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Functional Literacy Strategies Supporting Outcomes-Based Science Education: Basis for Alignment of Learning Activities

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Abstract

This study investigated the use of functional literacy strategies to enhance outcomes-based Science education, particularly in Science 5 classes. Through surveys with school heads and teachers in the Labo West District, it examined the extent of utilization of various teaching approaches like inquiry, problem-solving, demonstrations, laboratory work, and project-based learning, as well as functional literacy strategies such as scientific vocabulary development, comprehension skills, technical writing, critical thinking, and visual literacy. The findings revealed inquiry-based learning as the dominant method, with demonstration ranking second and laboratory work being least utilized. Teachers prioritized summative over formative assessments. For literacy strategies, read-aloud for vocabulary and activating prior knowledge for comprehension were most common. The study found significant positive correlations between functional literacy strategy use and the level of outcomes-based implementation, identifying challenges like lack of training and limited resources.

To address these challenges, the researcher developed innovative materials, including a detailed soil erosion lesson plan, contextualized instructional materials on water and wind effects, and "Project GILAS" - an innovation proposal providing interventions, learning kits, and resources to help teachers integrate functional literacy strategies. The findings highlighted the need for more emphasis on laboratory-based learning, enhanced teacher training on inquiry guidance and data analysis, and wider integration of functional literacy strategies like summarization and context clues. The positive correlation between strategies and outcomes underscored their importance. Adopting the developed materials and further research on scalability and long-term impacts were recommended for improving science education quality.

Keywords: Functional Literacy Strategies, Outcomes-Based Science Education, Teaching Practices, Correlation Analysis, Innovative Materials

1. Introduction

Functional literacy is an essential aspect of education worldwide. It refers to a set of practical skills and competencies necessary for coping with real-life situations in the community and society. The term was first defined by UNESCO in 1960 as the ability to use basic cognitive skills to meet the demands of everyday life. With the advent of globalization, functional literacy has become even more critical for learners to navigate the complexities of the modern world.

In a more profound sense, functional literacy has been viewed and understood as the utilization of basic cognitive abilities to contribute to the real-life socio-economic development of the community and society. Moreover, in an international Green (2018), it was found that most of the teacher-respondents highly agreed that there is in-depth functional literacy among learners when they develop the capacity for social awareness and critical and analytical reflection that they use as a basis for personal and social change and development.

Therefore, it can be viewed and understood that functional literacy has the power to transform basic cognitive skills into more in-depth, complex, higher-order thinking and learning skills. The functional literacy competencies are inclusive of abilities that highlight the interconnection between fundamental skills and critical and progressive skills. The scope of functional literacy is more crucial and comprehensive as it enables and trains the learners to use complex skills in coping with the relevant tasks, activities, and real-life challenges in the immediate community and society.

The depth of functional literacy can be viewed in its capacity to help learners develop a sense of community. Functional literacy trains learners to think, learn, and act beyond the classroom or school settings, instead, they think and act as significant members and builders of the community. Through this, functionally literate learners are also more likely to develop social awareness, social involvement, cooperative and collaborative values, and other life-relevant virtues. Therefore, it can be attested that attaining mastery of functional literacy is one salient way of making learners more value-laden and socially oriented.

Science is one of the vital and major learning areas and fields of knowledge that highly require the useful integration and application of functional literacy skills. By nature, Science is highly practical, life-relevant, dynamic, and mobilizing for learners due to the various scientific tasks, activities, and endeavors that arise in day-to-day living. Thus, amidst the variety and multiplicity of these scientific tasks and activities, there are ample opportunities to link, incorporate, and apply functional literacy skills. In addition, teaching Science cannot thrive out of purely conceptual and theoretical instruction. Lectures are not enough to teach learners practical and dynamic skills, instead, instruction that is context-based, task-oriented, activity-based, and learner-centered is held most indispensable. Context, tasks, activities, and student-centeredness of instruction are ways and channels towards approaching learning in a functional literacy way in science.

In scientific learning, content knowledge, facts, ideas, and instructional meanings only become attainable when these are discovered, learned, and explored by the learners through practical and functional tasks and engagements. That is why in a national scenario, the Philippine education system has been continuously promoting and implementing educational initiatives to enhance the opportunities of incorporating functional literacy in major learning areas such as Science. These initiatives include training programs for faculty on functional literacy strategies, educational innovations promoting functional literacy skills, and learning resource management and development of functional literacy tools and assessments. These are attested by Salamero (2020) which also revealed in its results that most of the teacher-respondents assume or execute personal efforts and initiatives to integrate functional literacy in science education through teacher-made learning materials and well-planned instructional planning, delivery, and management.

