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Enhancing Professional Development for Science Teachers in Selected Elementary Schools in Suakoko Town, Bong County, Liberia.

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ABSTRACT

The report advocated for sustained professional development aimed at enhancing teachers' science awareness and overhauling science teaching practices. Emphasizing the imperative of long-term initiatives, the study underscored their relevance for nations committed to eliminating subpar elementary science instruction. It urged the provision of pertinent resources for elementary science educators, enabling them to nurture students aspiring to advance their scientific skills. The research spotlighted transformative learning's practical applicability in teacher education and ongoing professional development programs. In elementary science education, teacher development initiatives were recommended to incorporate transformative learning theory. This approach sought to create conducive conditions fostering teachers' transition to a more comprehensive, self-reflective, and experientially integrative frame of reference. By advocating for these transformative measures, the report aimed to contribute to the continual improvement of elementary science education, ensuring a more robust foundation for students eager to excel in the field of science.

Keyword: *Professional Development, Science Teachers, Elementary Schools, Suakoko Town, Liberia.*

1. Introduction

Since the conclusion of World War II, elementary science experienced a notable advantage, benefiting from generous support from various governments. However, individuals whose careers unfolded in the post-World War II era observed a lack of substantial increase in study funding in recent times. T

The foundation of our support rested on two key assumptions: first, that science would improve the lives of citizens, and second, that it would contribute to our safety in an increasingly perilous world marked by the Cold War tensions between the United States and the Soviet Union (Leach, Scoones, & Wynne, 2005). The study conducted by Isik-Ercan (2020) investigated the application of inquiry-based science learning in a second-grade classroom situated in an urban setting. The research delved into the intricate dynamics involved in integrating inquiry-based methods into science education. Additionally, the study offered valuable insights into the practical facets and outcomes associated with employing this approach within the specific context of the mentioned educational setting.

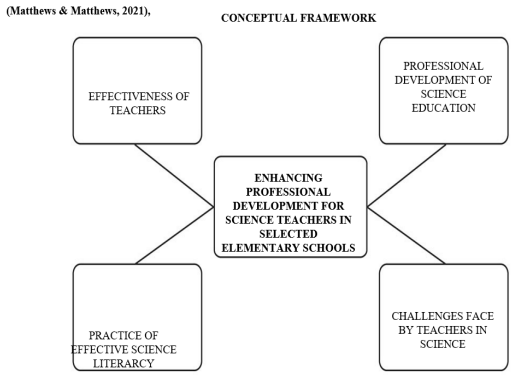
In 2015, Ferreira investigated the impact of a professional development program on elementary teachers' science knowledge and pedagogical skills. The study assessed how participation in the program influenced teachers' understanding of science concepts and their ability to effectively incorporate these concepts into their teaching practices. The research focused on the intersection of professional development, science education, and pedagogical skills among elementary educators. The findings aimed to provide insights into the effectiveness of such programs in enhancing both the content knowledge and instructional strategies of elementary school teachers in the field of science education.

The philosophical proposition of the study rested on the Constructivism theory of (Matthews & Matthews, 2021), which posited that individuals actively constructed their

knowledge based on their experiences. The enhancement of professional development for science teachers was approached from a constructivist standpoint by emphasizing hands-on and inquiry-based learning strategies. Teachers were encouraged to engage in collaborative activities, reflective practices, and the construction of knowledge through practical experience.

(Matthews & Matthews, 2021),

2. CONCEPTUAL FRAMEWORK



The conceptual framework for the study, "Enhancing Professional Development for Science Teachers in Selected Elementary Schools," focused on the effectiveness of teachers in promoting science literacy. It encompassed dimensions such as teachers' practices in science literacy, the impact of professional development on science education, and understanding how children learned science. The framework explored core elements like science content, challenges faced by science educators, and emphasized the collaborative role of government and stakeholders in educational reform. Additionally, it investigated instructional models and practices that contributed to effective science teaching literacy in elementary schools.

Main problem

The Suakoko District faced a significant problem in its elementary science education system. One key issue was the effectiveness of elementary science teachers. The challenge lay in understanding and addressing the factors that impacted the quality of science education in this district. This encompassed aspects such as the adequacy of instructional models and practices, the sustainability of professional development initiatives, identification and resolution of challenges faced by elementary science teachers, and the role of government and other stakeholders in contributing to the improvement of the overall science education landscape in Suakoko District.

Specific Objectives

1. What is the key demographic information of respondent in science?
2. How is professional development in science sustained?
3. What are the challenges of science teachers?

3.1 what is the role of government and stakeholders in enhancing the status of science teaching?

