

# EVALUATING THE IMPACT OF MULTI-SECTOR COLLABORATIONS ON PRIMARY SCHOOL TEACHERS' STEM PEDAGOGICAL COMPETENCE IN LAGOS STATE, NIGERIA

AKIODE, Abimbola Oluwatoyin Ph.D

Department of Educational Foundations and Counseling Psychology, Early Childhood Education Unit,  
Lagos State University, Ojo  
[abimbolaakiode@gmail.com](mailto:abimbolaakiode@gmail.com)

## Abstract

*This study examined the impact of multi-sector collaboration on the STEM pedagogical competence of primary school teachers in Lagos State. The study determined the extent to which multi-sector collaborations are implemented to strengthen teachers' STEM competence, examined the relationship between multi-sector collaboration initiatives and teachers' STEM pedagogical competence. A descriptive research design was adopted. The population comprised primary school teachers in Lagos State, while a sample of 200 teachers from public and private primary schools in Eti-Osa Local Government Education Authority was selected using stratified and convenience sampling techniques. Data were collected using a validated questionnaire titled Multi-Sector Collaboration in Primary School Teachers' STEM Pedagogical Competence (IMCTSPC) and analysed using descriptive statistics. Findings revealed that multi-sector collaborations assist to a high extent in strengthening teachers' STEM competence, with positive relationships observed between collaborative initiatives and teachers' pedagogical skills. However, challenges such as poor coordination, inadequate funding, unclear policy frameworks, and insufficient communication were identified as major barriers. The study concludes that while multi-sector collaboration significantly enhances teachers' STEM pedagogical competence, addressing structural and administrative constraints is essential for maximizing its effectiveness. The study recommends strengthened coordination mechanisms, sustained funding, and coherent policies to support effective multi-sector partnerships in primary education.*

**Keywords:** Multi-sector collaboration; STEM pedagogical competence; Teacher professional development

## Introduction

Education is crucial to any pupil, especially at the foundational level because it equips the pupil with the values, knowledge, and abilities needed to a better life to navigate or explore the world. It enables the pupils at different levels of learning to think critically, make wise choices, and make significant contributions to society. Additionally, education promotes intercultural awareness and respect, which eventually promotes harmony and collaboration. Fundamentally, education serves as the cornerstone for social progress, individual development, and the advancement of humanity at large. It might therefore be true to conclude that for education to be sound the foundational level is of great importance. This is so because primary school establishes the groundwork for a child's future learning and overall development. It gives pupils the fundamental abilities they need to comprehend more difficult subjects later in life, such as reading, writing, and basic math. Beyond academics, primary education prepares pupils for active participation in society by fostering the development of social skills, self-assurance, and discipline. Providing every pupil with the opportunity to create a brighter future, regardless of background, it also advances equality. To put it briefly, the first and most important stage in forming a child's intellect, character, and chances for success in life is the primary school (Sevrukoya, 2018). All of these can only be achieved through the assistance of a primary school teacher who is seasoned, professional and of impeccable character. A teacher who oversees organising and carrying out lessons in a variety of key disciplines, fostering a supportive and engaging learning environment, evaluating and tracking pupils' progress, and upholding classroom safety and discipline. According to Eistein (2018), other important responsibilities of the teacher include interacting with parents, working with other teachers, taking part in professional development, and supporting larger school events and activities. For a primary school teacher to be successful, he or she needs to have a variety of interpersonal, organisational, and teaching abilities which include patience, empathy, communication, Classroom management, creativity and topic knowledge. They can communicate with children and parents, handle the intricacies of a classroom and curriculum, and foster a pleasant learning environment all these are professional abilities which are required by the teachers, and which can majorly be achieved through training, workshops, seminars and more. Indeed, there is a need for multi-collaborations because the schools alone might not be able to handle the responsibilities.

Thus to make learning rich, robust and relevant at the primary school level there is a need for collaborations by different agents, organizations and so on, such is the multi-sector collaboration which is a strategic partnership where entities from different sectors, such as government, non-profits, private businesses, and community groups work together to address a common goal or complex challenges. In primary schools such as digital learning implementation, teacher shortage, quality, professional development, safety and development among others, that cannot be solved by one organisation alone.

