Diagnosing Biology Learning Gaps among ALS Junior High School Completers: Basis for a Senior High School Bridging Program

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ABSTRACT

This study aimed to identify the learning gaps of ALS Junior High School completers in Biology as a basis for developing a bridging intervention program for Senior High School readiness. Specifically, it identified the least mastered biology competencies among ALS learners, explored the reasons for these gaps, and examined the challenges teachers encounter in teaching science. A descriptive mixed-methods research design was used, with a Biological Science Competency Questionnaire administered to 50 ALS completers and open-ended needs-assessment questions administered to 5 ALS teachers in the Iligan City Division. The results showed that learners' acquisition of all biological competencies was low. The weakest areas included microscopic and unobservable concepts, genetics and heredity, complex biological processes, human body systems, ecology, and scientific inquiry skills. Thematic analysis revealed that these gaps were also due to limited instructional time, poor foundational knowledge, a lack of science-specialized educators, insufficient learning resources and laboratory experiences, and irregular attendance. Teachers also reported difficulties in addressing diverse learner backgrounds, teaching abstract concepts, and implementing hands-on learning activities. Suggested strategies to overcome these problems included introducing bridging programs, using visual and interactive learning methods, providing opportunities for experiential learning, and enhancing teacher training and collaboration. The findings provide empirical support for the development of targeted interventions to improve biology readiness among ALS learners transitioning to Senior High School.

Keywords: Alternative Learning System (ALS), biology learning gaps, Senior High School readiness, needs assessment, bridging intervention program

INTRODUCTION

The Alternative Learning System (ALS) in the Philippines is an alternative pathway to basic education for learners who cannot finish formal schooling due to socioeconomic or personal reasons. It offers a flexible, accelerated curriculum that enables learners to complete Junior High School (JHS) in one to two years, compared with the conventional four-year program. While this strategy provides access and inclusivity, issues regarding the depth and quality of academic preparation that ALS learners receive before proceeding to Senior High School (SHS) remain, particularly in the science disciplines (Department of Education, 2019).

Biology, as a core science subject in SHS, requires learners to have strong foundational knowledge, scientific literacy, and inquiry-based thinking skills. Key topics such as cell biology, genetics, ecology, and energy flow are interconnected and require both conceptual understanding and familiarity with scientific terminology and processes. Within the Philippine K–12 curriculum, science education uses a spiral progression approach, in which concepts are introduced at simpler levels and revisited with increasing complexity across grade levels (DepEd, 2016). This curricular design underscores the importance of mastering foundational competencies, as subsequent lessons build on prior knowledge. Consequently, gaps in earlier biology education may accumulate, posing greater challenges as learners progress to higher levels of science education.

In formal basic education, these competencies are developed through years of structured instruction, scaffolded learning experiences, and laboratory-based activities. However, even learners in the regular basic education system have been reported to struggle with several biology competencies, particularly genetics, cellular processes, and scientific reasoning. National and international assessments have consistently shown that Filipino learners perform below desired proficiency levels in science, especially in applying concepts and higher-order thinking skills (OECD, 2019; DepEd, 2020). If learners in the regular four-year Junior High School program already encounter such difficulties, the challenge may be even greater for ALS learners who complete the entire JHS curriculum in as few as one to two years, often with irregular attendance and fewer opportunities for sustained instruction.

In contrast, the ALS curriculum often emphasizes completing learning strands and equivalency assessments, with limited opportunities for extended inquiry and hands-on experiences essential to meaningful science learning (Wayas & Dinoro, 2023). Existing studies further underscore persistent challenges encountered by ALS learners in science. Research indicates that ALS learners frequently encounter difficulties with conceptual understanding and science process skills, which are vital for success in biology and other scientific disciplines. For instance, Barabato and Latip (2025) observed that ALS secondary students exhibited gaps in fundamental biology concepts and faced challenges in applying scientific inquiry skills. Similarly, studies have identified obstacles to reading comprehension and higher-order thinking that further hinder learners' ability to engage with complex scientific content (Wayas & Dinoro, 2023). These challenges are compounded by limited access to instructional resources, including laboratory facilities and interactive materials, thereby restricting opportunities for experiential learning.