Furthermore, Science education in Philippine schools is also currently integrating OBE or outcomes-based education. Outcomes-based Science education focuses on developing and honing learners' capacity to achieve and attain outcomes in the forms of required curriculum-based content knowledge, skills, competencies, and values. These curriculum outcomes are expected to be attained and mastered by the learners after being subjected to systematic outcomes-based instruction and curriculum services.

Through outcomes-based education, the shift in the educational paradigm from teacher-centered instruction to the student-centered learning system becomes more attainable and justifiable. One of the vital ways to measure the learning outcomes and achievements of the learners properly and effectively is through the purposeful combination of functional literacy and OBE. For instance, in science education, teachers are cognizant that an integral indicator of positive learning outcomes for learners is when they can relate and apply their learnings and knowledge in practical community tasks and situations using functional literacy. This is also in consideration of the scenario that concrete and practical learning outcomes of the learners are also attainable during community-based learning tasks, crossover learning, and distance learning activities and systems in science.

The legal basis of this research will be the inputs of House Bill No. 1925 or An Act Promoting Outcome-Based Education (OBE) in the Philippines. It is otherwise known as the Outcome-Based Education (OBE) Act. This act stresses that the State acknowledges the crucial and indispensable function of education in developing the most significant resource of the country: its people. It is a reality that quality education should be anchored on the human resource capability of the nation. It further declares that the Department of Education together with other concerned sectors shall work collaboratively in instituting the curricular reforms that shall promote and support the implementation of Outcome-Based Education which will equip Filipino learners with the functional literacy, knowledge, skills, attitude, and experience needed for them to attain success and achievements in their chosen field of endeavor. In addition, the legal foundation of functional literacy strategies promoted in this study is anchored with the provisions of DepED Memorandum No. 78 s. 2009, otherwise known as the Adoption of the New Operational Definition of Functional Literacy. It clearly states that it was resolved that the new operational definition of functional literacy is the ability to communicate effectively, to solve problems scientifically, to think critically and creatively, to use resources sustainably and be productive, to develop one's sense of community and to expand one's world view.

Corollary to this, it was attested by Sharma and Alvi (2021) that the past pandemic crisis has left serious issues, problems, and challenges against the delivery and implementation of the outcomes-based approach. One of these crucial gaps and challenges includes the issues regarding the transparency of outcomes-based practices including performance-based and output-based assessment of the learners subjected to home-based distance learning systems. Meanwhile, the research gap recognized in the context of the locale of this study included the outcomes of the Classroom Observation of the Science teachers in Labo West District for the School year 2022-2023, wherein out of the nine (9) Classroom Observation Tool indicators, the lowest performance rate was identified among the teachers within the fourth indicator (Manage classroom to engage learners, individually or in groups, in meaningful exploration, discovery and hands-on activities within the range of physical learning environment). This indicator belongs to the salient components of OBE (Hargraves, 2021). Therefore, one of the evident gaps of this study was the limitations in the competence and performance of teachers along the execution and management of an outcomes-based approach to education. Furthermore, another integral gap established in the study relates to the issues and limitations in the performance of the learners during the education transition period. This poor performance in academic achievement posed conflicts and issues with the objectives and scope of the outcome-based education approach. This gap was affirmed and attested by the Learning Recovery Plan of DepEd Camarines Norte result for the End of School Year 2022-2023 was 37.97% of learners were in ME level (Meet Expectation) which is below the 75% passing rate. The same assessment was given for the Beginning of the School Year 2023-2024 with a result of 41% with a slight increase of 3.06% (SDO-CN, 2023).

1.1. Objective of the Study

This study investigates the functional literacy strategies that facilitate outcomes-based Science education and how these strategies align with learning activities. The research delves into the various outcomes-based approaches employed by educators in Science 5, such as inquiry and problem-solving methods, demonstration techniques, laboratory-based activities, project-based learning, and diverse assessment strategies. It examines the extent to which these approaches are utilized and the functional literacy strategies that are frequently used to support them, including the development of scientific vocabulary, enhancement of comprehension skills, promotion of technical and research-based writing, cultivation of critical thinking and analysis, and advancement of visual literacy.

A key aspect of the study is to explore the potential relationship between the functional literacy strategies employed and the level of outcomes-based approach utilization by the respondents. Additionally, the research seeks to identify the challenges teachers face when integrating functional literacy into outcomes-based education in science. Finally, the study aims to propose innovative materials that could assist teachers in applying functional literacy strategies to support outcomes-based approaches in Science, thereby contributing to the improvement of Science education practices.

