Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal
of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Construction and Validation of Contextualized Experimental Activities to Scaffold Students Laboratory Skills

Novie B. Tacis [1], Michael Vene S. Abalos, MST-Physics [1]
tacisnb@gmail.com / 0009-0001-3234-9528

1 – Abra State Institute of Sciences and Technology, Bangued Campus, Bangued, Abra

Publication Date: August 16, 2026 DOI: **10.5281/zenodo.21962582**

Abstract

This study focused on the construction and validation of contextualized laboratory activities designed to scaffold students' laboratory skills in science. Specifically, it aimed to develop a set of experimental activities aligned with the K–12 Science curriculum and evaluate their effectiveness in enhancing students' competencies in laboratory procedures, critical thinking, and scientific inquiry.

Quantitative research design with a developmental and validation strategy was used. The study involved the creation of twelve (12) contextualized laboratory activities, which were subjected to expert validation in terms of content, format, presentation and organization, and accuracy. A total of 10 expert validators assessed the materials using a structured validation instrument. The modifications were made based on validators' suggestions to improve the quality and appropriateness of the designed activities.

Findings revealed that the developed experimental activities were highly valid across all evaluated aspects and demonstrated string alignment with curriculum requirements and learners needs. The activities were also found to be reliable, appropriate, and effective in promoting student learning, particularly in enhancing clarity of instructions, relevance to real-situations, and development of laboratory skills. Expert evaluators showed fair to excellent agreement in their assessments, further supporting the validity of the materials. The study concludes that the level of validity of the developed contextualized experimental activities are highly valid in terms of content, format, presentation and organization, and accuracy. The activities were indeed valid, reliable and appropriate according to DepEd's k-12 curriculum standards and well-structured for classroom implementation. Additionally, expert evaluators showed fair to excellent agreement in their assessment of the validity of the developed contextualized experimental activities. Lastly, the inclusion of codes, measurable objectives, HOTS, visual aids, time allotment and list of materials were recommended to make the activities more meaningful, clear, and practical in the classroom setting.

Based on these findings, it is recommended that the developed experimental activities be continuously improved to ensure consistency and quality. Teachers may utilize these validated materials to enhance students' practical skills and engagement in science. Future studies may further examine their effectiveness across different learner groups to strengthen generalizability. Moreover, ongoing validation by additional experts and continuous refinement based on feedback especially in terms of instructional clarity and promotion of higher-order thinking skills are encouraged to ensure sustained effectiveness in classroom implementation.

Keywords: *Contextualized learning, experimental activities, Science education, Laboratory skills, Scaffold*

1. Introduction

Science education plays a vital role in developing students' critical thinking, problem-solving, and inquiry skills. Laboratory activities are essential in science instruction because they provide hands-on experiences that help students connect scientific concepts with real-life situations. However, many students still experience difficulties in conducting scientific investigations due to limited laboratory exposure, insufficient guidance, and lack of contextualized learning activities. Scaffolding has been recognized as an effective instructional approach in helping learners perform complex laboratory tasks through guided support and step-by-step learning. Studies have shown that scaffolded inquiry activities improve students' experimental design skills, scientific reasoning, confidence, and problem-solving abilities. Likewise, contextualization makes learning more meaningful by relating scientific concepts to students' local experiences and environment. The integration of contextualization and scaffolding can therefore enhance students' engagement, understanding, and laboratory competencies.

In the Philippines, the Department of Education emphasizes contextualized learning in the K–12 curriculum. Despite this, many science classrooms still rely on traditional instruction and limited laboratory engagement due to inadequate facilities, lack of materials, and insufficient instructional resources. This concern is reflected in the poor performance of Filipino learners in international assessments such as the Program for International Student Assessment (PISA), highlighting the need for more learner-centered and skill-based science instruction. Although previous studies have explored scaffolding and contextualization separately, limited research has focused on developing and validating contextualized experimental activities specifically designed to scaffold students' laboratory skills. Hence, this study aimed to construct and validate contextualized experimental activities aligned with the K–12 Science curriculum to improve students' laboratory competencies, scientific inquiry, and engagement in science learning.

Literature Review

This study was anchored on theories that emphasize experiential, constructivist, scaffolded, and contextualized learning in science education. These theories support the idea that students learn best when they actively engage in meaningful experiences, receive appropriate guidance, and connect learning to real-life situations. John Dewey's Experiential Learning Theory highlights the importance of "learning by doing," where students develop critical thinking and problem-solving skills through active participation in laboratory activities. Similarly, Jean Piaget's Constructivist Theory explains that learners construct knowledge through direct interaction with their environment, making hands-on experimentation essential in developing scientific understanding and laboratory competencies.

The study was also guided by Lev Vygotsky's Sociocultural Theory, particularly the Zone of Proximal Development (ZPD), which emphasizes that students can achieve higher levels of learning through guidance and support. From this theory emerged the concept of scaffolding, where teachers provide structured assistance that is gradually removed as learners gain independence and mastery of skills. In support of laboratory skill development, Kolb's Experiential Learning Theory explains that learning occurs through a cycle of concrete

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

experience, reflection, conceptualization, and experimentation. Meanwhile, Fitts and Posner's Skills Acquisition Theory describe how learners progress from understanding procedures to mastering them through continuous practice. Sweller's Cognitive Load Theory further emphasizes the importance of organizing instructional tasks to avoid overwhelming learners and to support effective learning.

The study also adopted the principle of contextualization, which connects learning activities to students' local environment and real-life experiences. Research shows that contextualized and scaffolded laboratory activities improve students' engagement, scientific reasoning, confidence, and inquiry skills. Collectively, these theories and studies provided the foundation for developing and validating contextualized experimental activities designed to scaffold students' laboratory skills and promote meaningful science learning.

Statement of the Problem

The purpose of this study was to construct and verify contextualized experimental activities designed to provide guidance to students' laboratory skills. Its primary focus was to determine the validity, usability, and efficiency of the constructed experimental activities in enhancing students' laboratory skills.

1. What is the level of validity of the developed contextualized experimental activities based on the DepEd LRMDS:
    a. Content,
    b. Format,
    c. Presentation and Organization, and
    d. Accuracy?
2. What are the perceptions of students regarding the developed contextualized experimental activities in terms of;
    a. Clarity of instruction,
    b. Relevance to real-life situations,
    c. Development of Science laboratory skill?
3. Is there significant agreement between the expert evaluators' ratings on the validity of the developed contextualized experimental activities?
4. What revisions can be made on the developed experimental activities based on the validation results and feedback?

Hypothesis

1. There is a significant agreement between the validation scores of the evaluators on the developed contextualized experimental activities.

2. Materials and Methods

Research Design

This study utilized quantitative-developmental research design as it focuses on the development and validation of contextualized experimental activities. Quantitative data were gathered from expert evaluations and statistical analyses to determine the validity and reliability of the developed materials. This design ensured an objective and systematic process in developing activities that effectively scaffold students' laboratory skills.