In primary education, multi-sector collaboration involves several key agents (stakeholders) who each play a role in supporting children's learning and wellbeing as well as the teacher (Brodén, 2022). The main agents involved in collaboration in primary schools are the following: Government agencies which are responsible for the oversight and administration of specific functions, some of such is the State Universal Basic Education Board (SUBEB) in Nigeria which is to manage and provide quality basic education in primary ensuring equitable access for all children.

Also, the Local Government Education Authority (LGEA) is responsible for employment, appointment and development within their area of jurisdiction. School Administration which involves the management of all school operations, from creating a safe learning environment to managing the school budget, parents and families who provide home support, supervision, and encouragement. Parent-Teacher Associations (PTA) whose main aim is to advance pupil education, promote cooperative partnerships between the school and parents, engage in activities to provide facilities and equipment that support the school.

Multi-sector collaboration in primary education may be necessary because there is a need for the holistic development of pupils with the help of the teacher; this is so because education alone cannot solve all the challenges pupils face (Moore, 2022). Collaborations could ensure pupils are healthy and ready to learn. Also, many public schools lack adequate facilities for teachers' development and professionalism, however through collaboration, government, NGOs, private businesses, and community group resources can be pooled together resources (books, scholarships, meals, infrastructure) to develop the teacher which in turn improve learning outcomes. Furthermore, governments alone may overlook key issues. When different sectors speak with one voice, stronger policies (like free school meals, teacher protection laws, Professionalism) are developed. Improved academic performance is a crucial outcome of multi-sector collaboration because it results from a synergy of diverse perspectives, resources, and expertise from various stakeholders, such as students, educators, industry, and the community. This collaboration fosters innovative learning environments, provides real-world relevance to education, enhances student motivation and engagement, and equips pupils with vital 21st-century skills, all of which lead to improved academic results and overall institutional effectiveness through the teacher. With health, financial, emotional, and educational needs being addressed through joint efforts, pupils are more likely to stay in school, attend regularly, and perform better academically (Brodén, 2022).

Multi-sector collaboration has a direct impact on primary school teachers and their instructional delivery in different ways. It provides capacity-building workshops, seminars, and refresher courses for teachers. This improves teachers' knowledge of modern pedagogy, child-centered learning, and classroom management, which in turn help in pupils' academic performance. The teachers' access to teaching resources and partnerships with the private sector and NGOs supply instructional materials, digital tools, libraries, and laboratories, which make lessons more engaging and effective. It also leads to improved motivation and morale which could lead to effective performance. When schools receive external support (for example, infrastructure improvement, welfare packages, recognition programs), teachers feel valued, supported, and motivated to deliver better lessons. According to Otundo (2024) with support from multi-sector stakeholders (government infrastructure projects, community involvement, NGOs), teachers work in safer, cleaner, and more supportive learning environments, which enhances their instructional delivery. As part of the collaboration, a good example is the Spacecom and its local partner Data Connect installed information and communications technology (ICT) infrastructure at the three school sites to facilitate broadband satellite connectivity in Lagos State. This allows for both online and offline learning, meaning teachers and pupils can continue classes even without internet. At some primary schools in Kebbi, the smallest and most rural of the three schools, solar panels were installed to provide more reliable electricity service (Orewole, 2013).

Multi-sector collaboration enhances curriculum implementation by fostering innovation through diverse expertise, ensuring curricula are relevant and responsive to real-world needs through community input, and improving pupils' outcomes by creating integrated learning environments. Furthermore, collaboration fosters the introduction of innovative programs (ICT integration, literacy programs, inclusive education support) that improve how teachers deliver lessons and how professional they are. Also, when schools and community groups, businesses, and parents form partnerships, they create better learning environments that positively affect pupils' academic performance (Chandrateya, 2024), which is one of the major reasons why they are in primary school. For instance, pupils and parents involved in community partnerships are more engaged with their children's education, resulting in higher academic performance. Teachers benefit from stronger ties with parents and community leaders, leading to better discipline, attendance, and cooperation among pupils, making instruction smoother.

