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Factors influencing teachers' effectiveness in teaching primary science in public primary schools

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ABSTRACT

Effective teaching of primary science in public schools remains a persistent challenge in many regions. Despite its foundational role in developing pupils' scientific literacy and problem-solving skills, primary science instruction often falls short due to a combination of teacher-, resource-, and school-related factors. The study used a descriptive survey to capture existing conditions in teaching primary science in Awka South, Anambra State. A sample of 100 teachers was selected through purposive random sampling, and data were collected using a structured questionnaire. Experts validated the instrument, and test–retest reliability produced a coefficient of 0.88. Data were analyzed with weighted means and standard deviations, using 2.50 as the decision benchmark for interpreting responses. Teachers' academic qualifications were found to significantly enhance effectiveness in teaching primary science, particularly in explaining concepts and developing relevant curricula, with most items scoring above the 2.50 benchmark. However, qualifications were not seen as strongly improving teacher credibility. Teaching resources such as maps and videos improved lesson clarity and engagement, though respondents disagreed that they support diverse learning styles. Administrative support was viewed as essential for accessing updated materials, although time allocation was rated low. Socio-economic factors affected teachers' engagement and access to resources, while overall school climate positively influenced morale, despite mixed perceptions of its broader classroom impact. This research provides insights into how to strengthen primary science instruction and improve pupils' learning experiences..

1. INTRODUCTION

The quality of science teaching in the elementary school remains a major concern in many of the county elementary schools, due to the far-reaching impacts that the introduction to scientific investigation has on the continued involvement and achievement of students in the subject. One of the main issues raised by the available literature is that science curriculum is often applied in conditions that hinder inquiry-based pedagogies, thus promoting superficial understanding rather than conceptionual development (Senyigit et al., 2021). Therefore, teachers have to operate in environments that have limited resources, inadequate preparation as professionals, and structural barriers that hinder their ability to provide quality science education.

One of the most longstanding themes of academic discussion is the interrelationship between the quality of instruction and teacher competence. The proficiency of basic scientific knowledge requires teachers with well-developed pedagogical skills and a solid scientific background. Empirical data show that educators who do not have profound knowledge of the subject will tend to simplify or present incorrect models of scientific phenomena, which harms the clarity of concepts among students (Ezema et al., 2022). Adebanjo et al. (2025) also explains that pedagogical proficiency influences classroom practices like lesson planning, the sequence of demonstrations, and learning experience

scaffolding. All these data suggest that the effectiveness of the teachers is closely intertwined with the depth and relevance of the pre-service and continuous professional growth.

The achievement of science education at the primary level in public schools is significantly influenced by the availability and use of instructional resources as the essential instruments of the activity-based and inquiry-based pedagogy. Scientific ideas are learned more meaningfully when learners are given the chance to work with the apparenuis, to observe phenomena and to empirically test hypotheses. However, a high percentage of government elementary schools face the challenges of elementary science kits and functional laboratories, which forces teachers to make improvisations or skip practical lessons, which limits the exposure of students to real world science (Egwu & Mbonu, 2023; Ezugoh, Agu, and Egwu, 2023). Improvisation can offer short-term solutions, but it is not sufficient to cover lessons that require accuracy, which reduces the overall teaching and learning of science.

The size of classes makes a significant impact on teaching. High student-teacher ratios hinder one-to-one teaching and the safe implementation of demonstrations, a factor that triggers teachers to employ the lecture-based modalities that are not aligned with the principles of learner-centred science pedagogy (Ikegbusi, Egwu, Okoli, Udegbe, & Ekwe, 2025). There is also teacher motivation and occupational satisfaction that further moderates educational outcomes. Patronizing leadership, career development opportunities, and equivalent compensation positively impact dedication to lesson planning, resource preparation, and active involvement in practical work; the lack of morale negatively affects such efforts (Ikegbusi, Egwu, & Iheanacho, 2021).

