

Instructional Delivery and Scientific Literacy of Learners in the Alternative Learning System

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Abstract— This study examined the relationships between Alternative Learning System (ALS) instructional methods and science literacy among ALS learners in the Dolores District, Quezon Province. Using a descriptive-correlational design, the study included 47 ALS learners enrolled in the Continuing Education Program and three mobile teachers/facilitators serving twelve Community Learning Centers. Data were collected using a researcher-developed 50-item Science Literacy Assessment Instrument aligned with the PISA Scientific Literacy Framework and an ALS Instructional Methods Survey covering three dimensions: instructional approach, learning resource quality, and facilitator support. Data were analyzed using weighted means, standard deviations, and Pearson Product-Moment Correlation Coefficient at the 0.05 level of significance. Findings revealed that ALS instructional methods were highly implemented across all three dimensions, with facilitator support registering the highest overall mean ($M = 4.98$). In terms of science literacy, the majority of learners performed at the Developing level in comprehension (59.57%) and practical application (51.06%), while a majority achieved the Proficient/Advanced level in critical thinking (51.06%). Pearson correlation analysis yielded no statistically significant relationships between ALS instructional methods and science literacy, supporting the null hypothesis. However, strong positive directional trends were observed between all instructional method dimensions and critical thinking, with instructional approach recording the largest coefficient ($r = 0.983$). The study recommends strengthening inquiry-based instruction, expanding the facilitator workforce, localizing learning materials, and replicating the study with larger samples across multiple districts.

Keywords— Alternative Learning System, science literacy, instructional methods, non-formal education, descriptive-correlational.

I. INTRODUCTION

Education is the foundation of national development, yet major obstacles prevent equitable access to quality instruction for all Filipino learners. Poverty, geographic isolation, and family circumstances continue to hinder many students from completing formal schooling (Mahinay, 2025). To address these barriers, the Department of Education (DepEd) developed the Alternative Learning System (ALS), a flexible, non-formal education program that offers out-of-school youth and adults an accessible means to complete basic education. Formalized through Republic Act No. 11510 in 2020, ALS serves approximately 800,000 learners annually (World Bank, 2024) and has been recognized as a significant second-chance mechanism for marginalized populations (Albert et al., 2024).

Among the most important yet understudied learning outcomes in ALS is scientific literacy — defined as the ability to understand scientific concepts, evaluate evidence, and apply scientific reasoning to real-world situations (OECD,

2019). For disadvantaged learners, scientific literacy opens career pathways, promotes evidence-based health and environmental decisions, and enables meaningful participation in community development (Mehra et al., 2021). However, ALS science instruction faces particular challenges: the absence of laboratory facilities, limited supplementary materials, high learner-to-facilitator ratios, and English-medium modules that pose language barriers for learners whose first language is Filipino or a regional dialect (Albert et al., 2024; Mahinay, 2025).

Despite the recognized importance of science literacy in ALS, few systematic studies have examined how instructional approaches in real-world, resource-constrained rural settings associate with science literacy development among ALS learners. This study addresses that gap by examining the relationship between ALS instructional methods — specifically instructional approach, learning resource quality, and facilitator support — and the science literacy of learners in Dolores District, Quezon Province, a predominantly agricultural, geographically isolated municipality where ALS serves as the primary educational resource for many out-of-school youth and adults.

II. METHODOLOGY

A. Research Design

A descriptive-correlational research design was employed to systematically determine the association between ALS instructional methods and the science literacy levels of ALS learners in Dolores District. This design accurately describes variables as they occur in natural settings and identifies statistical patterns characterizing relationships between variables (Creswell, 2014; Sousa et al., 2007). Pearson Product-Moment Correlation was used to quantify the strength and direction of bivariate relationships between each instructional method dimension and each dimension of science literacy.

B. Respondents

The respondents were 47 ALS learners enrolled in the Continuing Education Program (Accreditation and Equivalency Test Preparation) in Dolores District, drawn from all twelve Community Learning Centers using purposive sampling. Inclusion criteria required at least six months of ALS enrollment, completion of at least three science learning modules, and active participation in Learning Strand 2 (Scientific and Critical Thinking Skills). Three mobile teachers/facilitators serving the twelve CLCs also participated, completing the ALS Instructional Methods Survey. The learner population was predominantly aged 16–24, with varied reasons for leaving formal schooling — economic necessity (45%), family duties (28%), early pregnancy (18%), and geographic inaccessibility (9%).