In relation to STEM (Science, Technology, Engineering and Mathematics), Multi-sector collaboration significantly enhances teachers' competence in STEM instruction by providing them with access to training, resources, and professional support, Traphagen, K., and Traill, S. (2014). Through partnerships with government agencies, NGOs, and private sector organizations, teachers receive capacity-building opportunities in modern STEM pedagogy, such as inquiry-based learning, problem-solving, and technology integration. In addition, the provision of instructional materials and digital tools, including computers, laboratory equipment, and interactive software, enables teachers to move from abstract, theory-driven lessons to more practical and activity-based learning experiences. Collaboration also fosters curriculum enrichment by introducing initiatives such as science fairs, mathematics competitions, and robotics clubs, which broaden both teachers' and pupils' exposure to real-world STEM applications. Moreover, by sharing responsibility with health and social welfare agencies for addressing pupils' non-academic challenges, teachers are able to concentrate more fully on effective instruction. These combined efforts not only improve teachers' confidence and competence in delivering STEM content but also promote innovative teaching practices that enhance pupils' engagement and achievement (UNICEF, 2020; UNESCO, 2021).

### **Statement of the Problem**

Despite the international focus on STEM education as a catalyst for innovation and national development, Lagos State still faces challenges with low STEM learning outcomes, especially at the primary school level. According to studies, many primary school teachers lack the pedagogical skill, confidence, and content knowledge necessary to teach STEM subjects successfully. In STEM classrooms, this deficiency frequently manifests as rote teaching strategies, few practical exercises, and low pupils' involvement. Although interventions have been implemented by the government, business organisations, and non-governmental bodies to enhance teachers' proficiency in STEM instruction in Lagos State, where education is a top policy priority and no child is left behind. However, these projects frequently function in divisions, leading to fragmented training, limited sustainability, and duplication of efforts. It is believed that one comprehensive strategy to increase teachers' pedagogical competency in STEM is multi-sector collaboration, which brings together government organisations, teacher training programs, non-governmental organisations, and business partners. The drawback, though, is that there is little actual data regarding how successful these kinds of partnerships are. There is not enough information on the quantifiable effects of multi-sector initiatives on teachers' pedagogical ability, despite unempirical accounts that partnerships increase teacher capacity. Therefore, it is still unknown if these partnerships greatly improve teachers' capacity to implement creative, inquiry-based, and pupil-centred STEM curricula in Lagos State primary schools. This disparity calls for a methodical assessment of the ways in which multi-sector collaboration affects teachers' STEM pedagogical proficiency in order to lead future partnerships, inform evidence-based policy, and eventually enhance STEM learning outcomes for pupils in primary schools.

### **Purpose of the Study**

The main purpose of this study is to evaluate the impact of multi-sector collaboration on the STEM pedagogical competence of primary school teachers in Lagos State, Nigeria. Specifically, the study seeks to:

- i. ascertain the extent to which multi-sector collaborations are being implemented to strengthen teachers' STEM teaching capacity in public primary schools in Lagos State.

- ii. determine the relationship between multi-sector collaboration initiatives and teachers' STEM pedagogical competence.
- iii. determine the challenges and barriers limiting effective multi-sector collaboration in improving STEM pedagogical competence of primary school teachers.

### Research Questions

- I. To what extent do multi-sector collaborations implemented assist in strengthening primary school teachers' STEM competence in Lagos State?
- ii. What is the relationship between multi-sector collaboration initiatives and teachers' STEM pedagogical competence?
- iii. What challenges hinder effective multi-sector collaboration for strengthening teachers' STEM pedagogical competence?

### Methodology

The study adopted a descriptive survey research design. The study population consisted of all primary school teachers in Lagos State. A questionnaire was used for data Table 4 showed that multi-sector collaboration rating of items 1-5 was 3.10, 3.03, 2.95, 2.83, 2.88, 2.97 respectively with corresponding standard deviation of 0.82, 0.78, 0.85, 0.90, 0.87, 0.84. Based on the cut-off point of 2.50, the teachers rated all the items as accepted indicating that, multi-sector collaboration strengthens primary school teachers' STEM competence. The cluster mean of 2.96 and standard deviation of 0.84 were rated above the cut-off point of 2.50. This implies that multi-sector collaboration strengthens primary school teachers' STEM competence. collection, titled Multi-Sector Collaboration in Primary School Teachers' STEM Pedagogical Competence (IMCTSPC). The sampling population was 200 primary school teachers in Eti-Osa Local Government Education Authority in Lagos State which was purposively selected. Using a stratified random technique, the schools were selected and divided into stratum 1, public schools and stratum 2, private schools. Using the convenience sampling technique; 140 teachers were chosen in the public primary schools and 60 participants from the private primary schools. Two experts validated the questionnaire. Data collected were analysed using descriptive statistics.

