment in which teachers introduce scientific problems, facilitate investigations, and support learners in developing explanations based on experimental evidence. Through these activities, learners can practice essential scientific process skills, including observing, classifying, predicting, measuring, identifying variables, recording data, interpreting results, and drawing conclusions.

Durmaz and Mutlu (2023) investigated the effectiveness of guided inquiry-based laboratory activities in developing the research and inquiry learning skills of Grade 5 learners in Türkiye. The study employed a quasi-experimental pretest-posttest design involving 38 learners divided into experimental and control groups. The researchers used a research skills test, an inquiry learning skills perception scale, and interviews to examine the effects of the intervention. Findings revealed statistically significant differences between the two groups in research skills and perceptions of inquiry learning skills, favoring the experimental group. The study emphasized that guided experimental activities provide learners with opportunities to formulate questions, plan investigations, collect and analyze evidence, and communicate scientific explanations. These findings demonstrate the importance of providing structured experimental experiences during the elementary years to strengthen learners' scientific inquiry competencies.

Similarly, Shao et al. (2024) examined the respective contributions of hands-on experiments and science educational videos to the learning of Grade 5 pupils in China. Using an experimental and control group pretest-posttest design involving two classes, the researchers compared students' scientific knowledge, modeling abilities, and health-related learning outcomes. Results indicated no significant difference between the two approaches in scientific knowledge acquisition. However, learners who participated in hands-on experimental activities demonstrated better results in perceiving and applying materials in modeling

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activities. The findings suggest that direct engagement with materials provides learning opportunities that may not be fully achieved through observation alone. This is particularly relevant to elementary Science instruction, where learners benefit from manipulating objects, constructing models, and observing actual experimental outcomes. The study also highlights the importance of ensuring that experimental procedures are accurate and appropriately designed to achieve the intended learning outcomes.

The relationship between inquiry-based instruction and scientific thinking was also examined by Wiyarsi et al. (2021), who investigated the effects of inquiry learning contextualized through socio-scientific issues on students' scientific habits of mind and chemical literacy in Indonesia. The quasi-experimental study involved 32 Grade 11 students assigned to experimental and control groups. The experimental group participated in Predict-Observe-Explain-Extend inquiry activities using real-life social and scientific issues, while the control group followed the regular scientific learning approach. Results revealed a significant overall difference between the groups in scientific habits of mind and chemical literacy when analyzed simultaneously. However, the separate analysis showed a significant difference in chemical literacy but not in scientific habits of mind. The findings demonstrate that connecting scientific inquiry to relevant real-world issues can support scientific literacy and evidence-based reasoning, although improvements in different dimensions of scientific thinking may not occur equally. This suggests that inquiry-oriented interventions should be supported by appropriate activities and assessment tools that explicitly target the skills intended to be developed.

These international studies collectively emphasize that experimental and inquiry-based learning can provide meaningful opportunities for learners to develop scientific reasoning, investigation, and problem-solving abilities. Nevertheless, the effectiveness of such approaches depends on the degree of guidance provided, the relevance of the learning activities, and the alignment between the instructional intervention and the intended learning outcomes. The findings also suggest that hands-on experimentation should not be viewed merely as an activity for demonstrating scientific concepts but as a purposeful learning process through which learners develop the ability to investigate and explain scientific phenomena.

Contextualized and Localized Experimental Activities in Science Education

The relevance of experimental activities can be strengthened when scientific investigations are connected to learners' immediate surroundings and everyday experiences. Contextualized instruction enables learners to understand scientific concepts through familiar situations, while localization involves incorporating available community resources, indigenous materials, and locally relevant examples into classroom instruction. In resource-limited schools, these approaches provide practical opportunities to conduct meaningful Science experiments without relying exclusively on expensive laboratory equipment. By using recycled materials, household objects, indigenous plants, and other accessible resources, teachers can design experimental activities that encourage active participation and connect scientific concepts with real-life situations.