Instructional quality is significantly determined by professional supervision and long term growth. Constant teaching oversight maintains the standards of pedagogy and strengthens the best practices, while the workshops and refresher courses provide modern methodologies like guided inquiry, constructivist learning, and problem-solving strategies which, in turn, will reduce dependence on outdated teacher-centred approaches (Egwu et al., 2024; Ofozoba et al., 2025). In addition, the school environment, such as enabling climate, effective infrastructure, and well-organized schedules, facilitates a standard practice of teaching. Conversely, unsystematic institutional environments suppress teacher efficiencies and hinder learning science through activities (Egwu, 2022; Egwuh, 2022). The common literature highlights that effective instruction of primary science is a cumulative product of sufficient teaching materials, manageable classroom sizes, professionally oriented and encouraged teachers, and a properly organized school environment. It is inalienable to tackle these factors holistically in the effort to improve science pedagogy in the public primary schools.

The motivation underlying the present study has its origins in the longstanding gaps in classroom delivery, learning outcomes, and the entire provision of science education in the primary schools of the general population. A number of studies highlight that, although science plays a cornerstone position in later scientific literacy, a significant number of learners leave primary education with weak conceptual knowledge due to the difficulties of educators in delivering the subject effectively (Aderinoye-Rabiu et al., 2025). It is also found that poor teacher training, limited learning materials, and crowded classrooms continue to hinder activity-based science instruction but are poorly managed in most systems (Nwosu et al., 2022).

Most importantly, existing studies usually consider such issues separately, investigating teacher competence, resource accessibility, or class size, instead of a combination of these factors to clarify how these variables interact with each other (Adamu et al., 2022). This disjointed methodology blurs a coherent perception of collective influences of the school setting, pedagogical motivation of teachers, supervisory institutions, and pedagogical preparedness on instruction in science. It is based on this need that this research project is inspired by a desire to provide a holistic, context-based examination of these integrated forces in public elementary institutions to provide evidence that can be used to reinforce the performance of teachers in primary science.

Research questions

1. What is the impact of teachers' academic qualifications on their effectiveness in teaching Primary science in public primary schools in Awka South Local Primary science Area?
2. How do teaching resources influence Primary science teaching effectiveness in public primary schools in Awka South Local Primary science Area?
3. What role does administrative support play in enhancing teachers' effectiveness in teaching Primary science?
4. What are the effects of socio-economic factors on teachers' ability to effectively teach Primary science in public primary schools in Awka South Local Primary science Area?
   How does the overall school climate affect the effectiveness of teaching Primary science?.

2. METHOD

The study leaned on a descriptive survey approach, mostly because the researchers wanted a clear snapshot of what was happening at one point in time. It's the kind of design you choose when you're trying to understand existing conditions and compare them with expected standards. Everything took place in Awka South Local Primary Science Area in Anambra State. The area sits among several neighbouring LGAs and is known for a population that's a mix of civil servants and business people.

The population for the study consisted of teachers across public primary schools. From this group, the researcher selected 100 teachers using purposive random sampling, relying on their judgment to pick participants they felt best represented the issues being examined. Data came from a questionnaire divided into two sections: personal information and items measuring factors influencing teacher effectiveness in primary science. Responses followed a four-point scale ranging from strongly agree to strongly disagree.

To make sure the instrument was valid, the researchers asked two experts from the Department of Educational Psychology to review the questions. Their feedback guided revisions before the final draft was produced. Reliability was checked using a test–retest method with ten teachers outside the main sample. After administering the questionnaire twice in two weeks and correlating the scores with Pearson's Product Moment Correlation, the reliability index came out at 0.88, which suggested high consistency. Data collection was done electronically. For analysis, weighted means and standard deviations were used. With an acceptance benchmark of 2.50, any mean at or above this point was considered accepted, while lower values were rejected.

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3. RESULT AND DISCUSSION

Research Question 1: What is the impact of teachers' academic qualifications on their effectiveness in teaching Primary science in public primary schools in Awka South Local Primary science Area?

The result reveals the impact of teachers' academic qualifications on their effectiveness in teaching Primary science in public primary schools in Awka South Local Primary science Area. However, teachers' qualifications influence their capacity to effectively explain primary science principles (3.35). It is obvious that academic qualifications enable teachers to develop engaging and pertinent primary science curricula (3.30). In other way round, academic credentials enhance teachers' credibility and pupils' trust in Primary science instruction (2.45). In all, items 1, 2, 3 and 4 yields mean scores of 3.35, 3.25, 3.30 and 3.35 corresponding to standard deviations of 0.79, 0.77, 0.78 and 0.79 were all accepted, respectively. While item 5 with corresponding mean scores of 2.45 and with standard deviation of 1.07 were rejected.