Significance of the study

The significance of the study, "Enhancing Professional Development for Science Teachers in Selected Elementary Schools in Suakoko Town, Bong County, Liberia," lay in its potential to bring about positive transformations in elementary science education. By focusing on professional development for science teachers, the study addressed critical aspects such as instructional quality, teacher effectiveness, and overall science literacy among students. The findings from this research could inform policies and strategies to improve science education in Suakoko Town, offering insights into the challenges faced by teachers and suggesting effective models for sustained professional development. Ultimately, the study had the potential to contribute to the enhancement of the educational landscape, fostering a stronger foundation in science education for elementary school students in the specified region.

Methodology: The research design for this study is quantitative in nature, primarily relying on structured surveys administered to science teachers in suakoko district who entirely chose science education enhancement techniques will be compiled.

Research Respondents: A sample of science teachers (N = 10) from various schools in suakoko Bong County will participate in the survey.

- 3.2 A sample of preschool teachers and parents (n=10) from science in suakoko town participate in the interview and survey.

3.3 Data Collection/Administering:

Qualitative and quantitative data through interview and surveys were distributed to science teachers and the formula to estimate the sample size is:

$n = Z^2 * (p) * (1-p) / E^2$

Where: - n is the sample size - Z is the z-score (which corresponds to the confidence level you want to achieve. For example, for a 95% confidence level, Z is 1.96).

- p is the estimated proportion of the population that has the attribute in question (if you don't know, you can assume p=0.5) - E is the margin of error. I was able to

derive a sample size of 20 from the population of 100 based on the equation (Lu & Lohr, 2010).

3.3 Data Collection/Administering: Quantitative data will be through structured surveys distributed to preschool teachers in the study area.
3.4 Data Gathering: Closed-ended questions about the influence of digital learning on academic performance, attitudes toward technology, and demographic information will be included in the survey questionnaire.

3. REVIEW OF RELATED LITERATURE

Effectiveness of Elementary Science Teachers

In 2015, the National Research Council conducted a study that formulated a framework enabling students to learn science through the use of inquiry-oriented methods, emphasizing conceptual understanding over mere factual memorization. Although numerous reviews had scrutinized different facets of science teaching, a comprehensive evaluation of alternative approaches to elementary science education had been lacking, presenting a gap in the existing research that the researchers aimed to address. According to Vitale, Romance, & Crawley (2010), experimental studies with student learning as an outcome accounted for 16% of the studies published in the Journal of Science Teaching between 2005 and 2009. This percentage witnessed a decline since the 1980s. They also noted that the majority of experiments conducted by teachers and students were brief laboratory-type studies rather than evaluations of practical programs.

Practices of Effective Science Teaching Literacy

In 2008, Jang highlighted that, throughout the history of science education, no consensus had been reached on the definitions of science literacy. As a result, there was no universally accepted foundation for formulating policies, conducting research, developing curricula, and guiding science literacy instruction. Nevertheless, achieving a national objective to reform science education for the enhancement of scientific literacy hinged on the establishment of a singular, consistent definition. The inception of the term "scientific literacy" dated back to its appearance in educational literature, as noted in papers by Paul Hurd in 1958. This perspective aligned with the viewpoint presented (Singh & Singh, 2016). Contrarily, Öztürk, (2018), contended that the essence of scientific literacy, focusing on active citizenship, responsible environmental behavior, and social reconstruction, was more rooted in learning about science than the conventional emphasis on learning science. In 2022, Philip introduced a fresh perspective on elementary science education through the National Science Education System (NSES), emphasizing shifts in science content and the assessment of knowledge and understanding. These initiatives and standards were designed to promote science literacy and drive educational reforms, amounting to a total of 26.

Professional Development of science education

In 2023, Roehrig conducted a study emphasizing the crucial role of sustained professional development in science education reform. The study underscores the importance of cultivating a teacher mindset that sees themselves as lifelong learners. Aligned with the principles of constructive student learning, teacher learning involved a continuous process of building upon and reflecting on the material that had been taught (Parsons et al., 2018). Consequently, the NRC had previously advocated for the extended and sustained nature of professional development in elementary science education, spanning a duration of three years or more (Dzieżyc & Kazienko, 2022).

How Children Learn Science

In 2022, Dzieżyc & Kazienko conducted a study that identified three principal scientific learning elements. These principles encompassed addressing preconceptions, understanding what it means to engage in scientific practices, and developing metacognition. They served as guiding principles for the NRC's science education reform efforts. Each principle will be briefly described below. The first principle highlighted the significance of addressing preconceptions in children's science learning. Students often brought sensible yet scientifically limited or incorrect conceptions of everyday phenomena to the classroom. Teachers played a crucial role in addressing these ideas through classroom argumentation and reasoning to foster a deeper understanding of science. Achieving scientific comprehension frequently necessitated a shift in individuals' perception and understanding of everyday phenomena.