The transition from ALS Junior High School to Senior High School Biology thus represents a substantial academic challenge. Upon entering SHS, ALS completers are expected to cope with increased cognitive demands, a faster pace, and performance-based assessments, including laboratory work and inquiry projects. These expectations may not align with the preparation received in the ALS context, potentially resulting in learning gaps, reduced academic confidence, and difficulty in adapting to formal science instruction. These difficulties may also affect learners' academic trajectories, particularly their participation in science-related tracks such as Science, Technology, Engineering, and Mathematics (STEM).

Despite these concerns, there remains limited empirical evidence identifying the specific biology competencies in which ALS learners demonstrate low mastery, as well as the factors that influence these gaps. Without such information, developing targeted and responsive instructional interventions becomes challenging. Needs assessment plays a crucial role in bridging this gap by systematically identifying learners' strengths and weaknesses as a basis for the development of effective support programs.

In response to this need, this study aims to identify the gaps in biology learning among ALS Junior High School completers as a basis for developing a bridging intervention program aimed at preparing students for Senior High School. Specifically, the study aims to identify the least mastered biology competencies, investigate the factors contributing to these gaps, and examine the challenges teachers face in teaching biology within the ALS framework. The results of this research are expected to inform the development of targeted instructional strategies and support mechanisms to enhance ALS learners' readiness for Senior High School science. Furthermore, the findings aim to promote more inclusive and equitable educational outcomes, consistent with the objectives of quality education.

METHODOLOGY

Research Design

This study used a descriptive mixed-methods design to identify gaps in biology learning among Alternative Learning System (ALS) Junior High School completers, serving as a basis for developing a bridging intervention program for Senior High School readiness. The quantitative component used a Biological Science Competency Questionnaire to assess learners' perceived mastery of selected biology competencies. In contrast, the qualitative component used open-ended needs assessment questions administered to ALS teachers to gather insights into learning challenges, contributing factors, and instructional needs. Data triangulation integrated learners' self-

assessment results with teachers' perspectives, enabling a more comprehensive and credible analysis of gaps in biology learning.

Participants

The participants in this study comprised 50 Alternative Learning System (ALS) Junior High School completers and 5 ALS teachers from the Iligan City Division. The learners were selected through purposive sampling based on their completion of the ALS Junior High School program and their readiness to transition to Senior High School. In addition, ALS teachers who handle science-related learning strands were included to provide professional insights into learners' biological competencies and instructional challenges.

Instruments

Two primary research instruments were used to collect data:

Biological Science Competency Questionnaire

Adapted from the study by Delos Santos, R. R. Lim, and D. V. Rogayan Jr. (2021). The instrument was aligned with the K–12 science curriculum and assessed selected biology competencies, including cell structure and function, genetics and heredity, human body systems, ecological concepts, and scientific inquiry skills. Learners rated their mastery of each competency on a structured scale.

Teacher Needs Assessment Questionnaire

Consisting of open-ended questions designed to elicit ALS teachers' insights into the challenges encountered in teaching biology, the factors contributing to learners' difficulties, and recommended strategies to improve science learning.

Both instruments underwent content validation by science education experts to ensure clarity, relevance, and alignment with the research objectives.

Data Collection Procedure

Prior to data collection, a formal request was submitted to the Iligan City Schools Division Office to obtain permission to conduct the study. Upon approval, coordination with ALS coordinators and teachers was undertaken to facilitate the administration of the research instruments. The Biological Science Competency Questionnaire was distributed to 50 ALS Junior High School completers, who were given sufficient time to respond. Simultaneously, the Teacher Needs Assessment Questionnaire was administered to 5 ALS teachers, who provided written responses to the open-ended questions. All participants were informed of the purpose of the study, and their participation was voluntary. After the completed instruments were retrieved, the responses were organized, encoded, and prepared for quantitative and qualitative analysis.