In the Philippine context, Bello et al. (2023) examined the effects of contextualized and localized Science teaching and learning materials on students' academic performance. Their experimental study involved 40 Grade 10 learners during School Year 2021–2022 and utilized a 50-item multiple-choice assessment. The researchers employed paired-samples and independent-samples t-tests to determine improvements in learning performance. Results showed statistically significant improvements in the groups exposed to the instructional approaches, with reported t-values of −39.722 and −21.078, respectively, and corresponding p-values below .001. The findings indicated that contextualized and localized instructional materials contributed to improved Science learning performance. Although the study focused on Grade 10 learners, its findings support the application of locally relevant instructional resources in elementary Science education. However, the study primarily emphasized academic performance rather than the specific development of scientific inquiry skills through guided experimental activities.

In another Philippine study, Plaza (2024) developed and evaluated Localized and Contextualized Learning Activity Sheets for Science 6 based on identified least-learned competencies. Using a developmental research design, the study identified three least-learned competencies in the third quarter based on consolidated diagnostic assessment results for School Year 2021–2022. The developed learning activity sheets incorporated localized materials, inquiry-based activities, and contextualized content and assessments. Four qualified experts evaluated the materials using the prescribed evaluation instrument for print resources. Results showed that the materials received a Very Satisfactory rating in terms of content, format, organization, presentation, and accuracy. The study demonstrated that locally available resources could be incorporated into inquiry-based learning materials to address competency gaps, particularly in schools with limited instructional resources. However, its primary emphasis was on the development and validation of instructional materials rather than measuring their direct effects on learners' inquiry skills and academic performance through an intervention.

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Similarly, Lituañas and Dela Cruz (2024) developed and validated contextualized Strategic Intervention Materials in Science for 91 Grade 6 learners at Tungao Central Elementary School in Butuan City. The study identified learning difficulties through four first-quarter summative assessments, particularly in differentiating solutes from solvents, describing suspensions, and explaining methods of separating mixtures. The developed materials included guide cards, activity cards, assessment cards, enrichment activities, reference cards, and answer keys. The results of the initial assessments revealed that most learners did not meet expectations, providing a basis for the development of targeted instructional materials. The study highlighted the importance of aligning contextualized intervention materials with learners' identified learning difficulties. However, its primary focus was the development and validation of strategic intervention materials rather than the combined implementation of localized experimental activities and the measurement of scientific inquiry skills.

Further evidence supporting the development of scientific process skills through accessible experimental activities was provided by Bibon (2022) through Project HANDLE (Home-Based Activities Needed for Distance Learning Experiments). The study involved 35 Grade 7 learners from Cagraray Island, Albay, and employed a one-group pretest-posttest pre-experimental design. The intervention consisted of home-based laboratory experiments using a printed activity manual. Data were analyzed using descriptive statistics, mean gains, t-tests, and Cohen's effect size. Findings revealed statistically significant improvements in all tested science process skills, with measuring emerging as the most developed skill and observing as the least developed. Learners also reported positive experiences associated with independence, enjoyment, conceptual formation, and ease of performing the activities. The study further proposed a framework integrating contextualization, culture-based approaches, and brain-based learning in the development of experimental activities. These findings demonstrate that meaningful experimental learning can be facilitated through accessible materials, even in resource-constrained settings. Although the study was conducted at the secondary level and during distance learning, its approach provides relevant insights into the use of locally available materials in developing scientific competencies.

In addition, Barantes and Tamoria (2021) examined the effectiveness of Learners Active Response to Operant lessons in improving the basic science process skills of 30 Grade 4 pupils in Zambales, Philippines. The action research employed a descriptive research design and utilized parallel assessments to determine changes in learners' science process skills before and after the intervention. Results revealed that learners who initially demonstrated average performance improved to an outstanding level after the implementation of the intervention. The t-test results further indicated that the intervention was effective in enhancing basic science process skills. Although the approach emphasized educational games rather than guided experiments, the study supports the use of active and learner-centered instructional strategies in developing foundational scientific competencies among elementary pupils.