2. Methodology

This study applied a quantitative research approach using a descriptive correlational design to systematically describe a population, situation, or problem subject. Numerical data on two or more variables were collected and analyzed to understand their relationship. The descriptive aspect of the study systematically characterized the various outcomes-based approaches used in Science 5, detailing the extent of their incorporation into teaching practices, and outlined the functional literacy strategies frequently employed by educators to support an outcomes-based approach to science education. This provided a comprehensive overview of the current state of functional literacy strategies within outcomes-based Science education. Concurrently, the correlational design examined potential relationships between the level of outcomes-based education approaches and the functional literacy strategies used by respondents. By analyzing numerical data on these variables, the study sought to uncover any significant associations, offering insights into how these strategies might influence the effectiveness of outcomes-based Science education. This approach also explored the challenges faced by educators in integrating functional literacy into outcomes-based education and informed the development of innovative materials to enhance teachers' competencies in applying functional literacy strategies within the fifth-grade Science curriculum. The integration of these two research designs offered a robust framework for understanding and improving the alignment of learning activities with functional literacy strategies in outcomes-based Science education.

2.1. Population, Sample Size, and Sampling Technique

This study encompassed a total enumeration of 59 respondents, comprising 24 school heads and 35 Science 5 teachers from Labo West District, with the primary aim of achieving true and reliable results. The sole criteria for inclusion were that the respondent must be an elementary Science 5 teacher or a school head of Labo West District. These school heads and teachers, who participated in the study, served as major data sources on the Outcomes-Based Education (OBE) approaches and their level in Science 5. Furthermore, the teacher-respondents provided key information on the functional literacy strategies that support developmental outcomes-based education in Science and the results of using these strategies in implementing outcomes-based education.

2.2. Data Gathering Procedures

Before the formal distribution of the survey questionnaire, a preliminary validation process was undertaken involving a dry run with 20 elementary teachers from Labo East District to test the clarity, relevance, and effectiveness of the survey items. The validation team, comprising 5 experienced educators, critically reviewed the questionnaire, ensuring its academic rigor and practical applicability. The questionnaire was refined to better capture the nuances of functional literacy strategies and their alignment with outcomes-based Science education, and its reliability was assessed using Cronbach's Alpha. In the pre-implementation phase, the researcher adhered to ethical considerations and standards, including obtaining approval from school heads, district, and division committees, and sending formal letters of request to the respondents. The researcher also ensured the confidentiality and privacy of the respondents, secured their consent to record the data gathered, and informed them about their rights under the Republic Act 10173, also known as the Data Privacy Act of 2012. In the implementation phase, the researcher adapted the data-gathering methods and procedures to the major research objectives, conducting a survey research questionnaire for the teacher respondents to collect information on the utilization of outcomes-based Science approaches, functional literacy strategies, and the challenges in using these strategies. Survey questionnaires were also distributed to school heads for data collection on the challenges in classroom observation in outcomes-based approaches in science education and the use of functional literacy.

2.3. Statistical Treatment of Data

In this study, a variety of analytical tools were employed for the statistical treatment of data. The researcher-created questionnaire was validated using Cronbach's Alpha, a measure of internal consistency that assesses the reliability of a set of scales or test items, with a high value indicating that the items measure the same underlying concept. The first research objective, identifying the outcomes-based approaches used by respondents, was addressed using frequency and ranking analysis. The second and third objectives, examining the level of utilization of outcomes-based approaches and the functional literacy strategies used by respondents, were analyzed using the weighted mean. The fourth objective, exploring the relationship between functional literacy strategies and the level of outcomes-based approach, was addressed using the Pearson Correlation Coefficient, which measures the strength and direction of the linear relationship between two continuous variables. The formula for the Pearson Correlation Coefficient is:

$$R = \frac{N(\sum xy) - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

where (R) is the Pearson correlation coefficient, (x) and (y) are the two variables being compared, (\sum x) and (\sum y) are the sum of the (x) and (y) values, respectively, (N) is the number of pairs of scores, and (\sum x^2) and (\sum y^2) are the sum of the squared scores for each variable. For the fifth problem statement, frequency and ranking methods were again applied to categorize and prioritize the challenges. Finally, for the sixth statement of the problem, an intervention plan was crafted and defined its significant use. The statistical analyses were conducted using SPSS 2021, and the results were presented in tables and discussed in detail through narrative descriptions to ensure clarity.