Data Analysis

Data analysis employed both quantitative and qualitative methods. Quantitative data from the Biological Science Competency Questionnaire were analyzed using JASP statistical software (version 0.95.4). Descriptive statistics, including the mean and standard deviation, were computed to determine the level of mastery for each biology competency and to identify the least mastered areas among ALS learners.

Qualitative data from the Teacher Needs Assessment Questionnaire were analyzed using thematic analysis, following a systematic process of coding, categorizing, and identifying emerging themes related to learning difficulties, contributing factors, instructional challenges, and recommended strategies. To ensure anonymity and organize responses, teacher participants were assigned codes (T1, T2, T3, T4, and T5), which were used in presenting and interpreting the qualitative data.

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To strengthen the findings, data triangulation was employed by integrating quantitative results and qualitative themes, enabling validation and deeper interpretation of the identified biology learning gaps.

Ethical Considerations

Ethical standards were strictly observed throughout the study. Prior to data collection, permission to conduct the research was obtained. Participants were fully informed about the study's purpose, procedures, and their rights as respondents. Participation was voluntary, and respondents were assured that they could withdraw at any time without penalty.

Confidentiality and anonymity were maintained by ensuring that no identifying information was disclosed at any stage of the study and that all responses were used solely for academic purposes.

RESULTS AND DISCUSSION

Table 1. Students' least mastered competencies in Grade 7 biology

Indicators	Mean	SD	Description
1. Identify parts of the microscope and their functions.	1.780	0.737	LM
2. Focus specimens using the compound microscope.	1.520	0.677	LM
3. Describe the different levels of biological organization from cell to biosphere.	1.920	0.778	LM
4. Differentiate plant and animal cells according to presence or absence of certain organelles.	2.000	0.808	LM
5. Explain why the cell is considered the basic structural and functional unit of all organisms.	2.080	0.944	LM
6. Identify beneficial and harmful microorganisms.	2.000	0.833	LM
7. Differentiate asexual from sexual reproduction in terms of number of individuals involved.	2.220	0.954	LM
8. Differentiate asexual from sexual reproduction in terms of similarities of offspring to parents.	2.260	0.853	LM
9. Describe the process of fertilization.	2.100	0.839	LM
10. Differentiate biotic from abiotic components of an ecosystem.	2.220	0.932	LM
11. Describe the different ecological relationships found in an ecosystem.	2.000	0.700	LM
12. Predict the effect of changes in one population on other populations in the ecosystem.	2.000	0.756	LM
13. Predict the effect of changes in abiotic factors on the ecosystem.	2.200	0.808	LM

Legend: M- Mastered (3.50-4.00), MTM- Moving Towards Mastery (2.50-3.49), LM- Low Mastery (1.50-2.49), NM- No Mastery (1.00-1.49)

Table 1 presents the least mastered competencies in Grade 7 Biology among ALS Junior High School completers. The results show that all listed competencies fall within the "Low Mastery (LM)" level, with mean scores ranging from 1.52 to 2.26, indicating that learners generally have insufficient mastery of fundamental biology concepts.

Among the competencies, the lowest mean score (M = 1.52) was for focusing specimens with the compound microscope, followed by identifying parts of the microscope and their functions (M = 1.78). These findings suggest that learners have significant difficulty with microscopy skills, likely due to limited exposure to laboratory equipment and hands-on activities.

Other competencies with low mastery include topics in cell biology, such as levels of biological organization (M = 1.92), cell structure and function (M = 2.00–2.08), and microorganisms (M = 2.00), indicating gaps in foundational biological knowledge. Similarly, competencies in genetics and reproduction (M = 2.10–2.26) and ecology (M = 2.00–2.22) were rated as low mastery, suggesting difficulties in understanding abstract processes and relationships within biological systems.