Participants:

The study was conducted at Tagodtod National High School, Cayapa National High School, Pangtod National High School, Gaddani National High School and Rosalio Eduarte National High School during the School Year 2025–2026. The participants of the study consisted of two groups:

1. Expert Validators – composed of ten (10) science education experts who evaluated the validity of the developed contextualized experimental activities.
2. Student Respondents – composed of 138 Grade 7 students (from TNHS, PNHS, GNHS, RENHS, and CNHS) who participated in the pilot testing of the developed activities.

Instruments

The main research tool used for this study is the Validation Checklist based on the Department of Education's (DepEd) Learning Resources Management and Development System (LRMDS) Evaluation and Quality Assurance Tool. It was developed to measure the validity of the contextualized laboratory activities developed using the following parameters: (a) Context; (b) Format; (c) Presentation & Organization; and (d) Accuracy. It employs a 5-point Likert scale where 5 refers to Very Highly Valid/Strongly Agree while 1 means Not Valid/Strongly Disagree.

Perception survey was also done among the participants involved in the piloting of contextualized experiment activities. This tool gathered perceptions regarding the effectiveness of the learning materials from their users.
This tool uses the five-point Likert scale where the participants' responses range from 5 (Strongly Agree) to 1 (Strongly Disagree)

To interpret the agreement of the evaluators on the developed contextualized experimental activities, the following norms were used:

Range	Descriptive Rating
0.00 – 0.20	Poor Agreement (.A)
0.21 – 0.40	Fair Agreement (FA)

0.41 – 0.60	Moderate Agreement (MA)
0.61 – 0.80	Good Agreement (GA)
0.81 – 1.00	Very Good Agreement (VGA)

Data Gathering Procedure

a. Planning Phase. The planning phase focused on developing the research plan, identifying appropriate science topics and participants, and ensuring compliance with ethical standards. The K–12 Science Curriculum Guide was reviewed to support the development of experimental activities. Participants were selected in coordination with school administrators and science teachers. Ethical clearance was obtained from the Abra State Institute of Science and Technology – Research Ethics Committee (REC), and necessary permissions were secured from school authorities. Informed consent and assent were obtained from participants and their guardians, ensuring voluntary participation and the right to withdraw at any time. Confidentiality and data privacy were protected through the use of identification codes and secure data storage in accordance with the Data Privacy Act of 2012 (RA 10173). The study posed minimal risks, with proper supervision and safeguards in place. Participants were oriented about the research, and while no financial incentives were provided, they benefited from enhanced laboratory experiences and experimental learning opportunities.

b. Development Phase. The researcher developed contextualized experimental activities based on the identified science competencies and topics. The activities were carefully planned, ensuring that objectives, materials, procedures, and scaffolding strategies were appropriate, relevant, and utilized readily available resources. The developed activities were presented to a panel of Science teacher-evaluators for review. Their suggestions and recommendations were incorporated to improve and finalize the activities. Afterward, the researcher secured permission from the school principal and cooperating teacher to conduct pilot testing of the developed experimental activities.

c. Evaluation Phase. The results from expert validators, and students are analyzed. Necessary revisions are done to enhance clarity, improve task design, and ensure curriculum alignment.

d. Outcome Phase. This is the stage where the validated and improved contextualized experimental activities for laboratory skills development will be.

Data Analysis:

1. Content Validity Index (CVI) to assess content validity
2. weighted mean to determine the level of validity and students' perceptions
3. Fleiss' kappa to measure the level of agreement among expert validators.
3. Qualitative feedback from validators and students to identify the areas for improvement and refinement of the developed activities.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

3. Results

Problem 1. What is the level of validity of the developed contextualized experimental activities based on the DepEd LRMDS:

a. Content,

b. Format,

c. Presentation and Organization, and

d. Accuracy?

The following tables presents the level of validity of the developed experimental activities based on DepEd LRMDS along content, format, presentation and organization and accuracy.

Table 2a. Level of Validity of the Initial Developed Contextualized Experimental Activities Based on DepEd LDRMDS Content Indicators

Content Indicators	Activities												Over all	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
1. The laboratory activity aligns with the K–12 Science curriculum standards and learning competencies.	5.0	4.8	4.8	5.0	4.9	4.8	5.0	4.9	4.8	4.4	4.8	4.9	4.84	E
2. The objectives are clearly stated, measurable, and attainable.	4.6	4.4	4.4	4.6	4.6	4.4	4.6	4.9	4.5	4.4	4.1	4.4	4.49	E
3. The content is appropriate to the students' grade level and prior knowledge.	4.3	4.1	4.0	4.3	4.3	4.4	4.3	4.5	4.5	4.4	4.4	4.2	4.31	E
4. The activity develops relevant laboratory skills and higher-order thinking.	4.0	3.9	4.0	4..0	4.3	4.5	4.0	4.3	4.4	3.9	4.3	4.1	4.14	VG
5. Concepts and procedures are scientifically accurate and current.	4.4	3.9	4.7	4.4	4.1	4.5	4.4	4.4	4.5	4.0	4.1	4.7	4.33	E
Area Mean	**4.46**	**4.22**	**4.38**	**4.46**	**4.44**	**4.52**	**4.46**	**4.60**	**4.54**	**4.22**	**4.34**	**4.46**	**4.42**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2b. Level of Validity of the Initial Developed Contextualized Experimental Activities Based on DepEd LDRMDS Format Indicators

Format Indicators	Activities												Over all	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
1. The layout is visually appealing and easy to follow.	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.40	E
2. Font style and size are consistent and readable.	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.40	E
3. Tables, figures, and illustrations are clear and properly labeled.	4.2	4.0	4.3	4.2	3.8	4.1	4.2	4.1	4.2	3.9	4.4	4.4	4.15	VG
4. Space is adequately provided for student responses.	4.2	4.1	4.5	4.2	4.0	4.4	4.2	4.4	4.4	4.3	4.4	4.7	4.32	E
5. Overall physical format is appropriate for classroom use.	4.3	4.4	4.2	4.3	4.2	4.2	4.3	4.1	4.1	4.1	4.2	4.1	4.21	E
Area Mean	**4.30**	**4.26**	**4.36**	**4.30**	**4.16**	**4.30**	**4.30**	**4.28**	**4.30**	**4.22**	**4.36**	**4.40**	**4.30**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

Table 2b presents the expert evaluators' ratings on the format validity of the initial developed contextualized experimental activities based on DepEd LRMDS format indicators.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2c. Level of Validity of the Initial Developed Contextualized Experimental Activities Based on DepEd LDRMDS Presentation and Organization Indicators