3. Results and Discussion

3.1. Outcomes-Based Approaches in Science Education

The research delves into the empirical data concerning the utilization of outcomes-based education (OBE) approaches in Science 5, examining the frequency and ranking of these methods. The inquiry approach was found to be the most prevalent, indicating its effectiveness in engaging students in active learning and critical thinking. This approach aligns with the shift towards scientific practices that emphasize the development of research skills and the construction of scientific knowledge (García-Carmona, 2020). The demonstration method was the second most employed, serving as a supportive strategy that complements the inquiry approach, potentially enhancing students' understanding of scientific concepts through visual and practical examples.

Table 1. OBE Approaches Used by Teacher Respondents in Science

OBE Approaches	f	Rank
Inquiry Approach		
Utilized an inquiry approach that encourages learners to ask questions, search for answers, and explore new ideas that contribute to their learning outcomes.	**31**	**1**
Problem-Solving Approach		
Used outcome-based problem-solving by encouraging my pupils to identify problems, obtain data, analyze data, and solve scientific problems.	**16**	**5**
Demonstration Method		
Used the demonstration method in an outcome-based approach by showing, illustrating & modeling specific concepts to understand abstract ideas.	**28**	**2**
Laboratory Method		
Used an outcome-based laboratory method by engaging my pupils to perform experiments or hands-on activities in small groups or individually.	**14**	**6**
Project-Based		
Utilized an outcome-based project method by engaging my pupils in purposeful output-based activities in which students will apply what they have learned.	**17**	**4**
Assessment Strategies	**25**	**3**
a. Applied the use of paper and pencil tests.	29	1
b. Included Performance tasks.	25	2.5
c. Used rubrics.	24	4
d. Implemented Summative assessment.	25	2.5
e. Utilized Formative assessment.	23	5

N=35

In contrast, the laboratory method was the least employed, pointing to potential barriers to its implementation such as safety concerns, resource limitations, and the complexity of managing hands-on activities. These barriers can hinder the effective integration of laboratory activities into the curriculum, which is unfortunate given the unique learning opportunities that such activities can provide (Ndihokubwayo, et al. 2020; Byukusenge, et al. 2022). The study’s findings regarding assessment strategies reveal a pronounced preference for paper and pencil tests, indicating that educators favor traditional, practical, and cost-effective methods to assess a wide range of skills (Nitko and Brookhart, 2019).

However, the lowest ranking of formative assessments points to significant barriers in their implementation, including time constraints, ambiguity in their execution, resource scarcity, and inadequate training (Bond et al., 2020). These challenges highlight a gap between the potential benefits of formative assessments and their practical application in the classroom. The implications of these findings are multifaceted, emphasizing the need for professional development programs that can equip educators with the skills and resources necessary to effectively implement formative assessments and diversify assessment strategies. This can lead to more meaningful and engaging learning experiences for students, better preparing them for future scientific endeavors.

3.2. Level of Utilization of Outcomes-Based Approaches

The study delves into the utilization of outcomes-based education approaches in Science education, analyzing data through weighted means to assess the level of implementation among teacher-respondents. Findings indicate a prevalent practice of inquiry-based methods, particularly through the use of probing questioning techniques, although there's room for improvement in empowering students to verify and formulate test hypotheses independently during experiments and activities. This resonates with previous research by Proctor and Rivera (2022) emphasizing the need to move beyond mere questioning to foster genuine student inquiry, and student-driven exploration to promote authentic student inquiry which suggests potential areas for professional development.