Table 2. Students' least mastered competencies in Grade 8 biology			
Indicators	Mean	SD	Description
1. Explain ingestion, absorption, assimilation, and excretion.	2.000	0.904	LM
2. Explain how diseases of the digestive system are prevented, detected, and treated.	2.020	0.958	LM
3. Identify healthful practices that affect the digestive system.	2.040	0.807	LM
4. Compare mitosis and meiosis, and their role in the cell-division cycle.	2.060	0.956	LM
5. Explain the significance of meiosis in maintaining the chromosome number.	2.020	0.820	LM
6. Predict phenotypic expressions of traits following simple patterns of inheritance.	1.860	0.700	LM
7. Explain the concept of a species.	2.040	0.856	LM
8. Classify organisms using the hierarchical taxonomic system.	1.980	0.937	LM
9. Explain the advantage of high biodiversity in maintaining the stability of an ecosystem.	2.160	0.934	LM
10. Describe the transfer of energy through the trophic levels.	2.140	0.926	LM
11. Analyze the roles of organisms in the cycling of materials.	2.160	0.912	LM
12. Explain how materials cycle in an ecosystem.	2.080	0.900	LM

Legend: M- Mastered (3.50-4.00), MTM- Moving Towards Mastery (2.50-3.49), LM- Low Mastery (1.50-2.49), NM- No Mastery (1.00-1.49)

The results for Grade 8 biology competencies indicate that all identified areas fall within the Low Mastery (LM) level, with mean scores ranging from 1.86 to 2.16, reflecting generally limited understanding among ALS learners.

The lowest mean score (M = 1.86) was observed for predicting phenotypic expressions of traits following simple patterns of inheritance, indicating difficulty applying basic genetics concepts. Other competencies related to cell division, such as comparing mitosis and meiosis (M = 2.06) and explaining the significance of meiosis (M = 2.02), also showed low mastery.

Regarding human body systems, learners demonstrated low mastery in explaining ingestion, absorption, assimilation, and excretion (M = 2.00), in explaining how digestive system diseases are prevented and treated (M = 2.02), and in identifying healthful practices affecting the digestive system (M = 2.04).

Similarly, competencies related to taxonomy and biodiversity, such as classifying organisms using the hierarchical taxonomic system (M = 1.98) and explaining the concept of a species (M = 2.04), were also at the low mastery level. In ecology, learners showed low mastery in explaining biodiversity and ecosystem stability (M = 2.16), describing energy transfer through trophic levels (M = 2.14), analyzing the roles of organisms in material cycling (M = 2.16), and explaining material cycles in ecosystems (M = 2.08).

Table 3. Students' least mastered competencies in Grade 9 biology			
Indicators	Mean	SD	Description
1. Explain how the respiratory and circulatory systems work together to transport nutrients, gases, and other molecules to and from the different parts of the body.	2.120	1.023	LM
2. Infer how one's lifestyle can affect the functioning of respiratory and circulatory systems.	2.020	0.892	LM
3. Describe the location of genes in chromosomes.	1.900	0.886	LM
4. Explain the different patterns of non-Mendelian inheritance.	1.820	0.825	LM
5. Relate species extinction to the failure of populations of organisms to adapt to abrupt changes in the environment.	2.120	0.982	LM
6. Differentiate basic features and importance of photosynthesis and respiration.	2.000	0.904	LM

Legend: M- Mastered (3.50-4.00), MTM- Moving Towards Mastery (2.50-3.49), LM- Low Mastery (1.50-2.49), NM- No Mastery (1.00-1.49)

The results for Grade 9 biology competencies indicate that all identified areas fall within the Low Mastery (LM) level, with mean scores ranging from 1.82 to 2.12, suggesting that ALS learners have a limited understanding of key biology concepts.

The lowest mean score (M = 1.82) was recorded for explaining the different patterns of non-Mendelian inheritance, suggesting that learners have difficulty understanding more complex genetics concepts. This is further supported by low performance in describing gene locations on chromosomes (M = 1.90), indicating gaps in foundational knowledge of heredity.