Presentation and Organization Indicators	Activities												Over all	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
1. The activity follows a logical sequence (introduction, procedure, analysis, conclusion).	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.8	3.8	3.8	3.8	3.8	3.68	VG
2. Instructions are clear, concise, and easy to understand.	4.4	4.2	3.9	4.4	4.1	4.6	4.4	4.6	4.5	4.0	4.4	4.5	4.33	E
3. The activities encourage active engagement and scaffolding.	4.5	4.2	4.0	4.5	4.3	4.6	4.5	4.6	4.5	4.0	4.6	4.4	4.39	E
4. The flow of tasks facilitates independent and guided learning.	4.6	4.1	4.2	4.6	4.4	4.5	4.6	4.6	4.4	4.0	4.5	4.5	4.42	E
5. The organization supports smooth classroom implementation.	4.4	4.4	4.3	4.3	4.4	4.4	4.4	4.5	4.4	4.4	4.4	4.2	4.38	E
Area Mean	**4.30**	**4.10**	**4.00**	**4.28**	**4.16**	**4.34**	**4.30**	**4.42**	**4.32**	**4.04**	**4.34**	**4.28**	**4.24**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

Table 2c shows the validity level of the initial contextualized experimental activities, using the DepEd LRMDS presentation and organization indicators. An overall area mean of 4.24, seen as Excellent (E), suggests that the activities are highly valid in presentation and organization.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2d. Level of Validity of the Initial Developed Contextualized Experimental Activities Based on DepEd LDRMDS Accuracy Indicators

Accuracy Indicators	Activities												Over all	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
1. Information is scientifically accurate and error-free.	4.3	4.0	4.2	4.3	4.3	4.0	4.3	4.3	4.4	4.3	4.1	4.2	4.23	E
2. The materials use current data, examples, and technologies.	4.0	4.0	4.0	4.0	.4.1	4.6	4.0	3.9	4.3	3.9	4.0	4.0	4.07	VG
3. Units, formulas, and scientific symbols are correctly used.	4.1	4.5	4.1	4.1	4.2	4.2	4.1	4.0	4.0	4.0	4.0	4.0	4.11	VG
4. References and sources are credible and properly cited.	3.1	2.8	3.0	3.1	2.8	3.3	3.1	2.9	3.0	3.0	3.0	3.0	3.01	G
5. Procedures yield valid and reliable experimental results.	4.0	4.1	4.0	4.0	4.2	4.0	4.0	4.0	4.3	4.1	4.0	3.9	4.05	VG
Area Mean	**3.90**	**3.88**	**3.86**	**3.90**	**3.92**	**4.02**	**3.90**	**3.82**	**4.00**	**3.86**	**3.82**	**3.82**	**3.89**	**VG**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

The validity of the created experimental activity in the context was determined using the DepEd LRMDS standards for accuracy, which were listed in Table 1d below. The mean score obtained from all criteria considered was 3.89, classified as Very Good (VG). This means that the materials are valid and accurate but still have room for improvement.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal
of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2e. Summary on the Level of Validity of the Initial Developed Contextualized Experimental Activities Based on DepEd LDRMDS Indicators

LRMDS Indicators	Activities 1	2	3	4	5	6	7	8	9	10	11	12	Over all	DR
Content	4.46	4.22	4.38	4.46	4.44	4.52	4.46	4.60	4.54	4.22	4.34	4.46	4.42	E
Format	4.30	4.26	4.36	4.30	4.16	4.30	4.30	4.28	4.30	4.22	4.36	4.40	4.30	E
Presentation/Organization	4.30	4.10	4.00	4.28	4.16	4.34	4.30	4.42	4.32	4.04	4.34	4.28	4.24	E
Accuracy	3.90	3.88	3.86	3.90	3.92	4.02	3.90	3.82	4.00	3.86	3.82	3.82	3.89	VG
Area Mean	**4.24**	**4.12**	**4.15**	**4.24**	**4.17**	**4.30**	**4.24**	**4.28**	**4.29**	**4.09**	**4.22**	**4.24**	**4.21**	
	E	**VG**	**VG**	**E**	**VG**	**E**	**E**	**E**	**E**	**VG**	**E**	**E**	**E**	

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

Table 2e shows the validity ratings of the originally produced contextualized experimental activities according to the LRMDS indicators which include Content, Format, Presentation/Organization, and Accuracy. It is observed that the overall area mean of 4.21 falls under the Excellent (E) category, suggesting that the activities have excellent validity and meet LRMDS standards regarding their instructional and practicality aspects.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2f. Level of Validity of the Final Developed Contextualized Experimental Activities Based on DepEd LDRMDS Content Indicators

Content Indicators	Activities												Over all	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
1. The laboratory activity aligns with the K–12 Science curriculum standards and learning competencies.	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.9	4.8	4.8	4.9	4.95	E
2. The objectives are clearly stated, measurable, and attainable.	4.9	4.9	4.8	4.9	4.8	4.9	4.7	5.0	4.7	4.7	4.6	4.6	4.79	E
3. The content is appropriate to the students' grade level and prior knowledge.	4.6	4.8	4.6	4.6	4.8	4.9	4.7	4.75	4.7	4.6	4.8	4.6	4.70	E
4. The activity develops relevant laboratory skills and higher-order thinking.	4.4	4.6	4.6	4.6	4.8	4.8	4.7	4.63	4.7	4.5	4.8	4.6	4.64	E
5. Concepts and procedures are scientifically accurate and current.	4.8	4.6	4.9	4.7	4.6	4.8	4.7	4.88	4.8	4.6	4.5	4.8	4.72	E
Area Mean	**4.74**	**4.78**	**4.78**	**4.76**	**4.80**	**4.88**	**4.76**	**4.85**	**4.76**	**4.64**	**4.70**	**4.70**	**4.76**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

The content validity of the final activities is shown in Table 2f based on the DepEd LRMDS content indicators. The total mean of the areas is 4.76, which falls under the category of Excellent (E). This means that there is already a high degree of content validity among the revised and finalized activities compared to their initial creation.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2g. Level of Validity of the Final Developed Contextualized Experimental Activities Based on DepEd LDRMDS Format Indicators

Format Indicators	Activities												Over all	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
1. The layout is visually appealing and easy to follow.	4.6	4.8	4.6	4.6	4.7	4.8	4.5	4.63	4.7	4.7	4.6	4.7	4.66	E
2. Font st yle and size are consistent and readable.	5.0	4.7	4.8	4.7	4.8	4.8	4.7	4.75	4.7	4.8	4.7	4.7	4.76	E
3. Tables, figures, and illustrations are clear and properly labeled.	4.4	4.6	4.3	4.4	4.4	4.7	4.6	4.75	4.3	4.6	4.8	4.7	4.55	E
4. Space is adequately provided for student responses.	4.7	4.7	4.9	4.8	4.6	4.9	4.7	4.88	4.7	4.6	4.6	4.7	4.73	E
5. Overall physical format is appropriate for classroom use.	4.6	4.5	4.2	4.3	4.2	4.7	4.6	4.63	4.6	4.6	4.6	4.5	4.50	E
Area Mean	**4.66**	**4.66**	**4.56**	**4.56**	**4.54**	**4.78**	**4.62**	**4.73**	**4.60**	**4.66**	**4.66**	**4.66**	**4.64**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

Table 2g presents the level of validity of the final developed contextualized experimental activities based on the DepEd LRMDS format indicators