Table 2. Level of Utilization of Outcomes-based Approaches

Indicators	WAM	Int.
Inquiry Approach		
Utilized an inquiry approach to science education by asking probing questions to pupils.	4.17	H
Executed lessons with the class through brainstorming.	3.80	H
Gave the pupils information and let them ask questions.	4.00	H
Guided the class in verifying and making hypotheses in experiments and activities.	3.74	H
Asked students relevant questions to stimulate curiosity.	3.94	H
Encouraged students to also ask open-ended questions in the class.	4.03	H
Problem-Solving Approach		
Provided opportunities for pupils to share their thinking and reasoning	4.23	H
Encouraged pupils to give evidence that relates to and supports their ideas.	3.89	H
Helped pupils to represent or analyze data using simple tables, charts, or graphs in solving problems.	3.80	H
Helped the pupils conclude a summary of key ideas addressed in the lesson.	3.83	H
Demonstration Method		
Acted as a model and guided hands-on activities at the beginning of a new science concept.	4.26	H
Integrated technology and virtual tools in the development of OBE-based learning materials in science.	4.03	H
Executed differentiated instruction guided by specific objectives and targeted outcomes.	3.89	H
Integrated localized and contextualized lessons and activities in outcomes-based Science instruction.	3.83	H
Engaged pupils in meaningful dialogues that lead to independent learning.	3.83	H
Engaged student’s attention by showcasing real-world applications.	4.03	H
Laboratory Method		
Used Hands-on or laboratory activities to reinforce a science idea that the pupils have already learned	4.06	H
The teacher connected lessons to real-world application	3.97	H
The teacher used technology integration	3.91	H
The teacher let the students explore the community	3.80	H
The teacher gave activities for Daily Life Living	3.89	H
Provided pupils with opportunities to connect the science they learn in the classroom to what they experience outside the classroom.	4.09	H
Project-Based		
At the beginning of the activity, clear instruction was given on a science concept, procedure, and output to be done.	4.09	H
Allowed students to do hands-on projects in small groups, individually or in pairs.	4.00	H
Let the pupils discover their community and use indigenous materials in making simple science projects.	3.69	H
Prepared hands-on projects for them to reflect on what they have learned in science lessons.	3.79	H
Assisted pupils in doing the correct methodology or procedure for making the project.	3.83	H
Made sure to motivate my pupils to appreciate and value their work.	4.14	H
Assessment Strategies		
Used personalized assessment	4.06	H
Used varied assessment methods such as written or performance tasks.	4.03	H
Evaluated authentic and reliable results	4.11	H
Evaluated students' learning during the lesson proper to know if they understood.	3.91	H
Gave standardized tests or summative assessments at the end of the unit.	4.11	H
Encouraged my learners to reflect on their learning by making journals or reflective notes.	3.97	H

Legend: 4.50 – 5.00: Very High (VH); 3.50 – 4.49: High (H); 2.50 – 3.49: Average (A); 1.50 – 2.49: Low (L); 1.00 – 1.49: Very Low (VL)

Moreover, the study highlights a significant emphasis on collaborative learning environments, with teachers facilitating discussions and reasoning processes. However, there's a need to enhance the visual aspects of learning, particularly in data representation and analysis. This aligns with research emphasizing the impact of collaborative learning on academic performance, while also advocating for the integration of visual representations to enhance scientific understanding (Talan, 2021; Wu and Rau, 2019).

Furthermore, the study underscores the importance of experiential learning through laboratory methods and community engagement. While teachers excel in providing hands-on activities, there's a potential to further integrate local contexts and foster deeper student engagement through community-led exploration. This aligns with research emphasizing the benefits of community engagement in science education and the importance of integrating both formative and summative assessments to provide comprehensive evaluations of student learning (Public Lab, 2021; Pandero and Lipnevich, 2022).

3.3. Functional Literacy Strategies Used that Support OBE

The study examined the functional literacy strategies utilized by science teachers within an outcomes-based education framework. Strategies for developing scientific vocabulary included the prevalent reading-aloud approach and the less frequently used context clues method. While activating prior knowledge was commonly employed to enhance scientific comprehension skills, summarization techniques were underutilized despite their importance for comprehension and retention. Journaling and reflective activities were regularly integrated to support self-regulated learning, but collaborative research projects, beneficial for fostering inquiry and critical thinking, were less frequently implemented.

Table 3. Functional Literacy Strategies Used that Support OBE

Indicators	WAM	Int.
Scientific Vocabulary		
Used a read-aloud strategy in teaching Science lessons.	3.97	UU
Used vocabulary games with clear goals in Science lessons.	3.71	UU
Encouraged the use of context clues in scientific selections.	3.51	UU
Utilized contextualized visuals in Science.	3.54	UU
Scientific Comprehension Skills		
Activated prior knowledge of pupils in Science.	3.89	UU
Unlocked unfamiliar scientific words or phrases before the lessons.	3.69	UU
Used literal and inferential questions in Science.	3.43	GU
Encouraged pupils to summarize lessons in Science.	3.31	GU
Involved in hands-on experiences and interactive activities to deepen understanding.	3.54	UU
Designed group work activities to promote peer collaboration in understanding concepts and lessons.	3.63	UU
Technical/Research-Based Writing		
Assigned activities in making journals and reflection activities in science.	3.60	UU
Ensured activities for recording data during experiments activities in Science.	3.54	UU
Let the pupils make simple graphic organizers in Science.	3.57	UU
Assigned collaborative simple research in Science.	3.34	GU
Engaged pupils in activities that they will observe and gather data in their environment.	3.57	UU
Critical Thinking and Analysis		
Encouraged my students to ask questions during the lesson.	3.91	UU
Used probing questions to elicit answers.	3.80	UU
Presented real-world problems.	3.60	UU
Encouraged peer collaboration permitted inside the classroom during experiments and science activities.	3.43	GU
Made use of concept maps in teaching and asked HOTS questions.	3.63	UU
Facilitated activities on problem-solving guided by specific goals and expected outcomes.	3.54	UU
Visual Literacy Development		
Made use of graphic organizers.	3.66	UU
Ensured that the use of multimedia is present.	3.77	UU
Used real materials in presenting science lessons.	3.71	UU
Used manipulative or interactive games.	3.60	UU
Encouraged the students to create their own illustrations or diagrams about the lesson.	3.69	UU
Used multimedia such as videos, science experiments, or documentaries to contribute to their learning.	3.80	UU
Assessment		
Used paper and pencil tests.	4.17	UU
Made use of observation sheets.	3.83	UU
Fostered accurate and constructive feedback.	4.00	UU
Ensured that the learners have the opportunity for self-assessment.	3.66	UU
Encouraged peer feedback is also evident	3.63	UU
Facilitated performance tasks with clear and concise rubrics.	3.80	UU