Regarding human body systems, learners demonstrated low mastery in explaining how the respiratory and circulatory systems work together (M = 2.12) and in inferring how lifestyle affects these systems (M = 2.02), reflecting challenges in integrating and applying biological concepts to real-life contexts.

Similarly, competencies related to cellular processes and energy transformation, such as differentiating photosynthesis and respiration (M = 2.00), also showed low mastery. In ecology and environmental science, learners demonstrated a low level of understanding of how species extinction relates to environmental change (M = 2.12).

Table 4. Students' least mastered competencies in Grade 10 biology			
Indicators	Mean	SD	Description
1. Describe the parts of the reproductive system and their functions.	2.120	0.940	LM
2. Explain the role of hormones involved in the female and male reproductive systems.	2.120	0.824	LM
3. Describe the feedback mechanisms involved in regulating processes in the female reproductive system (e.g., menstrual cycle).	2.040	0.903	LM
4. Describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis.	2.060	0.867	LM
5. Explain how protein is made using information from DNA.	1.880	0.824	LM
6. Explain how mutations may cause changes in the structure and function of a protein.	1.900	0.814	LM
7. Explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution.	2.040	0.727	LM
8. Explain the occurrence of evolution.	2.000	0.904	LM
9. Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments.	2.000	0.881	LM
10. Explain the relationship between population growth and carrying capacity.	2.020	0.820	LM
11. Suggest ways to minimize human impact on the environment.	2.040	0.880	LM

Legend: M- Mastered (3.50-4.00), MTM- Moving Towards Mastery (2.50-3.49), LM- Low Mastery (1.50-2.49), NM- No Mastery (1.00-1.49)

The results for Grade 10 biology competencies show that all identified areas fall within the Low Mastery (LM) level, with mean scores ranging from 1.88 to 2.12, indicating that ALS learners demonstrate limited understanding of advanced biology concepts.

The lowest mean score (M = 1.88) was observed for explaining how protein is made using information from DNA, suggesting difficulty with molecular biology concepts such as gene expression and protein synthesis. This was followed by an explanation of how mutations may alter a protein's structure and function (M = 1.90), further indicating gaps in genetics and molecular inheritance.

In reproductive and regulatory systems, learners also showed low mastery in describing the parts of the reproductive system and their functions (M = 2.12), explaining the role of hormones in the female and male reproductive systems (M = 2.12), describing feedback mechanisms in the female reproductive system (M = 2.04), and explaining how the nervous system coordinates these mechanisms to maintain homeostasis (M = 2.06).

These results suggest challenges in understanding how integrated body systems and physiological regulation function.

Moreover, competencies related to evolution and ecology were rated low, including explaining evidence for evolution (M = 2.04), explaining the occurrence of evolution (M = 2.00), explaining how species diversity increases survival and adaptation (M = 2.00), explaining the relationship between population growth and carrying capacity (M = 2.02), and suggesting ways to minimize human impact on the environment (M = 2.04).

Overall Discussion for BSCQ Results

The results of the Biological Science Competency Questionnaire (BSCQ) showed that the least mastered competencies among ALS completers consistently fell within the Low Mastery (LM) level, indicating insufficient preparedness in essential biology concepts before they transitioned to Senior High School. This finding suggests that although the Alternative Learning System (ALS) provides a second-chance pathway to basic education, learners may still experience academic gaps in science competencies expected at the Junior High School level. A process evaluation of the Philippine ALS program by the Philippine Institute for Development Studies found that while ALS remains significant in expanding access to education, persistent concerns about instructional delivery, implementation quality, and learner support continue to affect academic outcomes (Orbeta et al., 2024).