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 1h. Level of Validity of the Final Developed Contextualized Experimental Activities Based on DepEd LDRMDS Presentation and Organization Indicators

Presentation and Organization Indicators	Activities												Overall	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
1. The activity follows a logical sequence (introduction, procedure, analysis, conclusion).	4.6	4.6	4.3	4.5	4.6	4.8	4.4	4.6	4.2	4.5	4.3	4.5	4.5	E
2. Instructions are clear, concise, and easy to understand.	4.7	4.5	4.5	4.8	4.5	4.9	4.8	4.75	4.5	4.4	4.6	4.6	4.63	E
3. The activities encourage active engagement and scaffolding.	4.7	4.7	4.3	4.7	4.6	4.8	4.6	4.75	4.5	4.5	4.6	4.7	4.62	E
4. The flow of tasks facilitates independent and guided learning.	4.8	4.7	4.4	4.7	4.5	4.8	4.5	4.75	4.6	4.6	4.5	4.6	4.6	E
5. The organization supports smooth classroom implementation.	4.6	4.7	4.5	4.4	4.5	4.8	4.8	4.88	4.7	4.6	4.4	4.5	4.6	E
Area Mean	**4.68**	**4.64**	**4.40**	**4.62**	**4.54**	**4.82**	**4.62**	**4.75**	**4.50**	**4.52**	**4.48**	**4.58**	**4.60**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

Table 2h presents the level of validity of the final developed contextualized experimental activities based on the DepEd LRMDS presentation and organization indicators. The overall area mean of 4.60, interpreted as Excellent, indicates that the revised materials demonstrate a very high level of effectiveness in terms of structure, clarity, and instructional flow, making them highly suitable for classroom implementation.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2i. Level of Validity of the Final Developed Contextualized Experimental Activities Based on DepEd LDRMDS Accuracy Indicators

Accuracy Indicators	Activities 1	2	3	4	5	6	7	8	9	10	11	12	Over all	DR
1. Information is scientifically accurate and error-free.	4.4	4.6	4.3	4.3	4.6	4.7	4.6	4.75	4.6	4.5	4.6	4.6	4.55	E
2. The materials use current data, examples, and technologies.	4.1	4.1	4.3	4.1	4.2	4.7	4.3	4.63	4.5	4.5	4.4	4.7	4.38	E
3. Units, formulas, and scientific symbols are correctly used.	4.3	4.5	4.2	4.2	4.4	4.8	4.2	4.25	4.4	5.0	4.3	4.5	4.42	E
4. References and sources are credible and properly cited.	4.0	4.0	4.2	4.0	4.4	4.3	4.6	4.50	4.5	4.0	4.6	4.6	4.31	E
5. Procedures yield valid and reliable experimental results.	4.6	4.4	4.5	4.5	4.6	4.4	4.5	4.13	4.3	4.6	4.5	4.6	4.47	E
Area Mean	**4.28**	**4.32**	**4.30**	**4.22**	**4.44**	**4.58**	**4.44**	**4.45**	**4.46**	**4.52**	**4.48**	**4.60**	**4.43**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.00 – 1.80	Poor (P)

The validity of the final developed contextualized experimental activities in terms of accuracy indicators according to DepEd LRMDS are shown in Table 1i.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2j. Summary on the Level of Validity of the Final Developed Contextualized Experimental Activities Based on DepEd LDRMDS Indicators

LRMDS Indicators	Activities												Over all	DR
	1	2	3	4	5	6	7	8	9	10	11	12		
Content	4.74	4.78	4.78	4.76	4.80	4.88	4.76	4.85	4.76	4.64	4.70	4.70	4.76	E
Format	4.66	4.66	4.56	4.56	4.54	4.78	4.62	4.73	4.60	4.66	4.66	4.66	4.64	E
Presentation/Organization	4.68	4.64	4.40	4.62	4.54	4.82	4.62	4.75	4.50	4.52	4.48	4.58	4.60	E
Accuracy	4.28	4.32	4.30	4.22	4.44	4.58	4.44	4.45	4.46	4.52	4.48	4.60	4.43	E
Area Mean	**4.59**	**4.60**	**4.51**	**4.54**	**4.58**	**4.77**	**4.61**	**4.70**	**4.58**	**4.59**	**4.58**	**4.64**	**4.61**	**E**

Norm:

Mean Range	*Descriptive Rating (DR)*
4.21 – 5.00	Excellent (E)
3.41 – 4.20	Very Good (VG)
2.61 – 3.40	Good (G)
1.81 – 2.60	Fair (F)
1.0 – 1.80	Poor (P)

Table 2j presents the validity level ratings based on the DepEd LRMDS indicators: Content, Format, Presentation/Organization, and Accuracy.

Problem 2. What are the perceptions of students regarding the developed contextualized experimental activities in terms of;

a. Clarity of instruction,

b. Relevance to real-life situations,

c. Development of Science laboratory skill?

The following tables presents the perceptions of students regarding the developed contextualized experimental activities in terms of clarity of instruction, relevance to real life situations and development of laboratory skills.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 3a. Level of Perception of Students on the Final Developed Contextualized Experimental Activities in terms of Clarity of Instruction

Clarity of Instruction Indicators	Students						DR
	RENHS	TNHS	PNHS	CNHS	GNHS	Overall	
1. The instructions in the activity were clear and easy to follow.	4.46	4.49	4.45	4.55	4.48	4.48	VH
2. The procedures helped me complete the activity correctly and on time.	4.53	4.52	4.48	4.45	4.44	4.48	VH
3. The objectives of the activity were clearly stated.	4.43	4.47	4.54	4.49	4.53	4.49	VH
4. I understood what was expected of me during the experiment.	4.47	4.40	4.44	4.48	4.43	4.44	VH
5. The steps of the experiment were presented in logical order	4.42	4.45	4.51	4.50	4.55	4.49	VH
6.I did not experience confusion while following the procedures	4.40	4.48	4.44	4.54	4.49	4.47	VH
7. Safety precautions were clearly stated and easy to follow during the activity.	4.59	4.57	4.67	4.66	4.68	4.63	VH
8. The materials and equipment required were clearly listed and identified.	4.47	4.52	4.54	4.54	4.47	4.51	VH
9. The instructions guided me on how to record observations and data properly	4.40	4.46	4.46	4.48	4.42	4.44	VH
10. Overall, the instructions reduced confusion while performing the experiment.	4.38	4.31	4.38	4.37	4.32	4.35	VH
Area Mean	**4.46**	**4.47**	**4.49**	**4.51**	**4.48**	**4.48**	**VH**

Norm:

Point Value	Description	*Mean Range*	*Descriptive Rating (DR)*
5	Strongly Agree	4.21 – 5.00	Very High (VH)
4	Agree	3.41 – 4.20	High (H)
3	Neutral	2.61 – 3.40	Moderate (M)
2	Disagree	1.81 – 2.60	Low (L)
1	Strongly Disagree	1.00 – 1.80	Very Low (VL)