Taken together, these Philippine studies demonstrate the value of contextualized instructional materials, localized resources, and experiential learning strategies in addressing Science learning difficulties. They also highlight the feasibility of developing instructional interventions that respond to learners' specific competency needs and the resource limitations of public schools. However, the reviewed studies differ in their instructional approaches, participants, and measured outcomes. Some focused on the development and validation of learning materials, while others examined academic performance or individual science process skills. This indicates the continuing need to investigate integrated instructional approaches that combine contextualized worksheets with guided experimental activities and examine their contribution to learners' Science achievement and scientific inquiry skills.

Effects of Contextualized and Experimental Instruction on Science Learning Performance

Academic performance is an important indicator of the extent to which learners acquire and apply scientific knowledge following an instructional intervention. In elementary Science, difficulties in understanding abstract concepts may arise when learners have limited opportunities to observe, investigate, and experience scientific phenomena. Contextualized worksheets and guided experimental activities can address these difficulties by presenting scientific concepts through structured tasks and practical investigations. The combination of written learning materials and hands-on activities allows learners to review essential concepts, follow experimental procedures, record observations, and relate their findings to scientific explanations.

The findings of Bello et al. (2023) provide evidence that contextualized and localized Science learning materials can significantly improve academic performance. Similarly, Bibon (2022) demonstrated that home-based experimental activities can improve learners' science process skills, while Shao et al. (2024) established the distinct contribution of hands-on experiments to learners' modeling abilities. These studies suggest that academic learning and practical scientific experiences can complement one another in strengthening Science instruction. However, improvement in achievement scores alone does not necessarily establish the development of specific inquiry competencies. Thus, instructional interventions should consider

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both learners' mastery of scientific concepts and their ability to engage in the processes of scientific investigation.

The relevance of targeted instructional interventions is also supported by the findings of Plaza (2024) and Lituañas and Dela Cruz (2024), whose studies identified least-learned Science competencies as the basis for developing contextualized instructional materials. These findings emphasize the importance of using assessment results to identify learning gaps and design appropriate interventions. Rather than employing generic learning activities, teachers need to develop materials that directly address the concepts and competencies that learners find difficult to understand. In this regard, guided experimental activities can provide opportunities for learners to apply scientific concepts through observation, manipulation of materials, and evidence-based explanations.

The reviewed literature establishes that guided inquiry, hands-on experimentation, and contextualized instruction are valuable approaches in strengthening Science education. International studies, particularly those of Durmaz and Mutlu (2023), Shao et al. (2024), and Wiyarsi et al. (2021), demonstrate the contribution of structured investigations and relevant scientific contexts to learners' scientific reasoning, inquiry learning, and conceptual understanding. Philippine studies by Bello et al. (2023), Plaza (2024), Lituañas and Dela Cruz (2024), Bibon (2022), and Barantes and Tamoria (2021) further support the use of localized instructional materials, accessible experimental resources, and active learning strategies in addressing Science learning difficulties and developing scientific competencies.

Despite these contributions, differences in the focus and outcomes of previous studies indicate an opportunity for further classroom-based investigation. Some studies emphasized inquiry skills without specifically integrating localized worksheets, while others concentrated on the development or validation of contextualized materials without directly examining their effects on scientific inquiry skills. Other interventions investigated science process skills through home-based experiments or learner-centered activities but did not specifically address the integration of contextualized and localized worksheets with guided experimental activities among Grade 6 learners. Moreover, the existing studies provide limited direct evidence concerning the combined application of these approaches to selected elementary Science topics, particularly human body systems and the classification of vertebrates and invertebrates.

The present study addresses this gap by examining the use of contextualized and localized Science worksheets integrated with guided experimental activities among Grade 6 learners. It focuses on improving learners' Science performance through practical, structured, and context-responsive learning experiences that utilize accessible and locally available materials. It also recognizes the importance of scientific inquiry processes in enabling learners to observe, investigate, interpret experimental results, and develop evidence-based conclusions. Through this intervention, the study seeks to contribute classroom-based evidence on the application of contextualized experimental instruction in strengthening elementary Science learning and informing the development of similar instructional approaches in resource-limited educational settings.