Across all grade levels, the competencies most in need of intervention were concentrated in microscopic and cellular concepts, genetics and heredity, complex biological processes, human body systems, ecology and environmental relationships, and scientific inquiry skills. These domains are conceptually demanding and often require visualization, experimentation, and guided explanation. Learners commonly find topics involving cells, microorganisms, DNA, and internal physiological systems difficult because these processes are not directly observable. This aligns with the findings of Barabato and Latip (2025), who reported that ALS learners had difficulty with science competencies involving conceptual understanding and the application of science process skills.

The low mastery of scientific inquiry skills, including the use of laboratory tools, data interpretation, and experimentation, is likewise significant. Biology education requires not only content knowledge but also opportunities to engage in scientific investigation. However, a national exploratory study of ALS learning resources found that although learning materials were available in some centers, they were often insufficient, and many facilitators relied on personal resources to support instruction. These limitations may directly affect the quality of science teaching and learners' opportunities for hands-on learning (Department of Education, 2022).

Furthermore, the observed learning gaps may be linked to interrupted schooling and weak foundational literacy skills among ALS learners. Many ALS participants are former school leavers or returning learners who may have missed prerequisite lessons in earlier grade levels. A local study of ALS learners in Batangas found that participants experienced significant difficulties with reading comprehension, suggesting that limited literacy skills may also hinder performance in science subjects that require the interpretation of technical terms, diagrams, and explanatory texts (Garcia & Mendoza, 2025).

Because biology competencies are cumulative in nature, a weak understanding of basic concepts may negatively affect the learning of more advanced topics. This is especially relevant in genetics, ecology, and physiology, where students are expected to connect multiple ideas and explain relationships among systems. The persistence of low mastery across major biology domains indicates that the learning difficulties of ALS completers are broad rather than limited to a few competencies.

Overall, the findings strongly justify the need for a targeted biology bridging intervention program in biology for ALS completers entering Senior High School. Such a program should focus on strengthening foundational knowledge, improving scientific literacy, and providing visual and hands-on learning experiences. Addressing these recurring competency gaps may help improve ALS learners' readiness, confidence, and academic success in Senior High School science.

Table 5. Complete Responses on the Needs Analysis for ALS Science Teachers

Themes	Sub-themes	Mentions	Sample Answers
Challenges in Learning Biology	Limited Foundational Knowledge	3	**T2:** "limited prior knowledge" **T3:** "gaps in basic knowledge" **T4:** "gaps in basic education"
	Irregular Attendance and Learning Disruptions	3	**T1:** "they go to school irregularly" **T3:** "irregular habits" **T4:** "habitual absences… missed the topic"
	Difficulty with Scientific Vocabulary and Reading	2	**T3:** "poor reading comprehension" **T5:** "difficulty in understanding scientific terminology"
	Lack of Hands-on and Experiential Learning	3	**T1:** "don't experience experiments and laboratory activities" **T3:** "limited hands-on experience" **T5:** "lack of laboratory experience"
	Abstract Nature of Biology Concepts	1	**T5:** "abstract nature of science concepts… without visual aids"
	Lack of Learning Resources	2	**T2:** "lack of learning resources" **T5:** "lack of learning materials"
Reasons Why Students Lag Behind	Limited Instructional Time	2	**T1:** "Limited instructional time" **T3:** "limited time"
	Weak or Interrupted Educational Background	3	**T1:** "gaps in foundational knowledge" **T3:** "lack of basic knowledge for science" **T5:** "limited educational background… school dropouts or long gaps"
	Lack of Qualified/Science-Specialized Teachers	1	**T2:** "no teachers specialized in teaching science"
	Limited Learning Resources and Facilities	3	**T1:** "limited access to learning resources" **T3:** "few materials" **T5:** "lack of laboratory facilities and equipment… limited tools and visual aids"
Instructional Challenges in ALS Science Education	Lack of Hands-on and Laboratory Experience	2	**T1:** "lack of laboratory and hands-on experiences" **T5:** "limited laboratory tools… harder to observe"
	Irregular Attendance	1	