Table 3a presents the level of students' perception of the final developed contextualized experimental activities in terms of clarity of instruction across five schools. The overall area mean of 4.48, interpreted as Very High (VH), indicates that students strongly agree that the instructions provided in the activities are clear, understandable, and easy to follow.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 3b. Level of Perception of Students on the Final Developed Contextualized Experimental Activities in terms of Relevance to Real Life Contexts

Relevance to Real Life Context Indicators	Students						
	RENHS	TNHS	PNHS	CNHS	GNHS	Overall	DR
1.The activity was related to real life applications	4.42	4.39	4.29	4.44	4.41	4.39	VH
2. The examples used were connected to my daily experiences.	4.54	4.53	4.56	4.53	4.57	4.55	VH
3. The activity helped me understand the importance of science in society.	4.43	4.60	4.57	4.58	4.55	4.55	VH
4. I can see how the activity is useful outside the classroom.	4.52	4.52	4.55	4.43	4.51	4.51	VH
5.The activity helped me make informed decisions in real-life situations using scientific knowledge	4.42	4.51	4.51	4.54	4.54	4.51	VH
6. The materials used in the experiment were familiar and easy to relate to.	4.48	4.59	4.58	4.49	4.62	4.56	VH
7. The activity encouraged me to relate classroom learning to real-world situations.	4.46	4.61	4.62	4.59	4.59	4.58	VH
8.The activity helped me recognized real-world problems that can be explained using science	4.60	4.52	4.48	4.53	4.55	4.53	VH
9. The activity increased my interest in applying science to real-life situations.	4.54	4.55	4.51	4.47	4.48	4.51	VH
10. The activity made the lesson more meaningful in my daily life.	4.47	4.49	4.46	4.44	4.44	4.46	VH
Area Mean	**4.49**	**4.53**	**4.51**	**4.50**	**4.53**	**4.52**	**VH**

Norm:

Point Value	Description	*Mean Range*	*Descriptive Rating (DR)*
5	Strongly Agree	4.21 – 5.00	Very High (VH)
4	Agree	3.41 – 4.20	High (H)
3	Neutral	2.61 – 3.40	Moderate (M)
2	Disagree	1.81 – 2.60	Low (L)
1	Strongly Disagree	1.00 – 1.80	Very Low (VL)

Table 2c presents the level of students' perception of the final developed contextualized experimental activities in terms of the development of science laboratory skills across five schools.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 3c. Level of Perception of Students on the Final Developed Contextualized Experimental Activities in terms of Development of Science Laboratory Skills

Development of Science Laboratory Skills Indicators	Students						
	RENHS	TNHS	PNHS	CNHS	GNHS	Overall	DR
1. The laboratory activity helped me develop my laboratory skills.	4.52	4.56	4.53	4.58	4.54	4.55	VH
2. The activity improved my ability to record and interpret data.	4.54	4.50	4.58	4.59	4.53	4.54	VH
3.The activity helped me develop skills in analyzing and drawing conclusions from results	4.52	4.53	4.55	4.60	4.60	4.56	VH
4.The activity helped me practice measurement and observation skills	4.47	4.51	4.51	4.54	4.55	4.52	VH
5. I become more confident in conducting experiments.	4.47	4.52	4.49	4.54	4.48	4.50	VH
6. the activity developed my critical thinking skills.	4.55	4.50	4.58	4.56	4.60	4.56	VH
7. The activity enhanced my ability to follow experimental procedures accurately.	4.50	4.51	4.55	4.55	4.54	4.53	VH
8. The activity encouraged me to ask questions and seek explanations.	4.41	4.42	4.46	4.42	4.46	4.43	VH
9. the activity prepared me for more complex laboratory activities in the future.	4.48	4.47	4.47	4.44	4.45	4.46	VH
10. The activity improved my problem-solving skills during the experiment.	4.39	4.38	4.45	4.42	4.40	4.41	VH
Area Mean	**4.49**	**4.49**	**4.52**	**4.52**	**4.52**	**4.51**	**VH**

Norm:

Point Value	Description	*Mean Range*	*Descriptive Rating (DR)*
5	Strongly Agree	4.21 – 5.00	Very High (VH)
4	Agree	3.41 – 4.20	High (H)
3	Neutral	2.61 – 3.40	Moderate (M)
2	Disagree	1.81 – 2.60	Low (L)
1	Strongly Disagree	1.00 – 1.80	Very Low (VL)

Table 3c presents the level of students' perception of the final developed contextualized experimental activities in terms of the development of science laboratory skills across five schools. The overall area mean of 4.51, interpreted as Very High (VH), indicates that students strongly agree that the activities effectively enhance their laboratory skills and scientific competencies. This finding is supported by studies which emphasize that well-structured, scaffolded, and inquiry-based laboratory activities significantly improve students' skill acquisition and engagement in science learning (e.g., OECD, 2023; UNESCO, 2024).

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Table 2d. Summary on the Level of Perception of Students on the Final Developed Contextualized Experimental Activities

Students' Perception Indicators	Students						
	RENHS	TNHS	PNHS	CNHS	GNHS	Overall	DR
Clarity of Instructions	4.46	4.47	4.49	4.51	4.48	4.48	VH
Relevance to Real Life Contexts	4.49	4.53	4.51	4.50	4.53	4.52	VH
Development of Science Laboratory Skills	4.49	4.49	4.52	4.52	4.52	4.51	VH
Area Mean	**4.48**	**4.50**	**4.51**	**4.51**	**4.51**	**4.50**	**VH**

Norm:

Point Value	Description	*Mean Range*	*Descriptive Rating (DR)*
5	Strongly Agree	4.21 – 5.00	Very High (VH)
4	Agree	3.41 – 4.20	High (H)
3	Neutral	2.61 – 3.40	Moderate (M)
2	Disagree	1.81 – 2.60	Low (L)
1	Strongly Disagree	1.00 – 1.80	Very Low (VL)

The table presents the level of students' perception of the developed contextualized experimental activities across five schools in terms of clarity of instructions, relevance to real-life contexts, and development of science laboratory skills. The overall area mean of 4.50, interpreted as Very High (VH), indicates that students strongly agree that the activities are effective across all measured aspects.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

Problem 3. Is there significant agreement between the expert evaluators' ratings on the validity of the developed contextualized experimental activities?