Methodology

Research Design

The study employed a quantitative pre-experimental research design using a one-group pretest-posttest approach to determine the effectiveness of contextualized and localized Science worksheets integrated with guided experimental activities. The design involved administering a pretest before the intervention and a posttest afterward to measure changes in learners' Science performance. A paired-samples t-test was used to determine whether the difference between the pretest and posttest scores was statistically significant.

Research Locale

The study was conducted at Surcoc Integrated School, located in the Municipality of Naguilian, Province of Isabela, Philippines. The school was selected as the research locale based on the identified learning difficulties in Science and the need to implement contextualized and localized instructional interventions.

Research Participants

The participants consisted of 33 Grade 6 learners enrolled at Surcoc Integrated School during School Year 2025–2026. They participated in the implementation of contextualized and localized Science worksheets integrated with guided experimental activities.

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Research Instrument

The primary research instrument was a researcher-made Science achievement test consisting of pretest and posttest items aligned with the Grade 6 Most Essential Learning Competencies in Science. The assessment covered selected lessons on human body systems and the classification of vertebrates and invertebrates. The instrument underwent expert validation to establish content relevance, accuracy, clarity, and alignment with the intended learning competencies. Revisions were incorporated based on the validators' recommendations before its administration. The contextualized and localized Science worksheets used in the intervention also underwent quality assurance and evaluation by the Public Schools Division Learning Resources and Curriculum Implementation Division to ensure their alignment with curriculum standards and appropriateness for Grade 6 learners. The learners' official quarterly Science grades for the first through fourth quarters were also obtained from school records as supplementary data to support the analysis of their academic performance.

Data Gathering Procedure

Prior to data collection, permission to conduct the study was secured from the school head, and the necessary consent and assent procedures were observed. A pretest was administered to the 33 participants to determine their initial understanding of the selected Science competencies. The intervention was then implemented through contextualized and localized Science worksheets integrated with guided experimental activities using accessible, low-cost, recycled, and household materials. Following the intervention, a posttest with the same content coverage and assessment structure as the pretest was administered to determine changes in learners' Science performance. The learners' official quarterly Science grades were also gathered from school records to provide supplementary information on their academic achievement throughout the school year. All collected data were organized, tabulated, and analyzed using appropriate statistical procedures. Confidentiality of participants' information was maintained throughout the research process.

Results and Discussions

Research Question 1: What is the level of performance of Grade 6 learners in Science before and after the implementation of contextualized and localized Science worksheets?

Table 1. Descriptive Statistics of Pupils' Pretest and Posttest Scores in Science

Test	N	Mean	Median	SD	Minimum	Maximum
1. Pre-test	33	15.50	13.00	7.65	5	31
2. Post-test	33	27.40	28.00	5.42	14	35

Table 1 presents the descriptive statistics of the Grade VI pupils' Science scores before and after the utilization of contextualized and localized Science worksheets. The results show that the pupils obtained a pre-test mean score of 15.50, which increased to 27.40 in the post-test. This represents an increase of 11.90 points in the class mean, indicating improved Science performance following the intervention. The median score also increased from 13.00 in the pre-test to 28.00 in the post-test. This indicates that the improvement was reflected not only in the mean score but also in the middle score of the group. Meanwhile, the standard deviation decreased from 7.65 to 5.42, suggesting that the post-test scores were less dispersed than the pre-test scores. This indicates that pupils' performance became more closely distributed around the higher post-test mean.

The improvement may be associated with the use of contextualized and localized learning materials that connect scientific concepts with familiar experiences and available resources. By incorporating guided experimental activities, pupils were given opportunities to observe, explore, and apply Science concepts through concrete learning experiences rather than relying solely on theoretical explanations.