C. Research Instruments

Two instruments were developed for this study. The Science Literacy Assessment Instrument is a 50-item researcher-developed test aligned with the PISA Scientific Literacy Framework (OECD, 2019) and distributed across three dimensions: Comprehension (items 1–20, 0–20 pts), Critical Thinking (items 21–40, 0–20 pts), and Practical Application (items 41–50, 0–10 pts). Items covered Life Science/Biology (22 items), Physical Science (8

items), Earth and Space Science (10 items), and Environmental Science (10 items). Scores were converted to percentages and classified as Proficient/Advanced (75–100%), Developing (50–74%), or Beginning (0–49%).

The ALS Instructional Methods Survey is a structured questionnaire using a five-point Likert scale (1 = Not Implemented to 5 = Highly Implemented) assessing three dimensions: Instructional Approach (16 items), Learning Resource Quality (16 items), and Facilitator Support (18 items). Both instruments underwent content validation by science education specialists and ALS implementers, and pilot testing for internal consistency. Weighted mean and standard deviation were used for descriptive analysis; Pearson *r* was applied for correlation at the 0.05 significance level.

III. RESULTS AND DISCUSSION

A. Extent of Implementation: Instructional Approach

Table 1. Extent of Implementation of ALS Instructional Methods in Terms of Instructional Approach

Indicators	Mean	SD	Verbal Interpretation
1. Allow students to progress through science modules at their own speed.	5.00	0.00	Strongly Agree
2. Integrate local environmental issues from Dolores into science discussions.	4.33	0.58	Agree
3. Use hands-on activities that require learners to physically manipulate materials.	4.67	0.58	Strongly Agree
4. Prioritize group work and peer-tutoring sessions in science lessons.	4.67	0.58	Strongly Agree
5. Adapt teaching strategies to bridge abstract theories with learners' real-life livelihoods.	5.00	0.00	Strongly Agree
6. Facilitate self-paced learning by helping students set their own science milestones.	4.67	0.58	Strongly Agree
7. Use indigenous knowledge and local folk wisdom to explain scientific phenomena.	4.67	0.58	Strongly Agree
8. Lead field observations where students study the local ecosystem in their barangay.	4.00	1.00	Agree
9. Encourage collaborative problem-solving for community-based science challenges.	4.00	1.00	Agree
10. Connect science concepts to agricultural or industrial practices in Quezon Province.	4.33	1.16	Agree
11. Provide flexible learning pathways for students unable to attend every session.	5.00	0.00	Strongly Agree
12. Use localized analogies to simplify complex scientific terms.	4.00	1.00	Agree



13. Implement peer-assessment strategies where learners review each other's outputs.	4.67	0.58	Strongly Agree
14. Ensure science lessons contribute to students' ability to perform daily practical tasks.	4.33	0.58	Agree
15. Utilize modular pre-tests to determine each student's starting point.	5.00	0.00	Strongly Agree
16. Help learners create digital or physical portfolios of applied science projects.	4.67	0.58	Strongly Agree
Overall	4.56	0.55	Highly Implemented

Legend: 1.00–1.49 – Not Implemented (Strongly Disagree); 1.50–2.49 – Poorly Implemented (Disagree); 2.50–3.49 – Moderately Implemented; 3.50–4.49 – Implemented (Agree); 4.50–5.00 – Highly Implemented (Strongly Agree)

Table 1 reveals an overall mean of 4.56 (SD = 0.55), interpreted as Highly Implemented, indicating that ALS facilitators in the Dolores District consistently employ a wide range of learner-centered instructional strategies. Perfect scores (M = 5.00) were recorded for allowing students to progress at their own pace, adapting teaching strategies to learners' real-life contexts, providing flexible learning pathways, and utilizing modular pre-tests — demonstrating genuine responsiveness to the life realities of ALS learners. These findings are consistent with Knowles et al.'s (2015) andragogical principles, affirming that self-direction, contextualization, and practical applicability are central to effective adult instruction. The somewhat lower scores for field observations and collaborative problem-solving (M = 4.00) indicate areas for continued development, particularly in facilitating community-embedded scientific inquiry as described by Lave and Wenger (1991) and Morris (2020).