Legend: 4.50 – 5.00: Always Used (AU); 3.50 – 4.49: Usually Used (UU); 2.50 – 3.49: Generally Used (GU); 1.50 – 2.49: Sometimes Used (SU); 1.00 – 1.49: Never Used (NU)

In terms of critical thinking and analysis, probing questions were widely used to encourage deeper engagement with content, but peer collaboration during experiments and activities was less prevalent. Although multimedia tools were regularly incorporated for visual literacy development, hands-on manipulatives, and interactive games showed room for increased use to bolster comprehension and retention through kinesthetic experiences. Traditional paper and pencil tests dominated assessment practices, while peer feedback mechanisms, which can foster critical thinking and align with formative assessment paradigms, were underutilized.

The findings highlighted areas where functional literacy strategies were well-implemented, such as reading aloud, activating prior knowledge, journaling, probing questions, and multimedia use. However, opportunities for enhancement were identified, including increased emphasis on context clues, summarization, collaborative research, peer collaboration, manipulatives, and peer feedback. Integrating these strategies more systematically could deepen student engagement, critical thinking, inquiry skills, and overall functional literacy in science education.

3.4. Significant Relationship Between Functional Literacy Strategies and Outcomes-Based Approaches

The study employed Pearson's correlation coefficient to examine relationships between functional literacy strategies utilization and the level of outcomes-based science education implementation. Significant positive correlations were observed across all variables. For instance, a strong positive correlation existed between the inquiry approach and scientific vocabulary development, comprehension, technical writing, critical thinking, visual literacy, and assessment practices. This trend indicated that as teachers increasingly integrated functional literacy strategies, the effectiveness of outcomes-based science education also rose.

Table 4. Relationship Between Functional Literacy Strategies Used and Level of Outcomes-based Approach

Level of Utilization	Outcomes-Based Approach											
	Scientific Vocabulary		Scientific Comprehension		Technical Research		Critical Thinking		Visual Literacy		Assessment	
	r	Sig.	r	Sig.	r	Sig.	r	Sig.	r	Sig.	r	Sig.
Inquiry Approach	.531**	.001	.703**	.000	.715**	.000	.677**	.000	.647**	.000	.633**	.000
Problem-Solving	.511**	.002	.707**	.000	.670**	.000	.568**	.000	.605**	.000	.500**	.002
Demonstration Method	.628**	.000	.820**	.000	.799**	.000	.715**	.000	.646**	.000	.640**	.000
Laboratory Method	.615**	.000	.717**	.000	.603**	.000	.597**	.000	.567**	.000	.583**	.000
Project Method	.641**	.000	.802**	.000	.779**	.000	.663**	.000	.608**	.000	.589**	.000
Assessment	.633**	.000	.747**	.000	.672**	.000	.517**	.001	.606**	.000	.516**	.001

*** Correlation is significant at the .01 level (2-tailed)*
N = 35

The findings consistently demonstrated significant positive correlations for all combinations of outcomes-based approaches (problem-solving, demonstration, laboratory, project-based) and functional literacy skills (vocabulary, comprehension, writing, critical thinking, visual literacy, assessment). All p-values were below the 0.01 significance level, leading to the rejection of the null hypothesis of no significant relationship between these variables. The positive correlations suggest that more frequent use of functional literacy strategies corresponds with more effective implementation of an outcomes-based approach.

These results align with the principles of outcomes-based education, emphasizing the alignment of teaching strategies with desired learning outcomes. The significant correlations imply that a deliberate focus on functional literacy strategies can lead to more successful outcomes-based science education and foster critical thinking, comprehension, and research skills among students. Related studies have highlighted the effectiveness of outcomes-based approaches in improving academic performance and engagement, further supporting the importance of integrating functional literacy strategies into science instruction.