This finding is consistent with Bello et al. (2023), who emphasized the value of contextualized and localized Science teaching and learning materials in making lessons more meaningful and relevant to learners. Similarly, Lituañas and Cruz (2024) demonstrated the importance of developing contextualized Science learning materials based on the identified learning needs of Grade 6 pupils. Shao et al. (2024) also highlighted the contribution of hands-on experiments to learners' understanding of scientific concepts.

The findings suggest that contextualized and localized Science worksheets, when integrated with guided experimental activities, can provide meaningful learning experiences that support the improvement of pupils' Science performance.

Research Question 2: Is there a significant improvement in the Science performance of the pupils after the utilization of contextualized and localized Science worksheets?

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Table 2. Significant Difference Between the Pre-test and Post-test Science Scores of Grade VI Pupils

Comparison	Mean Difference	t-value	df	p-value	Decision	Interpretation
1. Pre-test and Post-test	11.90	-16.70	32	< .001	Reject Ho	Significant

Table 2 presents the results of the paired-samples t-test conducted to determine whether a significant difference existed between the pupils' pre-test and post-test Science scores. The analysis yielded a *t*-value of -16.70, with 32 degrees of freedom and a *p*-value of less than .001. Since the computed *p*-value is lower than the .05 level of significance, the null hypothesis is rejected. Therefore, there is a statistically significant difference between the pre-test and post-test scores of the Grade VI pupils.

The negative *t*-value does not indicate a decrease in performance. It resulted from the order of subtraction used in the statistical computation, which was pre-test minus post-test. Since the post-test mean was higher than the pre-test mean, the resulting test statistic was negative. The positive mean difference of 11.90 points confirms that pupils obtained higher scores after the intervention.

This finding indicates that the improvement in Science performance was statistically significant and was observed after the utilization of contextualized and localized Science worksheets. The result supports the use of meaningful and guided learning experiences in teaching scientific concepts. When learners are provided with opportunities to engage in structured activities, they can connect scientific ideas with actual observations and experiences.

Related findings were reported by Barantes and Tamoria (2021), whose LARO lessons contributed to the development of elementary pupils' basic Science process skills. Likewise, Bibon (2022) found improvements in the Science process skills of learners who participated in home-based experimental activities under Project HANDLE. Durmaz and Mutlu (2023) also reported positive learning outcomes from guided inquiry-based activities among elementary learners.

The result of the present study is consistent with these findings, particularly in demonstrating the value of structured, activity-based, and learner-centered approaches in Science instruction. However, since the study employed a one-group pre-test–post-test design without a comparison group, the significant difference should be interpreted as improvement following the intervention rather than definitive proof that the intervention alone caused the improvement.

Research Question 3: What is the magnitude of improvement in the Science performance of the Grade VI pupils, as reflected in their gain scores?

Table 3. Magnitude of Improvement in Pupils' Science Performance

Indicator	Value	Interpretation
1. Mean Difference	11.90	Large raw-score gain
2. Estimated SD of Difference Scores	4.09	Moderate variability in individual gains
3. Standard Error of Difference	0.71	Precise estimate of mean gain
4. 95% Confidence Interval of Mean Gain	10.45 to 13.35	True mean gain likely falls within this range
5. Cohen's dz	2.91	Very large effect

Table 3 presents the magnitude of improvement in the pupils' Science performance based on their gain scores and effect size. The computed mean gain of 11.90 points indicates that the pupils' post-test scores were, on average, 11.90 points higher than their pre-test scores. The 95% confidence interval ranged from 10.45 to 13.35 points, indicating that the estimated mean improvement was above zero.

Furthermore, the computed Cohen's *d* of 2.91 indicates a very large standardized effect. This suggests that the difference between the pre-test and post-test scores was substantial relative to the variability of the pupils' individual score differences. Thus, the improvement was not only statistically significant but also large in magnitude.

The substantial gain may be understood in relation to the instructional approach used in the study. Contextualized and localized worksheets provided learning activities connected to the pupils' immediate environment, while guided experiments allowed them to explore scientific concepts through direct participation. These activities provided opportunities for learners to observe, investigate, and relate scientific explanations to concrete experiences.