			T3: "they attend irregularly to classes"
	Lack of Science Specialization and Teaching Experience	2	**T1:** "I am not a science teacher… I do not specialize in science." **T2:** "Most of the teachers have no experience in teaching biology."
	Limited Resources and Instructional Materials	3	**T3:** "limited resources" **T4:** "limited resources for hands-on activities" **T5:** "limited instructional materials"
	Lack of Hands-on and Laboratory Opportunities	3	**T2:** "difficulty… especially when it requires hands-on experience" **T4:** "science is easier… through experiments" **T5:** "lack of hands-on experiments"
Low Mastery in Key Biology Competencies	Difficulty with Microscopic and Unobservable Concepts	4	**T1:** "microorganisms… cannot see them… no laboratory activities" **T2:** "use of microscopes… hard to visualize things not seen by the naked eye" **T3:** "cells… microorganisms… abstract, hard to visualize" **T4:** "cells and microorganisms"
	Difficulty with Genetics and Heredity	2	**T1:** "struggle with genetic concepts… no strong background knowledge" **T3:** "genetics"
	Difficulty with Complex Biological Processes	2	**T3:** "metabolism… connecting ideas" **T4:** "photosynthesis, cellular respiration"
	Difficulty with Scientific Skills and Processes	1	**T5:** "forming hypotheses, interpreting data, analyzing results, conducting experiments"
	Abstract and Conceptually Demanding Nature of Biology	3	**T1:** "abstract" **T3:** "require memorization and connecting ideas to real life" **T4:** "abstract processes, complex systems"
	Bridging and Remedial Programs	3	**T1:** "students undergo a bridging program" **T3:** "enhancement and enrichment programs" **T5:** "provide remedial or bridging lessons… bridging classes"

Recommended Strategies for Improving Biology Learning	Use of Visual Aids and Interactive Learning	3	**T1:** "visual aids… interactive activities" **T3:** "visual aids and real-life examples" **T4:** "visual aids and interactive learning"
	Hands-on and Experiential Learning	3	**T1:** "laboratory experiments" **T3:** "hands-on activities" **T4:** "hands-on experiential learning"
	Teacher Expertise and Professional Support	3	**T1:** "science teachers… teaching these concepts" **T2:** "collaborate with teachers who are science majors" **T5:** "continuous teacher training and support"
	Collaboration and Support Systems	2	**T2:** "interagency collaboration" **T5:** "encourage collaborative learning"

The thematic analysis of the Needs Assessment Questionnaire completed by ALS teachers identified five major themes: challenges in learning biology, reasons students lag behind, instructional challenges in ALS science education, low mastery of key biology competencies, and recommended strategies for improving biology learning. These themes provide contextual support to the quantitative findings and offer a clearer understanding of the biology readiness of ALS completers transitioning to Senior High School.

One of the major themes identified was challenges in learning biology, particularly limited foundational knowledge, irregular attendance, difficulty with scientific vocabulary, and a lack of experiential learning opportunities. Teachers noted that many ALS learners have weak prior knowledge, which may hinder the acquisition of new biological concepts. This finding aligns with the profile of ALS learners in the Philippines, many of whom are returning learners or have interrupted schooling, often resulting in gaps in their academic foundations (Department of Education, 2019). In addition, difficulties with reading comprehension and scientific vocabulary may significantly affect science learning, since biology requires understanding technical terms, interpreting diagrams, and comprehending explanatory texts.

Another prominent theme was the reasons students lag behind, including limited instructional time, weak or interrupted educational backgrounds, a lack of science-specialized teachers, and insufficient learning resources. While ALS provides a flexible and accelerated pathway to education, this flexibility may also limit consistent contact time and instructional continuity. According to the World Bank (2020), ALS learners in the Philippines often face socioeconomic constraints, irregular participation, and limited learning support, which may negatively affect academic performance. Similarly, learners with prolonged absences or dropout histories may have fragmented academic development, resulting in persistent learning gaps.