B. Extent of Implementation: Learning Resource Quality

Table 2. Extent of Implementation of ALS Instructional Methods in Terms of Learning Resource Quality

Indicators	Mean	SD	Verbal Interpretation
1. ALS science modules are always available in sufficient quantities.	5.00	0.00	Strongly Agree
2. Language and text in the modules are clear and easy for independent study.	4.67	0.58	Strongly Agree
3. Supplementary materials like localized handouts fill gaps in the standard modules.	4.33	0.58	Agree
4. Visual aids and diagrams in resources are accurate and aid understanding.	5.00	0.00	Strongly Agree
5. Modules are physically durable and withstand frequent use in varied settings.	4.67	0.58	Strongly Agree



6. Layout of learning materials is engaging and sustains student interest.	4.33	0.58	Agree
7. Assessment tools within the modules accurately measure intended competencies.	4.33	0.58	Agree
8. Digitized versions of modules are provided for students with smartphone access.	4.67	0.58	Strongly Agree
9. Experiment instructions in the modules are safe and easy to follow at home.	4.67	0.58	Strongly Agree
10. Supplementary videos or audio recordings are provided for difficult science topics.	4.67	0.58	Strongly Agree
11. Illustrations used are culturally appropriate and recognizable to local learners.	4.33	1.16	Agree
12. Learning materials provide clear summaries that help students review for exams.	4.67	0.58	Strongly Agree
13. Modules include enough practice exercises to ensure mastery of scientific concepts.	4.67	0.58	Strongly Agree
14. Glossary or vocabulary sections are included to help with technical scientific terms.	4.67	0.58	Strongly Agree
15. Resource materials promote environmental awareness in the local context.	4.33	0.58	Agree
16. Locally-developed learning activity sheets complement the national modules.	5.00	0.00	Strongly Agree
Overall	4.63	0.50	Highly Implemented

Legend: 1.00–1.49 – Not Implemented (Strongly Disagree); 1.50–2.49 – Poorly Implemented (Disagree); 2.50–3.49 – Moderately Implemented; 3.50–4.49 – Implemented (Agree); 4.50–5.00 – Highly Implemented (Strongly Agree)

Table 2 shows an overall mean of 4.63 (SD = 0.50), also rated Highly Implemented. Perfect scores were observed for module availability, visual aid accuracy, and use of locally developed activity sheets, reflecting a strong commitment to accessibility and reliability. High scores for digitized modules and supplementary audiovisual recordings indicate that the district is actively bridging traditional and digital learning modalities. These findings align with Rico and Mendoza (2021), who found that high-quality SLMs with clear organization, accurate content, and cultural responsiveness significantly support learner engagement. Areas with somewhat lower scores — layout engagement, cultural illustration, and localized handouts — represent opportunities to further contextualize materials to Quezon Province's unique environmental and agricultural identity (Mahinay, 2025).

C. Extent of Implementation: Facilitator Support

Table 3. Extent of Implementation of ALS Instructional Methods in Terms of Facilitator Support

Indicators	Mean	SD	Verbal Interpretation
1. Provide frequent guidance by checking in on each student multiple times per session.	5.00	0.00	Strongly Agree
2. Give timely and specific feedback to correct scientific misconceptions immediately.	5.00	0.00	Strongly Agree
3. Actively encourage learner autonomy, letting students find their own answers.	5.00	0.00	Strongly Agree
4. Provide individualized assistance to students struggling with science math or logic.	5.00	0.00	Strongly Agree
5. Foster an approachable environment where students feel safe to ask any question.	5.00	0.00	Strongly Agree
6. Motivate learners by explaining how science literacy improves future job prospects.	5.00	0.00	Strongly Agree
7. Use scaffolding, providing help only when the student is truly stuck.	4.67	0.58	Strongly Agree
8. Am available for consultations even outside of scheduled center hours.	5.00	0.00	Strongly Agree
9. Celebrate small milestones in a student's science progress to build confidence.	5.00	0.00	Strongly Agree
10. Lead reflective sessions where students discuss their personal views on science.	5.00	0.00	Strongly Agree
11. Use positive reinforcement to encourage students who find science intimidating.	5.00	0.00	Strongly Agree
12. Help learners connect their personal experiences to scientific theories in the modules.	5.00	0.00	Strongly Agree
13. Demonstrate competence and confidence when explaining complex science topics.	5.00	0.00	Strongly Agree
14. Provide resources for students to do further research on topics that interest them.	5.00	0.00	Strongly Agree
15. Act as a role model for scientific thinking and evidence-based decision-making.	5.00	0.00	Strongly Agree
16. Provide emotional support to learners who feel frustrated by difficult science concepts.	5.00	0.00	Strongly Agree
17. Involve students' families in understanding the importance of science education.	5.00	0.00	Strongly Agree