The following tables presents the level of agreement between expert evaluators' ratings on the validity of the developed experimental activities

Table 4. Level of Agreement between the Expert Evaluators' Ratings on the Validity of the Developed Contextualized Experimental Activities

Activity No.	Content		Format		Presentation and Organization		Accuracy	
	Fleiss Kappa	Descriptive Rating	Fleiss Kappa	Descriptive Rating	Fleiss Kappa	Descriptive Rating	Fleiss Kappa	Descriptive Rating
1	.910	Excellent	.667	Moderate	.833	Good	.941	Excellent
2	.922	Excellent	.880	Good	.852	Good	.972	Excellent
3	.931	Excellent	.684	Moderate	.726	Moderate	.980	Excellent
4	.910	Excellent	.667	Moderate	.807	Good	.941	Excellent
5	.873	Good	.670	Moderate	.806	Good	.968	Excellent
6	.747	Moderate	.556	Moderate	.855	Good	.936	Excellent
7	.910	Excellent	.667	Moderate	.833	Good	.941	Excellent
8	819	Good	.870	Good	.783	Good	.956	Excellent
9	.790	Good	.600	Moderate	.766	Good	.952	Excellent
10	.735	Moderate	.544	Moderate	.556	Moderate	.949	Excellent
11	.870	Good	.600	Moderate	.760	Good	.975	Excellent
12	.885	Good	.568	Moderate	.779	Good	.976	Excellent

Norm:

Range of Correlation Coefficient	*Descriptive Rating (DR)*
0.90 – 1.00	Excellent Agreement (E)
0.75 – 0.89	Good Agreement (G)
0.50 – 0.74	Moderate Agreement (M)
Below 0.50	Poor Agreement (P)

Table 4 presents the level of agreement among expert evaluators on the validity of the developed contextualized experimental activities using Fleiss' Kappa across four indicators: content, format, presentation and organization, and accuracy. Overall, the results indicate generally high agreement among experts, suggesting that the evaluation of the materials is consistent and reliable.

Problem 4. What revisions can be made on the developed experimental activities based on the validation results and feedback?

The expert validators provided feedbacks to enhanced the quality, clarity and effectiveness of the developed contextualized laboratory activities. A common suggestion is the need to include the competency codes to ensure the alignment with science curriculum standards. They also emphasized the importance of making objectives measurable and clearly define observable and assessable outcomes. In terms of cognitive development, the experts recommend the integration of higher-order-thinking skills (HOTS) to encourage students to analyze, evaluate and apply rather than just recalling of concepts. Furthermore, the experts also highlighted the improvement of the structure and presentation of the activities. It includes providing brief introduction to let students connect the activity to their prior knowledge and for them to know what is expected in the activity. They also suggested to place visual cues as a guide for students throughout the activity. Time allotment is also included to ensure feasibility within the classroom settings. Additionally, experts also noted the importance of informing students about the materials needed in the activity to ensure preparedness.

In terms of instructional strategies, the evaluators proposed strengthening collaborative learning techniques such as think-pair-share to promote active engagement and deeper understanding. They also encourage establishing connection to real-life situations to enhance relevance and student motivation. Moreover, the need to provide sufficient space for students' answers to accommodate detailed responses, especially the tasks that requires critical thinking. And lastly, references should also be place to support the validity of the content presented.

From students' perspective, the feedbacks generally reflected a positive reception of the developed experimental activities. Learners found out that the activities are engaging and easier to follow due to clear instructions, good organization and inclusion of visual aids. They can relate the activities to real-life situations that helped them understand better the concepts being discussed. The inclusion of collaborative elements made the learning more interactive. They express their answers freely due to adequate space for their answers especially in tasks that require explanation and analysis.

However, there are still students who need clearer guidance in some part of the activities particularly in interpreting diagrams and understanding complex tasks. This means that there is a need of more examples or demonstrations to further enhance their comprehension. Overall, the student feedback affirmed that the revisions contributed significantly to improving the effectiveness, clarity, and engagement level of the experimental activities, while also offering insights for further refinement.

4. Discussion

1. On the validity of the developed experimental activities along DepEd LRMDS

The validation results show that the initial version of the experimental activities already achieved high validity, with most indicators rated Excellent and one rated Very Good, indicating strong expert agreement on the quality of the materials. However, minor refinements were needed, particularly in terms of accuracy and consistency across activities. After revisions, the final version improved significantly, with all indicators receiving Excellent ratings, showing that expert feedback enhanced the quality, validity, and usefulness of the materials. This aligns with Instructional Design research, which emphasizes that iterative refinement leads to more effective and reliable instructional materials. In terms of domains, Content improved from 4.42 to 4.76, Format from 4.30 to 4.64, Presentation and Organization from 4.24 to 4.60, and Accuracy from 3.89 (Very Good) to 4.43 (Excellent). These improvements indicate better curriculum alignment, clearer structure, improved organization, and corrected scientific accuracy. Overall, the findings show that the revised experimental activities achieved consistently Excellent validity ratings, confirming that they meet DepEd LRMDS standards and are suitable for classroom use.

2. On the perceptions of students regarding the developed experimental activities

The results revealed that clarity of instructions was rated very high in the experiment, obtaining mean of 4.48. Clear instructions are vital in laboratory sessions since they help to conduct experiment effectively without error and confusion. From the results, the aim has been achieved in designing the experiments.

For relevance to real-life situations, the activities scored mean of 4.52 indicating that the activities were very high in relation to real-life context. Students were able to see how the experimental activity can be applied in practical life making it more realistic.

On the other hand, development of science laboratory skills was measured and the result indicated very high mean score of 4.51 showing effectiveness of activities in development of skills. These skills include observation of changes during the experiments, proper handling of the materials, ability to follow procedures systematically, data recording, interpreting results, drawing conclusions, critical thinking skills and problem-solving skills. From the results obtained, the composite mean of 4.50 shows that students rated the activities highly with regard to all three domains tested. The Very High descriptive rating is indicative of positive perception and favorable performance in the experiments.

3. On the significant agreement between the expert evaluators ratings

Concordance on the reliability and validity of the created contextualized laboratory activities was determined via Fleiss' kappa coefficient and evaluated in terms of indicators such as content, format, presentation and organization, and accuracy.

Firstly, content showed an average agreement between 0.735 and 0.931, with most activities being classified as excellent in this regard and just a few of them being good or moderate. Thus, there is a high level of consensus between expert evaluators in terms of content quality and relevance in activities. Regarding the format of activities, the range of agreement varied between 0.544 and 0.880, with most activities being moderate in their organization while some were classified as good. Therefore, there were some differences in the opinion about the format of activities, but overall, there is a consensus. In turn, presentation and organization agreement ranged from 0.556 to 0.855. As a result, it can be stated that most activities demonstrated good agreements on their presentation and organization. Finally, accuracy agreement varied between 0.936 and 0.980, with all activities showing excellent agreement and consensus in terms of science accuracy, citing sources, referencing, and formatting of activities.

4. On the revisions made on the developed experimental activities

Expert evaluators recommended improvements to enhance the quality and efficacy of activities. Specifically, the recommendation is to include the competency code for aligning activities with curricular goals, measurable objectives, and the promotion of higher-order thinking through analysis, evaluation, and application instead of mere recall. Moreover, the expert evaluators highlighted the necessity to improve the structure and presentation of activities by including an introduction linking the activity to previous knowledge and visual guidance for students, specifying time requirements for each task, and listing all materials necessary for the performance of the activity.

Comparison to Existing Studies

The findings of the study were consistent with previous research indicating that contextualized and hands-on learning activities improve students' engagement, understanding, and academic performance in Science. Similar studies have shown that experimental activities linked to learners' real-life experiences enhance conceptual understanding and promote active participation in the learning process.