3.5. Challenges of Teachers in Integrating Functional Literacy and Challenges Experienced by the School Heads in Classroom Observation

The study identified and examined the challenges teachers face when implementing functional literacy strategies to support outcomes-based approaches in Science. The primary challenge was the lack of sufficient training on how to effectively incorporate functional literacy strategies into Science lessons. The second most common challenge was the availability of resources in schools to support the lessons. As to the assessment functions, the most experienced challenge was the incorporation of parents' support in the academic progress of the students and the least encountered challenges were strategies for assessing students' learning Science lessons. The findings imply that there is a need for a more comprehensive approach to teacher training programs that includes functional literacy strategies.

Table 5. Challenges Experienced by Teachers in Integrating Functional Literacy in OBE in Science

Indicators	f	Rank
TEACHING AND LEARNING		
Competence of a teacher in using functional literacy strategies.	22	6
Giving ample examples so that my students can activate prior knowledge.	10	14
Way of motivating the students in reading engagement in science lesson	7	16
Student's comprehension while explaining instructions during experiments resulted in time-consuming.	24	4
Resources available in school in facilitating the lesson.	26	2
Adequate training received on how to effectively integrate functional literacy strategies into their science lesson.	32	1
Student's ability to read individual tasks.	21	7
Student's comprehension of instructions during hands-on activities.	25	3
Student's ability to express their opinion in problem-solving task activities.	17	9
Student's language skills in communication with groups during activities.	18	8
Student's ability to recognize and analyze given situations to give solutions.	15	10
Students asking questions not related to the lesson.	11	13
Student's skills in writing comprehensive scientific explanations/journals to simple science activities.	23	5
Student's abilities in using context clues.	14	11
Student's skills in recording data during experiments.	13	12
Students avoid cooperating with students who struggling in reading ability.	9	15
ASSESSMENT FUNCTIONS		
Ensuring that the literacy strategies are aligned in the science lesson.	22	2
There are no follow-up interventions at home.	21	3
Time limitations to cover and incorporate functional literacy and science content.	14	4
Varied assessment methods used by the teachers.	11	5
Parents' support	24	1
Strategies in assessing students learning.	7	6

N=35

The study also identified the challenges perceived by school heads during classroom observations related to the integration of functional literacy within outcomes-based Science education. The predominant challenge was the inadequate training of teachers in the application of functional literacy strategies to support outcomes-based Science instruction. The secondary challenges encompassed the prolonged period of teaching brought about by hands-on activities while the least of all the challenges encompassed the giving of instructional support to the science teacher. The findings imply a pressing need for enhanced teacher training programs that prioritize functional literacy within outcomes-based Science education.

Table 6. Challenges Experienced by School Heads in the Conduct of Classroom Observation of Teachers in Integrating Functional Literacy in OBE in Science

Indicators	f	Rank
Teachers' preparation of lesson plan using functional literacy and OBE approach in science.	12	7
Predetermined schedule of classroom observation.	4	23.5
Pre-conference/post-conference before and after the class observation.	4	23.5
Teachers' ability to manage the class.	7	17.5
Alignment of science content and objectives.	11	9.5
Choice of subject matter in science and grade level to be taught.	2	29
Lack of time to conduct observation because of other activities.	14	5.5
Time management in classroom observation.	8	14
Teachers' mastery of the science lesson.	4	23.5
Students' behavior during classroom observation in science.	11	9.5
Teachers' management of struggling learners during science lessons.	15	3.5
Teachers' response in addressing unexpected problems during classroom observation	7	17.5
My expertise and ability to give technical assistance to my teachers.	2	29
Giving instructional support to my teachers	0	33
Students' ability to comprehend and understand the subject matter in science subject	15	3.5
Teachers' ability to carry out the OBE approach during a science lesson	14	5.5
Hands-on activities prolong the period of teaching in science subject	18	2
Teachers did not ensure the availability of laboratory materials during the conduct of the science experiment	7	17.5
Large number of the class population	4	23.5
Students' skills to demonstrate a willingness to learn	4	23.5
Availability of multimedia and ICT integration during a science lesson	4	23.5
Time is consumed during science subject observation.	8	14
Strategies used by the teachers in teaching-learning activities in science	6	20
Result of the student's formative or summative assessment.	9	12
Providing feedback to the science teacher on the integration of functional literacy that supports outcomes-based education.	2	29
Teachers' training in the integration of functional literacy that supports outcomes-based education.	20	1
Teachers' access to appropriate teaching materials.	7	17.5
Allocating resources in developing/purchasing materials aligned with functional literacy and OBE.	8	14
Time management in conducting classroom observations and other administrative tasks.	11	9.5
Teachers' resistance or refraining from integrating functional literacy that supports outcomes-based education in science.	2	29
Ensuring that the assessment measure used by the teacher is effective.	2	29
Development of a comprehensive evaluation plan to gather evidence to assess the success of the integration of functional literacy that supports outcomes-based education in science.	11	9.5
Others	1	32