Lakens (2013) emphasized the importance of reporting effect sizes alongside significance tests because effect sizes provide information about the magnitude of observed differences. In the present study, the very large effect size complements the significant paired-samples t-test result and demonstrates the substantial improvement observed in the pupils' Science scores.

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Nevertheless, the effect size should be interpreted within the limitations of the research design. Since the study involved only one group of pupils and did not include a comparison group, other factors such as test familiarity, regular classroom instruction, and additional learning experiences may also have contributed to the observed improvement. Despite this limitation, the findings provide encouraging classroom-based evidence supporting the use of contextualized and localized Science worksheets integrated with guided experimental activities.

Overall, the results demonstrate that the Grade VI pupils obtained higher Science scores after the utilization of contextualized and localized Science worksheets. The significant difference and very large effect size further indicate that the observed improvement was substantial. These findings support the continued development and use of relevant, localized, and activity-based instructional materials to provide meaningful Science learning experiences for elementary pupils.

Ethical Considerations

Before conducting the study, the researcher secured approval from the appropriate school authorities and complied with applicable Department of Education research policies and requirements. Since the participants were 33 Grade 6 learners who were minors, written informed consent was obtained from their parents or legal guardians, and learner assent was secured before data collection. The purpose and procedures of the study were explained in an age-appropriate manner. Participation was voluntary, and withdrawal did not affect the learners' grades or access to regular instruction. Confidentiality and privacy were maintained in accordance with the Data Privacy Act of 2012 (Republic Act No. 10173). Pretest and posttest scores and quarterly Science grades were used solely for research purposes, securely handled, and reported in aggregate form to protect the participants' identities. The guided experimental activities used appropriate, locally available materials, with due consideration for learner safety. The researcher also ensured accuracy, objectivity, and integrity in data collection, analysis, interpretation, and reporting.

Conclusion

The findings of this study indicate that the Grade 6 pupils of Surcoc Integrated School demonstrated room for improvement in their scientific skills and conceptual understanding before the implementation of the intervention. Following the use of guided experimental activities supported by localized and contextualized Science worksheets, the pupils exhibited improved performance in applying scientific concepts and completing science-related tasks. The statistical analysis revealed a significant difference between the pretest and posttest scores, suggesting that the intervention contributed to improved learning outcomes within the participating class. The findings highlight the potential of hands-on, inquiry-based instruction to make scientific concepts more accessible and meaningful by connecting classroom learning with learners' real-life experiences and locally available resources. Overall, guided experimental activities emerged as a promising instructional approach for strengthening scientific skills, encouraging active engagement, and supporting Science learning in a resource-constrained elementary school setting. These results underscore the value of integrating contextualized and experiential learning opportunities into elementary Science instruction, while recognizing that further research involving comparison groups and additional school settings would help establish the broader applicability of the approach.

Recommendations

Based on the findings and conclusions of the study, pupils are encouraged to participate actively in guided experimental activities, demonstrate curiosity, and apply scientific concepts to real-life situations to further develop their scientific reasoning and problem-solving skills. Science teachers are encouraged to integrate guided experimental activities and contextualized and localized worksheets into their lessons, using locally available and low-cost materials to improve learners' Science performance and provide meaningful hands-on learning experiences. School heads and administrators are encouraged to support these instructional practices by providing appropriate resources, organizing professional development activities, and promoting collaborative development of contextualized Science materials. Curriculum developers are encouraged to incorporate more contextualized, localized, and inquiry-based learning experiences into the Science curriculum to make scientific concepts relevant and accessible to elementary learners. Finally, future researchers are encouraged to conduct similar studies involving larger samples, multiple schools, and comparison groups to further establish the effectiveness of guided experimental activities. They may also examine their long-term effects on knowledge retention, conceptual understanding, scientific process skills, and learner engagement across different grade levels.

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