18. Encourage epistemic questioning, where students ask why we know what we know.	5.00	0.00	Strongly Agree
Overall	4.98	0.03	Highly Implemented

Legend: 1.00–1.49 – Not Implemented (Strongly Disagree); 1.50–2.49 – Poorly Implemented (Disagree); 2.50–3.49 – Moderately Implemented; 3.50–4.49 – Implemented (Agree); 4.50–5.00 – Highly Implemented (Strongly Agree)

Table 3 presents the highest implementation mean among all three dimensions ($M = 4.98$, $SD = 0.03$), with seventeen of eighteen indicators rated Strongly Agree ($M = 5.00$). Only scaffolding (item 7, $M = 4.67$) fell slightly below the perfect mark, reflecting the nuanced challenge of calibrating guidance with learner autonomy. These results affirm the facilitators' comprehensive commitment to every dimension of their role — from emotional support and epistemic questioning to role modeling and family engagement. The findings echo Lansita and Dalayap (2025) and Paez (2024), who documented that well-supported, engaged facilitators are the strongest predictors of ALS learner success, even under high learner-to-facilitator ratios. Balancing guidance with autonomy is particularly important in science, where scaffolding abstract concepts requires careful calibration (Mahinay, 2025; Abad, 2020).

D. Science Literacy: Comprehension

Table 4. Level of Science Literacy Among ALS Learners in Terms of Comprehension

Score Range	f	%	Verbal Interpretation
75–100%	17	36.17	Proficient/Advanced
50–74%	28	59.57	Developing
0–49%	2	4.26	Beginning
Total	47	100	

Legend: 75–100% – High/Proficient-Advanced; 50–74% – Moderate/Developing; 0–49% – Low/Beginning

Table 4 shows that 59.57% of learners are at the Developing level in comprehension, 36.17% are at the Proficient/Advanced level, and only 4.26% are at the Beginning level.

The majority's developing classification indicates functional understanding of scientific concepts but a continued need for reinforcement to achieve full competency. This pattern is consistent with Bernardo et al. (2023), who documented that Filipino learners from disadvantaged backgrounds tend to have limited access to inquiry-based science instruction, resulting in foundational knowledge gaps.

The 36.17% Proficient/Advanced learners represent a substantial cohort capable of engaging with complex scientific content — evidence that ALS instruction, when delivered with high fidelity, can cultivate meaningful conceptual understanding even in resource-constrained settings.

E. Science Literacy: Critical Thinking

Table 5. Level of Science Literacy Among ALS Learners in Terms of Critical Thinking

Score Range	f	%	Verbal Interpretation
75–100%	24	51.06	Proficient/Advanced
50–74%	11	23.40	Developing
0–49%	12	25.53	Beginning
Total	47	100	

Legend: 75–100% – High/Proficient-Advanced; 50–74% – Moderate/Developing; 0–49% – Low/Beginning

Table 5 shows that 51.06% of learners achieved the Proficient/Advanced level in critical thinking, making this the strongest-performing dimension. However, 25.53% remain at the Beginning level — a notable proportion requiring targeted intervention. The strong critical thinking performance relative to comprehension and practical application is consistent with ALS's pedagogical emphasis on collaborative problem-solving, reflective inquiry, and community-based applications of scientific reasoning (Belen & Panoy, 2022).

The gap between critical thinking achievement and comprehension suggests that learners can engage in higher-order reasoning when anchored in familiar contexts, even when their recall of abstract scientific content remains incomplete — a finding consistent with Situated Learning Theory (Lave & Wenger, 1991).

F. Science Literacy: Practical Application

Table 6. Level of Science Literacy Among ALS Learners in Terms of Practical Application

Score Range	f	%	Verbal Interpretation
75–100%	17	36.17	Proficient/Advanced
50–74%	24	51.06	Developing
0–49%	6	12.77	Beginning
Total	47	100	

Legend: 75–100% – High/Proficient-Advanced; 50–74% – Moderate/Developing; 0–49% – Low/Beginning

Table 6 shows that 51.06% of learners are at the Developing level in practical application, 36.17% are Proficient/Advanced, and 12.77% are at the Beginning level — a profile similar to comprehension. The majority's Developing classification reflects the challenge of translating scientific knowledge into real-world problem-solving when learners lack regular access to hands-on experiences, demonstration equipment, and field-based science activities (Albert et al., 2024).