Research Question One, revealed the impact of teachers' academic qualifications on their effectiveness in teaching Primary science in public primary schools in Awka South Local Primary science Area. Results in research question one item 4 showed that teachers' qualifications influence their capacity to effectively explain primary science principles. The respondent agreed that academic

qualifications enable teachers to develop engaging and pertinent primary science curricula, the finding agrees with the view of (Nwosu et al, 2022) rightly observed that teachers are the key implementers of any education curriculum and the degree to which education objectives are achieved largely depends on the quality of the teaching force. The researchers posited that teachers' higher academic qualifications often enhance their effectiveness in teaching Primary science. The Respondent disagree with the researcher that academic credentials enhance teachers' credibility and pupils' trust in Primary science instruction. Advanced degrees improve teachers' depth of knowledge and instructional quality.

Research Question 2: How do teaching resources influence Primary science teaching effectiveness in public primary schools in Awka South Local Primary science Area?

The result in table 2 reveals on how teaching resources influence Primary science teaching effectiveness in public primary schools in Awka South Local Primary science Area. Resources like maps and videos enrich the teaching of Primary science topics (3.20), it is obvious that effective teaching resources aid in explaining complex Primary science theories clearly (3.15), teaching resources enhance Primary science lessons by providing visual and interactive elements (2.85). In other way round, the respondent disagreed that quality resources support diverse learning styles and improve Primary science instruction (2.40). In all, items 6, 7, 8 and 10 yields mean scores of 2.85, 3.15, 3.20 and 2.95 corresponding to standard deviations of 1.06, 0.96, 0.98 and 1.07 were all accepted, respectively. While item 9 with corresponding mean scores of 2.40 and with standard deviation of 1.02 were rejected.

Research question 2 reveals how teaching resources influence Primary science teaching effectiveness in public primary schools in Awka South Local Primary science Area. Resources like maps and videos enrich the teaching of Primary science topics. To explain this phenomenon Adamu et al, (2022) pointed how improve the supply of high quality primary science teachers. As a result effective teaching resources aid in explaining complex Primary science theories clearly. This brings about teaching aids facilitate real-world connections to Primary science concepts and principles. In other ways, the respondent disagreed that quality resources support diverse learning styles and improve Primary science instruction. Egwu and Ekwe (2024) concluded that teaching resources enhance Primary science lessons by providing visual and interactive elements.

Research Question 3: What role does administrative support play in enhancing teachers' effectiveness in teaching Primary science?

The result showed that effective administrative backing helps teachers access updated materials for Primary science (3.20). The respondents agreed that administrative support provides essential resources, boosting teachers' effectiveness in Primary science (2.70). Nevertheless, administrative assistance ensures teachers have time to focus on Primary science lessons (1.90). In all, items 11, 12, 14, and 15 yields mean scores of 2.70, 3.20, 2.70 and 2.70 corresponding to standard deviation of 1.10, 0.98, 1.10 and 1.10 were all accepted. While items 13 with mean score of 1.90 corresponding to standard deviation of 0.94 were rejected respectively.

Research question 3 shows the role administrative support play in enhancing teachers' effectiveness in teaching Primary science. Effective administrative backing helps teachers access updated materials for Primary science. Adebanjo et al, (2025) Emphasized that school administrators play a crucial role in this development by valuing teachers' opinions, sharing a vision that embraces shared power, and empowering teachers through their expanded responsibilities. Respondent agrees that adequate support from administration aids in addressing pupils' Primary science learning. Ezema et al, (2022) also observed that school environment that supports teacher leadership and provides professional development experiences aimed at building collective teacher efficacy will enhance their leadership skills. Proper administrative support facilitates professional development for better

Primary science instruction. Administrative assistance ensures teachers have time to focus on Primary science lessons.

Research Question 4: What are the effects of socio-economic factors on teachers' ability to effectively teach Primary science in public primary schools in Awka South Local Primary science Area?