Implications for Practice and Policy

The results suggest that contextualized experimental activities can serve as effective instructional materials for Science teaching. Teachers may integrate these activities into their classroom instruction to enhance learners' scientific skills and understanding. Policymakers and educational leaders may also support the development and implementation of contextualized learning resources through training programs, curriculum enhancement initiatives, and the provision of necessary materials and support.

Study Limitations

The study was limited to a specific group of respondents and was conducted within a particular school setting, which may affect the generalizability of the findings. The intervention was implemented for a limited period, and only selected Science competencies were covered. Future studies may involve larger samples, multiple schools, and longer implementation periods to further validate and expand the findings.

5. Conclusion

Based on the comprehensive findings of the study, the following conclusions are shown:

1. The initial developed contextualized experimental activities were already rated highly valid by expert evaluators, with most indicators described as Excellent and one as Very Good, indicating strong agreement on the quality of the materials. However, further improvements were necessary, particularly in terms of accuracy and consistency.
2. The final developed contextualized experimental activities demonstrated significant improvement across all indicators, with consistently Excellent ratings in content, format, presentation and organization, and accuracy. This indicates that the revisions made based on expert feedback enhanced the overall quality, validity, and instructional value of the materials.
3. The activities were well-aligned with DepEd K–12 curriculum standards, scientifically accurate, and appropriate for learners. Enhancements in format and presentation

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 8 (2026)

improved clarity, organization, and sequencing of procedures, making the activities more coherent, structured, and user-friendly for both teachers and students.

4. The final developed activities were effective in promoting student learning, as evidenced by the pilot testing results. Students rated the activities as Very High in terms of clarity of instructions, relevance to real-life contexts, and development of science laboratory skills, demonstrating that the materials were understandable, applicable, and capable of developing practical skills.
5. Expert evaluators showed good to excellent agreement on the validity of the activities, particularly in content and accuracy, which demonstrates reliability and consensus regarding the quality of the materials. Minor differences in opinions regarding format and presentation suggest areas for continued refinement.
6. The experts' recommendations, including the integration of competency codes, measurable objectives, higher-order thinking skills (HOTS), visual cues, brief introductions, time allotments, and listing of materials, further support the enhancement of the activities' instructional effectiveness, clarity, and feasibility in classroom settings.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed:

1. Teachers may adopt the developed experimental activities to improve students' laboratory skills and engagement. They can also contextualize further based on their local environment and available materials. Continuously observe and provide feedback to students during activities to improve comprehension and procedural accuracy.
2. School administrators should support the implementation of contextualized and scaffolded experimental activities by providing adequate resources, training, and monitoring to ensure effective utilization.
3. Curriculum planners may integrate contextualized and scaffolded experimental activities into instructional materials to promote skill-based and meaningful science learning.
4. Future researchers may conduct experimental studies to determine the effectiveness of the developed activities in improving students' academic performance and laboratory competencies.
5. The developed activities may be continuously enhanced based on feedback, particularly in improving clarity, increasing higher-order thinking skills and ensuring adaptability to different learning environments.

References

Abulwahed, M., & Nagy, Z. K. (2009). Applying Kolb's experiential learning cycle for laboratory education. *Journal of Engineering Education, 98*(3), 283–294. https://doi.org/10.1002/j.2168-9830.2009.tb01025.x

Aikenhead, G. S. (2006). Science education for everyday life: Evidence-based practice. Teachers College Press.

Alemi, M. (2024). *A scaffolded curriculum to foster experimental skills acquisition in an introductory physics lab course.*

American Association for the Advancement of Science. (2011). Vision and change in undergraduate biology education. AAAS.

Ambrose, S. A., Bridges, M. W., DiPietro, M., Lovett, M. C., & Norman, M. K. (2010). How learning works: Seven research-based principles for smart teaching. Jossey-Bass.

Association for Supervision and Curriculum Development (ASCD). (2019). Effective teaching practices. ASCD.

Balagtas, M., & Tayao, M. (2020). Contextualized learning in the Philippine K–12 science curriculum: Issues and challenges. *Philippine Journal of Science Education*, 9(1), 34–48.

Brown, T., & LaBonte, R. (2021). Curriculum alignment in science education: Impacts on learning progressions. Journal of Science Curriculum Studies, 12(3), 45–62.

Bruner, J. S. (1960). The process of education. Harvard University Press.

Cagatao, P. P. S., Baniqued, W. B., & Bautista, R. G. (2024). Modelling the interplay of K–12 science teachers' pedagogical practices. *American Journal of Educational Research, 12*(11), 420–426.

Calderon, M., Dela Cruz, L., & Sison, R. (2018). Enhancing students' laboratory skills through contextualized science activities. *Asia Pacific Journal of Education*, 38(2), 210–223.

Cano, L. M., Dela Cruz, R. A., & Villanueva, A. C. (2022). Validation of localized science instructional materials for improving laboratory competencies. *Philippine Journal of Educational Research, 17*(2), 55–70.

Clark, R. C., & Mayer, R. E. (2020). E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning (4th ed.). Wiley.

Delgado-Rodríguez, S., et al. (2023). Design, development and validation of an educational methodology using immersive augmented reality for STEAM. *New Approaches in Educational Research, 12*(1), 89–104.

Department of Education (DepEd). (2016). *K to 12 Science Curriculum Guide.* DepEd Philippines.

Dewey, J. (1938). Experience and education. New York: Macmillan.

Dirksen, J. (2021). Design for how people learn (2nd ed.). New Riders.

Driver, R. (1989). Students' conceptions and the learning of science. International Journal of Science Education, 11(5), 481–490.

Fleischer, T., Moser, S., Deibl, I., Strahl, A., Maier, S., & Zumbach, J. (2023). Digital sequential scaffolding during experimentation in chemistry education: Scrutinizing influences and effects on learning. *Education Sciences, 13*(8), 811. https://doi.org/10.3390/educsci13080811.

Fitts, P. M., & Posner, M. I. (1967). *Human performance*. Belmont, CA: Brooks/Cole.

Gagarin, H. R. D. (2025). Development and validation of localized and indigenized teaching material in Grade 9 Physics. *AIDE Interdisciplinary Research Journal*, 13(1),. https://doi.org/10.56648/aide-irj.v13i1.197

Gericke, N., Eilks, I., & Markic, S. (2023). Context-based science education and its impact on students' motivation and engagement. *International Journal of Science Education, 45*(4), 412–428.

Gisev, N., Bell, J. S., & Chen, T. F. (2022). Interrater agreement and reliability: Key concepts, approaches, and applications. Research in Social and Administrative Pharmacy, 18(2), 1–7.

Gwet, K. L. (2021). Handbook of inter-rater reliability (5th ed.). Advanced Analytics, LLC.

Hofstein, A., & Lunetta, V. N. (2004). The laboratory in science education: Foundations for the twenty-first century. Science Education, 88(1), 28–54.