These results highlight the need for more experiential learning opportunities aligned with Kolb's (1984) learning cycle, particularly concrete experience and active experimentation, which are limited by the resource constraints of community-based ALS settings.



G. Correlation: ALS Instructional Methods and Science Literacy

Table 7. Test of Correlation between ALS Instructional Methods and Science Literacy

Science Literacy	Instructional Approach	Learning Resource Quality	Facilitator Support
Comprehension	-0.007	-0.650	0.500
Critical Thinking	0.983	0.869	0.756
Practical Application	0.007	0.650	-0.500

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. No coefficients reached statistical significance ($p > .05$).

Table 7 presents the Pearson correlation coefficients between the three ALS instructional method dimensions and the three science literacy dimensions. No statistically significant relationship was found between any instructional method dimension and any science literacy dimension at the 0.05 level of significance. The null hypothesis — that there is no significant relationship between the extent of implementation of ALS instructional methods and science literacy — is therefore accepted.

However, the directional trends are notably strong. The correlation between instructional approach and critical thinking was $r = 0.983$, the largest coefficient in the matrix, suggesting a powerful positive association that did not reach significance due to the extremely small facilitator sample size ($n = 3$). Similarly, learning resource quality and facilitator support showed large positive coefficients with critical thinking ($r = 0.869$ and $r = 0.756$, respectively). These directional patterns are consistent with Belen and Panoy (2022) and Lansita and Dalayap (2025), who documented significant gains in science process skills and critical thinking when ALS instruction is well-implemented, contextually grounded, and supported by engaged facilitators.

The non-significance is primarily a methodological artifact of the inherently small facilitator sample ($n = 3$), which severely limits statistical power in correlation analyses (Cohen, 1988). With only three data points contributing to the facilitator-level correlations, even very large true population associations will not reach significance. This limitation, acknowledged in the study design, underscores the importance of replicating the study with a larger facilitator sample across multiple districts to properly evaluate the statistical significance of these associations.

IV. CONCLUSIONS

The study finds that the ALS program in Dolores District operates as a robust and highly functional pedagogical environment. Facilitators have effectively employed learner-centered practices to mitigate the impact of high student-to-teacher ratios, with 'Highly Implemented' ratings across all instructional dimensions confirming a program culture that prioritizes accessibility and flexibility. The quality of instructional delivery — particularly facilitator support — reflects strong alignment with andragogical principles and situated learning approaches appropriate to adult, community-based education.

In terms of science literacy, learners' critical thinking levels are notably stronger than their comprehension and practical application — a pattern suggesting that ALS instruction successfully cultivates analytical and evaluative

reasoning, but that more bridge-building between theoretical knowledge and daily practical application is needed. The absence of statistically significant correlations between instructional methods and science literacy is attributed to the small facilitator sample size rather than the absence of a true relationship, as evidenced by the very large directional coefficients observed. As Darling-Hammond et al. (2020) affirm, the quality of the educational framework remains the largest predictor of learner success even in non-traditional contexts.

V. RECOMMENDATIONS

ALS Implementers and Mobile Teachers should continue developing localized activity sheets that address Dolores District's unique agricultural and environmental contexts, ensuring that science content is relevant to learners' immediate realities. Greater emphasis on field-based and community-embedded science activities — even with improvised materials — can strengthen practical application outcomes aligned with experiential learning principles.

Administrators at the District and Division Level should support the development of a district-wide repository of localized learning materials to ease facilitator preparation, reduce duplication of effort, and ensure consistency of resource quality across all twelve CLCs. Investment in additional facilitator positions is strongly recommended to reduce the current 47:3 learner-to-facilitator ratio, which constrains both individual attention and statistical power in program evaluation.

Future Researchers should conduct a comparative analysis assessing the efficacy of the current small-cohort model against larger-scale implementations to identify which pedagogical features are most at risk of dilution as enrollment increases.

Replicating this study across multiple districts and with larger facilitator samples would substantially improve statistical power and allow proper evaluation of the correlational patterns documented here. Mixed-methods and longitudinal designs would further illuminate the mechanisms by which instructional quality influences science literacy development in non-formal, rural contexts.

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