The result showed the effects of socio-economic factors on teachers' ability to effectively teach Primary science in public primary schools in Awka South Local Primary science Area. However, socio-economic stress can detract from teachers' engagement in Primary science subjects (3.10). Socio-economic factors can limit teachers' access to necessary teaching resources (2.90). Meanwhile, the respondents disagreed that limited socio-economic resources impact the quality of Primary science lesson planning (2.20). In all, items 16, 17, 19, and 20 yields mean scores of 2.90, 2.55, 3.10 and 3.10 corresponding to standard deviation of 1.14, 1.16, 1.04 and 0.94 were accepted respectively. While item 18 with mean score of 2.20 corresponding to standard deviation of 0.87 were rejected.

Research question 4 reveals how effects of socio-economic factors on teachers' ability to effectively teach Primary science in public primary schools in Awka South Local Primary science Area. Supportive school climate improves teachers' morale and effectiveness in Primary science. Socio-economic stress can detract from teachers' engagement in Primary science subjects. To explain this phenomenon Senyigit et al, (2021) pointed how socioeconomic factors play a significant role in influencing educational attainment, socioeconomically advantaged individuals often have better access to resources such as high-quality schools, educational materials, tutors, and extracurricular activities. Conversely, individuals from disadvantaged backgrounds may lack access to these resources, which can hinder their educational progress. In other ways, the respondent disagreed that proper administrative support facilitates professional development for better Primary science instruction. Socio-economic hardships can lead to reduced focus on teaching effectiveness.

Research Question 5: How does the overall school climate affect the effectiveness of teaching Primary science?

The result showed how the overall school climate affect the effectiveness of teaching Primary science. However, a positive school climate fosters a supportive environment for teaching Primary science (2.75). Supportive school climate improves teachers' morale and effectiveness in Primary science (2.70). Meanwhile, the respondents rejected that positive climate promotes a respectful atmosphere crucial for Primary science lessons (1.90). In all, items 21 and 23 yields mean scores of 2.75 and 2.70 corresponding to standard deviation of 0.94 and 1.00 were all accepted respectively. While items 22, 24 and 25 yields mean scores of 1.75, 1.90 and 2.10 corresponding to standard deviation of 0.94, 0.94 and 1.22 were rejected.

Research question 5 shows how overall school climate affect the effectiveness of teaching Primary science. A positive school climate fosters a supportive environment for teaching Primary science. Elias (2023) rightly observed that a positive school climate is the product of a school's attention to fostering safety; promoting a supportive academic, disciplinary, and physical environment. Supportive school climate improves teachers' morale and effectiveness in Primary science. Perez and Labitad (2025) rightly observed that Supportive school climate fosters youth development and learning necessary for a productive, contributing and satisfying life in a democratic society. This climate includes: Norms, values and expectations that support people feeling socially, emotionally and physically safe. People are engaged and respected. Pupils, families and educators work together to develop, live and contribute to a shared school vision. Educators model and nurture attitudes that emphasize the benefits and satisfaction gained from learning. Each person contributes to the operations of the school and the care of the physical environment. The respondent disagreed

that positive climate promotes a respectful atmosphere crucial for Primary science lessons. Strong school climate supports teachers in addressing Primary science teaching challenges.

4. CONCLUSION

To identify the empirical research, it is evident that the effectiveness of teachers as they provide primary science instruction depends on a complex web of determinants, not on a single factor. Academic competence becomes another significant factor in the ability of teachers to instructionally explain ideas in an articulate way and to create learning experiences of substantive value, thus validating the old claim that teacher competence is a central component in instructional achievement. At the same time, the quality and access to instructional material also play an equally important role, as they allow educators to reduce abstract concepts to understandable formats and to keep students engaged throughout the lesson. Where these resources are not available, the overall standards of teaching become consequently worse. Administrative assistance is also essential. Schools that provide a systematic guidance, support professional growth, and access to modern material provide the conditions under which teachers are enabled to work at a high level. On the contrary, lack of such support limits the capacity of teachers to fulfill curriculum imperatives. The effectiveness of teachers is also mediated by socio-economic factors; teachers are stressed and they lack access to resources to teach effectively and thus lower the quality of instruction. The larger school culture also affects motivation and morale implying that an agreeable and supportive culture improves teacher confidence and dedication in the classroom

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