### Result

**Research Question 1:** To what extent do multi-sector collaborations implemented assist in strengthening primary school teachers' STEM competence in Lagos State?

**Table 1: Mean rating and standard deviation on the extent of Multi-Sector Collaborations in Strengthening Primary School Teachers' STEM Competence**

S/N	Items	Mean ( $\bar{U}$ )	Std. Deviation
1	Collaborative programmes with government agencies have improve my understanding of STEM concepts.	3.31	0.60
2	Partnership with private organizations have enhanced my use of practical and inquiry-based STEM teaching methods.	3.27	0.64
3	Training workshops organized though multi-sector collaboration have strengthened my confidence in teaching STEM subjects.	3.35	0.58
4	Support from NGOs and community-based organization have increased access to STEM instructional resources.	3.22	0.66
5	Multi-sector collaboration initiatives have positively influenced my STEM teaching competence.	3.38	0.55
<b>Grand Mean</b>		<b>3.31</b>	



The table 1 above indicates that implemented multi-sector collaborations assist to a high extent in strengthening primary school teachers' STEM competence in Lagos State. The mean scores for the five items ranged from 3.22 to 3.38, all above the benchmark mean of 2.50, reflecting strong agreement among respondents.

The highest mean score (mean= 3.38) was recorded for the overall influence of multi-sector collaboration initiatives on teachers' STEM competence, suggesting that respondents perceive these collaborations as broadly effective. Training workshops and professional development activities (mean= 3.35) were also identified as particularly impactful. The relatively low standard deviation values (0.55–0.66) indicate consistency in teachers' responses.

The findings suggest that multi-sector collaborations implemented in Lagos State have made a meaningful contribution to enhancing primary school teachers' STEM competence, particularly through professional development, resource provision, and improved instructional practices.

**Research Question 2:** What is the relationship between multi-sector collaboration initiatives and teachers' STEM pedagogical competence?

**Table 2: Mean rating and standard deviation on the multi-sector collaboration initiatives and teachers' STEM pedagogical competence**

S/N	Items	Mean ( $\bar{X}$ )	Std. Deviation
1	Collaboration with industries enhances my ability to teach STEM concepts effectively.	3.28	0.62
2	Partnerships with NGOs and private organizations improve my STEM instructional skills.	3.15	0.67
3	Government and institutional support through collaboration strengthens my STEM teaching competence.	3.34	0.58
4	Joint training programmes with external stakeholders improve my use of innovative STEM teaching strategies.	3.21	0.65
5	Multi-sector collaboration provides access to resources that enhance STEM pedagogy.	3.42	0.55
<b>Grand Mean</b>		<b>3.28</b>	

Table 2 revealed that teachers generally perceive multi-sector collaboration initiatives as positively related to their STEM pedagogical competence. The mean scores for all five items ranged from 3.15 to 3.42, indicating a high level of agreement among respondents. The grand mean of 3.28 suggests that teachers acknowledge the importance of collaborations involving government agencies, industries, non-governmental organizations, and other stakeholders in enhancing their STEM teaching skills.

The relatively low standard deviation values (ranging from 0.55 to 0.67) indicate consistency in respondents' perceptions, suggesting shared views among teachers regarding the benefits of multi-sector collaboration. The findings imply that effective collaboration across multiple sectors plays a significant role in strengthening teachers' pedagogical competence in STEM education.

**Research Question 3:** What challenges hinder effective multi-sector collaboration for strengthening teachers' STEM pedagogical competence?

**Table 3: Mean rating and standard deviation on the challenges hinder effective multi-sector collaboration for strengthening teachers' STEM pedagogical competence**

S/N	Items	Mean ( $\bar{U}$ )	Std. Deviation
1	Inadequate funding limits effective collaboration between schools and external stakeholders.	3.36	0.61
2	Lack of clear policy frameworks hinders successful multi -sector collaboration for STEM education.	3.29	0.64
3	Poor coordination among government, private sector, and educational institutions affects collaboration outcomes.	3.42	0.58
4	Limited time and workload pressures prevent teachers from engaging in collaborative STEM initiatives.	3.18	0.69
5	Insufficient communication among collaborating partners weakens efforts to improve STEM pedagogy.	3.34	0.62
<b>Grand Mean</b>		<b>3.32</b>	

Table 3 indicate that teachers perceive several significant challenges hindering effective multi-sector collaboration aimed at strengthening STEM pedagogical competence. Mean scores across the five items ranged from 3.18 to 3.42, all exceeding the benchmark mean of 2.50, suggesting general agreement that these factors constitute major barriers.