4. RESULT AND DISCUSSION

In the preceding chapter, the focus was on presenting and analyzing research findings through the use of tables, charts, and graphs. Additionally, it explored the interpretation of the study's goals aligned with the presented and analyzed research findings in various tables, graphs, and charts.

Objective 1: Demographic Information of Respondents.

Types of School

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Boys only	16	32.0	32.0	32.0
	Girls only	14	28.0	28.0	60.0
	Co-education	20	40.0	40.0	100.0
	Total	50	100.0	100.0	

Source: Field Survey, 2024.

The data in Table 1 indicates that just over one-third (32%) of the respondents exclusively attended boys' schools, slightly more than one-fourth (28%) attended girls' schools exclusively, and two-fifths (40%) attended co-educational schools.

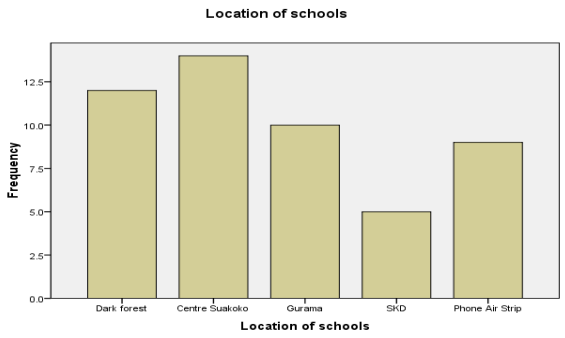
Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	28	56.0	56.0	56.0
	Female	22	44.0	44.0	100.0
	Total	50	100.0	100.0	

Source: Field Survey, 2024

The information presented in Table 2 indicates that just under three-fifths (56%) of the respondents were male, while slightly more than two-fifths (44%) were female.

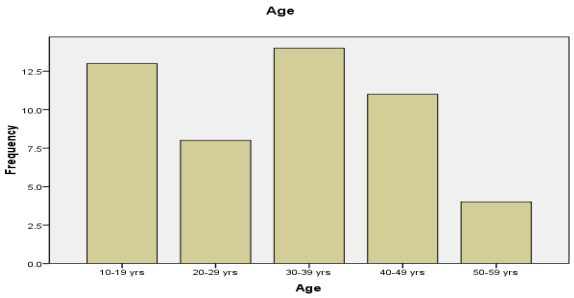
Location of Schools



Source: Field Survey, 2024

As illustrated in Figure 1 above, approximately one-fourth (24%) of the respondents originated from the Dark Forest, nearly one-third (28%) hailed from Centre Suakoko, and one-fifth (20%) came from Gurama.

Age of Respondents



Source: Field Surrey, 2024

The depicted figure illustrates the distribution of respondents across different age brackets. Approximately one-fourth (26%) fell within the age range of 10-19, slightly over one-tenth (16%) were in the 20-29 age bracket, nearly one-third (28%) fell between 30-39, one-fifth (20%) were aged 40-49, and just below one-tenth (8%) were 50 and above.

Number of Staff in the Science Department

Department	NUMBER	SPECIALIZED	NON-SPECIALIZED
Physics	5	4	1
Chemistry	4	4	0
Biology	3	5	1
Others (Specify)	0	0	0

Source: Field Survey, 2024

This section encompasses the count of science teachers within the surveyed schools, providing a comprehensive statistical overview of the total number of science teachers within the covered community.

Objective 2: Perception of Professional Development of Teachers

Are your teachers motivated in the teaching/ learning process?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	31	62.0	62.0	62.0
	No	19	38.0	38.0	100.0
	Total	50	100.0	100.0	

Source: Field Survey, 2024

The table indicates that 62% of respondents affirm their teachers' motivation, with the remaining 38% expressing a negative response. In conclusion, the majority (62%) of respondents in the study area acknowledge teacher motivation.

If Yes, How Are They Motivated?

Source: Field Survey, 2024

The depicted figure reveals that 40% of respondents report promotions, while 22% mention receiving scholarships, and another 20% state their children benefit from tuition waivers. Additionally, 16% note receiving incentives, while only 1% indicate having staff quarters in the

study area. In conclusion, the majority (40%) of respondents acknowledge experiencing promotions in the study area.

If no, why not?