N=24

Several studies have highlighted the importance of functional literacy in Science education. For instance, Yore (2024) emphasized the role of literacy in Science education and argued for a shift from traditional, text-based instruction to a more integrated approach that includes functional literacy. In terms of teacher training, the Commission on Higher Education (CHED) in the Philippines mandates all higher education institutions to adopt Outcomes-Based Education (OBE) to produce globally competitive professionals. This includes the implementation of Outcomes-Based Science Instruction (OBSI) in Teacher Education Institutions. However, the challenges encountered in OBSI implementation often include the unavailability and insufficiency of equipment, materials, and supplies needed in the laboratory.

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3.6. Development of Innovative Materials

The study advances beyond analysis to practical implementation by developing innovative materials aimed at fortifying the integration of functional literacy strategies within outcomes-based Science education. Stakeholder insights, including those from respondents, school leaders, and subject matter experts, guided the identification of effective materials aligning with the study's objectives. These insights culminated in a comprehensive array of recommendations, primarily emphasizing the creation of intervention and remediation plans of all the least utilized OBE approaches and functional literacy strategies, contextualized instructional materials, detailed lesson plans, and a Teacher's tool kit to be used in classroom observations. Recognizing the transformative potential of these resources, stakeholders underscored their role in bridging academic content with real-world experiences, thereby enhancing the application of functional literacy in Science education.

Moreover, the proposed innovative materials, such as detailed lesson plans and teacher's tool kit, are envisioned as pivotal tools in bolstering instructional support systems requisite for the successful integration of functional literacy within Science education. The idea of developing these tools is for the teachers to enhance and boost their skills in classroom observation, provide relevant activities for the engagement of the learners, and maximize their time and effort in preparation. These resources offer structured frameworks outlining learning objectives, content, and competencies while facilitating hands-on, practical Science tasks tailored to foster functional literacy skills. By embedding functional literacy strategies within the curriculum through these materials, educators aim to enhance student engagement, comprehension, and application of scientific concepts.

Complementing these recommendations, an Intervention and Remediation Plan was meticulously devised to address the identified gaps in outcomes-based approaches and functional literacy strategies within Science education. The plan delineates clear objectives, recommended interventions, required materials, and success indicators for each target area, encompassing inquiry-based approaches, problem-solving techniques, and various functional literacy skills. This comprehensive approach underscores the imperative of tailored interventions to improve learning outcomes, particularly in addressing least-utilized strategies and advancing student proficiency in Science literacy.

4. Conclusion and Recommendations

The study concluded that inquiry and demonstration methods were the most prevalent outcomes-based approaches used in Grade 5 Science, while laboratory-based methods were least employed, suggesting a need for increased hands-on exploration with proper safety measures. Teacher training should focus on guiding students through the full inquiry process and leveraging data visualization for problem-solving. Reading aloud and activating prior knowledge were common strategies for vocabulary and comprehension, but summarization and context clue use could be further incorporated to enhance these skills. Significantly, positive correlations were found between all functional literacy strategies and the level of outcomes-based implementation, highlighting their importance for improved learning outcomes.

The primary challenges identified were a lack of sufficient training on integrating functional literacy strategies and limited resources to support their implementation in science lessons. This underscores the critical need for comprehensive teacher training programs focused on functional literacy in science education and the development of resources that seamlessly integrate these strategies into the curriculum. The innovative materials developed by the researcher, including the Intervention and Remediation Plan, Detailed Lesson Plan, Contextualized Instructional Material, and Project GILAS, exemplify effective ways to address these gaps and support both teachers and learners in mastering essential science skills through functional literacy integration.

Recommendations emphasize increasing laboratory-based learning opportunities, enhancing teacher training programs to strengthen inquiry guidance and data visualization skills, incorporating a wider range of vocabulary and comprehension strategies, and promoting frequent use of functional literacy strategies given their positive impact on outcomes-based implementation. Furthermore, the adoption of the innovative materials developed in this study is recommended across the Labo West District and potentially broader contexts, as they have demonstrated effectiveness in enhancing the teaching and learning process through contextualized, localized approaches. Future researchers could explore the scalability of these strategies, investigate additional functional literacy approaches, and examine their long-term impacts on student outcomes.

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