Wiggins, G., & McTighe, J. (2005). Understanding by design (Expanded 2nd ed.). ASCD.

Hardman, P. (2023). Instructional design in the age of AI: Evidence-based practices for effective learning. Routledge.

Hattie, J. (2023). Visible learning: The sequel. Routledge.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2021). The difference between well-designed and poorly designed instructional materials. Educational Technology Research and Development, 69(1), 13–22.

Inocencio, B. T., & Calimlim, A. C. (2021). *Development and validation of teacher-made science workbook of Grade 8 students in the Philippines.* International Journal of Multidisciplinary: Applied Business and Education Research, 2(10), 858-869. https://doi.org/10.11594/ijmaber.02.10.02

Hallgren, K. A. (2021). Computing inter-rater reliability for observational data: An overview and tutorial. Tutorials in Quantitative Methods for Psychology, 17(2), 1–15.

Lederman, N. G. (2014). Nature of science and scientific inquiry. In N. G. Lederman & S. K. Abell (Eds.), Handbook of research on science education (Vol. II). Routledge.

McDonald, C. R. (2021). Instructional clarity and student success in classroom learning. Educational Research Press.

McHugh, M. L. (2020). Interrater reliability: The kappa statistic. Biochemia Medica, 30(2), 1–8.

Merrill, M. D. (2002). First principles of instruction. Educational Technology Research and Development, 50(3), 43–59.

Miller G. E., & Odom, S. (2020). Vertical alignment and coherence in K–12 science curricula. Journal of Curriculum Studies, 52(4), 523–540.

National Research Council. (2012). A framework for K–12 science education: Practices, crosscutting concepts, and core ideas. National Academies Press.

Organization for Economic Co-operation and Development (OECD). (2019). *PISA 2018 Results (Volume I): What Students Know and Can Do.* OECD Publishing.

Organization for Economic Co-operation and Development (OECD). (2022). Education at a glance 2022: OECD indicators. OECD Publishing. https://doi.org/10.1787/3197152b-en

Jin, M., Park, S., & Lee, J. (2024). Scaffolded laboratory instruction and its effects on students' experimental design skills. *Journal of Educational Science Research, 12*(1), 33–47.*

Keller, D., & Hermanns, J. (2023). The digital task navigator as a scaffold for supporting higher education students while solving tasks in organic chemistry. *Journal of Chemical Education, 100*(10), 3818–3824.

Killpack, T. L., & Myers, K. R. (2020). Teaching science laboratory skills for equity and competence: Addressing gaps in procedural learning. *CBE—Life Sciences Education, 19*(4).

Killpack, T. L., Fulmer, S. M., Roden, J. A., Dolce, J. L., & Skow, C. D. (2020). Increased scaffolding and inquiry in an introductory biology lab enhance experimental design skills and sense of scientific ability. *Journal of Microbiology & Biology Education, 21*(2), 1–9.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* Prentice Hall.

Krajcik, J. S., & Blumenfeld, P. C. (2006). Project-based learning. In R. K. Sawyer (Ed.), The Cambridge handbook of the learning sciences. Cambridge University Press.

Lee, E., & Hannafin, M. (2021). Design frameworks for scaffolded learning in science. Computers & Education, 165, 104131.

Legaspi, J. B., & Cajurao, E. (2020). Development and validation of contextualized lessons in Science, Technology, and Society (STS): Impacts on students' conceptual understanding, science process skills, and attitudes toward science. *Pegem Journal of Education and Instruction, 15*(2), 1–10.

Laurillard, D. (2022). Teaching as a design science: Building pedagogical patterns for learning and technology. Routledge.

Magwilang, E. B. (2023). Development and validation of a community-based learning resource package in inorganic chemistry. *International Journal of Humanities and Social Sciences*, 11(2), [pages unspecified]. https://doi.org/10.26803/ijhss.11.2.3

Martin, F., Polly, D., & Ritzhaupt, A. (2020). Instructional material design and learner engagement in classroom settings. Computers & Education, 150, 103839.

Marzano, R. J. (2023). The new art and science of teaching. Solution Tree Press.

Masava, D., Chen, X., & Zhou, T. (2022). The effectiveness of scaffolding approaches in laboratory-based learning: A systematic review. *Education Sciences, 12*(10), 640.

Mayer, R. E. (2021). Multimedia learning (3rd ed.). Cambridge University Press.

Meir, E., et al. (2024). Designing activities to teach higher-order experimental and design skills: Evaluation of a simulation-based tutorial. *CBE—Life Sciences Education, 23*(2).

Mundy, C. E., et al. (2024). *Investigating the effects of a context-based laboratory on students' conceptual understanding and learning experiences. Journal of Chemical Education, 101(4), 1321–1333.*

Mutlu-Bayraktar, D., Cosgun, V., & Altan, T. (2021). The effects of visual design principles on student engagement in digital learning materials. Educational Technology Research and Development, 69(2), 1121–1143.

Norman, D. A. (2013). The design of everyday things (Revised and expanded ed.). Basic Books.

Panjaitan, A. O., et al. (2024). The impact of proper citation on academic integrity and scholarship. ResearchGate. https://doi.org/10.13140/RG.2.2.XXXXXXX.

Panaluh, A.H. (2022). Improving the science skills of physics education students by using guided inquiry practicum. https://doi.org/10.48550/arXiv.2211.04006.

Piaget, J. (1954). *The construction of reality in the child.* Basic Books.

Reeves, T. D., & Reeves, P. M. (2021). Instructional design and measurable objectives in science education. Educational Technology Research and Development, 69(3), 1201–1220.

Ruff, E. F., Franz, J. L., & West, J. K. (2023). *An inorganic chemistry laboratory technique course using scaffolded, inquiry-based laboratories and project-based learning. Journal of Chemical Education, 100(2), 737–745.*

Sadarangani, R., Serafin, M., & Chabra, S. (2024). *Online and in-person science laboratory instructional practices: Input to a science instructional guide. International Journal of Research and Innovation in Social Science, 8(5), 1-10.*

Schunk, D. H. (2012). Learning theories: An educational perspective (6th ed.). Pearson.

Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), 257–285.

Szalay, L., Tóth, Z., Borbás, R., & Füzesi, I. (2023). *Scaffolding of experimental design skills in chemistry education. Chemistry Education Research and Practice, 24(2), 599–623.*

UNESCO. (2023). Global education monitoring report 2023. UNESCO Publishing.

Van Merriënboer, J. J. G., & Kirschner, P. A. (2020). *Ten steps to complex learning: A systematic approach to four-component instructional design*. Routledge.

Van Wyk, A. L., et al. (2024). *Analysis of analytical chemistry laboratory experiments in the MICRO project: Adoption of inquiry-based labs with scaffolded activities. Journal of Chemical Education, 101(5), 1652–1661.*

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes. Harvard University Press.*

Walsh, C., Riedy, M., & Salazar, A. (2022). *Authentic assessment of laboratory skills: Development and validation of a procedural rubric. Journal of College Science Teaching, 51(5), 42–50.*