The theme of instructional challenges in ALS science education further highlighted concerns about a lack of teacher specialization in science, limited instructional materials, and the absence of laboratory opportunities. Teachers reported difficulty delivering biology lessons when they were not science majors or had limited science teaching experience. This concern is supported by local educational reports that emphasize the need for ongoing teacher capability-building and subject-area enhancement among ALS implementers (Commission on Higher Education, 2018). Moreover, limited access to laboratory equipment, models, and interactive materials restricts inquiry-based learning, which is essential to science education.

The theme of low mastery of key biology competencies closely aligned with the quantitative findings, which showed that ALS learners struggled with topics involving microscopic and unobservable concepts, genetics and heredity, complex biological processes, and scientific inquiry skills. These findings are understandable, as biology concepts such as cell structure, inheritance, photosynthesis, and ecological systems are often abstract and require visualization, experimentation, and conceptual integration. Barabato and Latip (2025) similarly found that ALS secondary learners exhibited weaknesses in both conceptual understanding and science process skills, particularly in biology-related competencies.

Finally, the theme recommended strategies for improving biology learning emphasized the need for bridging and remedial programs, visual aids, hands-on activities, teacher training, and collaboration among teachers and agencies. These recommendations align with the goals of the ALS program to provide responsive, learner-centered education. Bridging interventions may be particularly effective in preparing ALS completers for the academic demands of Senior High School by strengthening prerequisite biology competencies before the formal transition.

Overall, the qualitative findings enrich and validate the quantitative results, showing that low mastery in biology is influenced not only by learner-related factors but also by instructional and systemic constraints. The convergence of these findings through triangulation strengthens the conclusion that ALS completers would benefit from a targeted biology bridging intervention program to improve their readiness for Senior High School science.

CONCLUSION

The study's findings revealed that Alternative Learning System (ALS) Junior High School completers demonstrated low mastery of essential biology competencies, indicating insufficient readiness for the academic demands of Senior High School science. The least mastered areas were concentrated in microscopic and cellular concepts, genetics and heredity, complex biological processes, human body systems, ecology, and scientific inquiry skills. These competencies are fundamental to biology and serve as prerequisites for more advanced learning in Senior High School.

The qualitative findings further showed that multiple factors, including limited instructional time, weak foundational knowledge, irregular attendance, a lack of science-specialized teachers, insufficient instructional resources, and limited opportunities for laboratory and hands-on learning, contributed to these learning gaps. Teachers also identified challenges in addressing diverse learner backgrounds and teaching abstract biology concepts within the ALS context.

Taken together, the quantitative and qualitative results confirm that the biology learning difficulties of ALS completers are both academic and systemic. Through data triangulation, the study established that instructional and environmental constraints reinforce gaps in learner performance. Therefore, a targeted biology bridging intervention program is necessary to strengthen foundational competencies, improve scientific literacy, and enhance ALS learners' readiness for Senior High School science. Such interventions may contribute to more inclusive, equitable, and successful educational transitions for ALS completers.

RECOMMENDATIONS

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

- Develop and implement a biology bridging program for ALS completers prior to taking biology-related subjects in Senior High School. The program should focus on the least mastered competencies identified in the study, particularly in microscopic concepts, genetics and heredity, complex biological processes, human body systems, ecology, and scientific inquiry skills.
- Integrate more visual, interactive, and hands-on learning activities in ALS science instruction. Since learners demonstrated difficulty with abstract and laboratory-based concepts, the use of simulations, visual aids, simplified experiments, and contextualized activities may improve conceptual understanding.

- Strengthen teacher capability-building initiatives for ALS educators. Professional development programs, particularly in biology content knowledge and science pedagogy, should be provided to ALS teachers, especially those without a science specialization.
- Enhance the availability of instructional resources in ALS learning centers. The Department of Education and concerned stakeholders may provide science learning materials, laboratory tools, models, and digital resources to support effective science instruction.
- Provide academic monitoring and support for ALS completers transitioning to Senior High School. Schools may establish intervention classes, mentoring programs, or academic support systems to help ALS learners adjust to the academic demands of Senior High School science.

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