		Frequency	Percent	Valid Percent	Cumulati Percen
Valid	Lack of foundation	11	22.0	22.0	22.0
	Negligence of the government	15	30.0	30.0	52.0
	Negligence of the school authorities	16	32.0	32.0	84.0
	Others (specify)	8	16.0	16.0	98.0
	Total	50	100.0	100.0	

Source: Field Survey, 2024

The table illustrates that 32% of respondents attribute school negligence, while 30% point to government negligence, and 22% cite a lack of foundation. However, 16% provide unspecified responses. In conclusion, the majority (32%) attribute the issue to school authorities' negligence in the study area.

Are your laboratories equipped?

		Frequenc y	Percent	Valid Percent	Cumulative Percent
Valid	Yes	20	40.0	40.0	40.0
	No	30	60.0	60.0	100.0
	Total	50	100.0	100.0	

Source: Field Survey, 2024

The table indicates that 60% of respondents lack an equipped laboratory, while 40% confirm having one. In conclusion, the majority (60%) in the study area report not having an equipped laboratory.

Objective 3: Challenges of Science Teachers

In the study area, when examining challenges faced by science teachers, 50% of respondents express disagreement with poor conditions of service, whereas 30% agree, and 20% do not agree. Regarding poor teaching environments, 50% disagree, 40% agree, and 10% strongly disagree. Concerning inadequate facilities, 40% disagree, 35% agree, and 25% strongly agree. In terms of negative professional behavior among STM education teachers, 50% disagree, 33% agree, and 15% agree slightly. Conclusively, a majority (70%) of respondents agree that poor accessibility to STM materials poses a challenge, while 20% disagree, and 10% do not agree at all in the study area.

Objective 3.1: The Roles of Government and Stakeholders in Improving Primary Science.

Who are the stakeholders?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Prominent people in the society	13	26.0	26.0	26.0
	People with expertise knowledge	16	32.0	32.0	58.0
	Government official	5	10.0	10.0	68.0
	NGOs workers	10	20.0	20.0	88.0
	Others (specify)	6	12.0	12.0	92.0
	Total	50	100.0	100.0	

Source: Field Survey, 2024

The table illustrates that 32% of respondents identify individuals with expertise as stakeholders, while 26% cite prominent figures

in society and 20% mention NGO workers. However, 12% provide unspecified responses, and 10% name government officials. In conclusion, the majority (32%) of respondents identify people with expertise as the primary stakeholders in the study area.

Do you have models of providing science instruction in Elementary Schools?

No	Statement	Agree	Disagree	Not at all
1	Poor condition of service	30%	50%	20%
2	Poor teaching environment	40%	50%	10%
3	Inadequate classrooms, libraries, laboratories and equipment	25%	35%	40%
4	STM education teacher negative professional behavior	15%	35%	50%
5	Poor availability and accessibility of STM materials	70%	20%	10%

Source: Field Survey, 2024

The table indicates that 56% of respondents support the implementation of models for providing science instruction in elementary schools, while 44% express opposition to this appr roach in the study area.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	28	56.0	56.0	56.0
	No	22	44.0	44.0	94.0
	Total	50	100.0	100.0	

Source: Field Survey, 2024

5. SUMMARY

The study presents a comprehensive overview of the respondents' demographic information, highlighting that nearly one-third attended boys' schools, with 56% identifying as males. In the realm of professional development, positive perceptions emerge, as 62% acknowledge teachers' motivation and 40% report promotions. Challenges include school administration negligence (32%) and dissatisfaction with unequipped laboratories (60%). Despite a majority (70%) rejecting various highlighted challenges, stakeholders, identified by 32%, play a pivotal role in curriculum development (28%) and understanding their status (30%). Advocacy for instructional models (56%) and concerns about the absence of well-planned syllabi are evident, while sustaining professional development standards elicits a varied response, with 58% affirming and 54% expressing doubt in high-quality standards.

Conclusion

The study validates the hypothesis that a lower emphasis on professional development for elementary science teachers corresponds to a diminished quality of elementary science teaching in selected schools in Suakoko Town, Bong County. The proven validity underscores the importance of addressing professional development to enhance science education.

Recommendations

In light of the research findings, the following recommendations are proposed to enhance professional development for science teachers in Suakoko Town, Bong County. While not exhaustive, these recommendations emphasize key areas:

1. The government should prioritize the implementation of science education in Liberian schools.
2. NGOs are urged to contribute to the growth of science learning in Liberia.
3. International agencies are encouraged to support the dissemination of the science teaching concept in the study area.
4. Science teachers should actively pursue opportunities to upgrade their educational qualifications in Liberia.

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