The highest mean score (3.42) was recorded for poor coordination among collaborating partners, indicating that ineffective alignment of roles and responsibilities is perceived as the most critical challenge. Inadequate funding (mean= 3.36) and insufficient communication among stakeholders (mean= 3.34) were also identified as prominent obstacles. The relatively low standard deviation values (0.58–0.69) suggest minimal variability in respondents' perceptions.

The findings suggest that structural, administrative, and logistical challenges significantly constrain the effectiveness of multi-sector collaboration initiatives designed to enhance teachers' STEM pedagogical competence.

### Discussion of Findings

The findings from Research Question 1 indicate that multi-sector collaborations implemented in Lagos State assist to a high extent in strengthening primary school teachers' STEM competence. The grand mean of 3.31, with all item means exceeding the benchmark mean of 2.50, demonstrates strong agreement among teachers that these collaborations are effective. In particular, the highest-rated item relates to the overall positive influence of multi-sector collaboration initiatives on STEM competence, suggesting that teachers perceive tangible benefits from such partnerships. The prominence of training workshops and professional development activities underscores the critical role of capacity-building initiatives facilitated through collaboration among government agencies, private organizations, NGOs, and community-based groups. These findings align with the view of Epstein, (2018) that sustained professional development is essential for improving teachers' subject mastery, instructional confidence, and ability to deliver STEM content effectively. The consistency of responses, as reflected in the relatively low standard deviation values, further suggests that the perceived benefits of collaboration are widely shared among primary school teachers in Lagos State. This supports existing literature that emphasizes collaborative approaches as a viable strategy for addressing skill gaps and resource limitations in STEM education.

The results for Research Question 2 reveal a positive relationship between multi-sector collaboration initiatives and teachers' STEM pedagogical competence. The grand mean of 3.28 indicates that teachers generally acknowledge the importance of collaboration with industries, government institutions, NGOs, and other stakeholders in enhancing their pedagogical skills. Notably, access to resources through collaboration recorded the highest mean score, highlighting the significance of material and instructional support in improving STEM

pedagogy. These findings support Otundo. (2024) who suggest that multi-sector collaborations do not only enhance teachers' content knowledge but also promote the adoption of innovative, inquiry-based, and learner-centred teaching strategies. Joint training programmes and institutional support appear to play a pivotal role in exposing teachers to contemporary pedagogical practices that are essential for effective STEM instruction. The relatively low variability in responses indicates a shared perception among teachers that collaboration across sectors is a key driver of pedagogical improvement. This corroborates prior studies which argue that partnerships between education systems and external stakeholders are instrumental in bridging the gap between theory and practice in STEM teaching.

Despite the positive outcomes associated with multi-sector collaboration, the findings from Research Question 3 reveal the existence of significant challenges that hinder its effectiveness. The grand mean of 3.32 indicates strong agreement among respondents that several structural and administrative barriers constrain collaborative efforts. Poor coordination among collaborating partners emerged as the most critical challenge, suggesting that unclear roles, weak alignment of objectives, and fragmented implementation processes undermine the potential benefits of collaboration.

Inadequate funding and insufficient communication were also identified as major obstacles, reflecting systemic issues that affect the sustainability and impact of collaborative initiatives (Sevrukova, 2018). Additionally, workload pressures and limited time were perceived as constraints that reduce teachers' active participation in collaborative programmes. These challenges highlight the need for coherent policy frameworks, adequate funding mechanisms, and efficient coordination structures to maximize the effectiveness of multi-sector collaborations. The consistency in respondents' perceptions further indicates that these challenges are pervasive and require deliberate policy and administrative interventions.

#### Conclusion

In Lagos State, Nigeria, this study assessed how multi-sector partnerships affected the growth of STEM (science, technology, engineering, and mathematics) pedagogical competency among primary school teachers. The results showed that collaborations between governmental bodies, commercial enterprises, non-governmental organisations (NGOs), and academic institutions are crucial for improving teachers' access to resources, exposure to innovative methods of instruction, and instructional skills. Collaborative initiatives including mentorship programs, teacher training seminars, and the distribution of digital learning resources have helped instructors become more competent and confident in their ability to teach STEM subjects. However, depending on the degree of institutional support, the longevity of partnerships, and the teachers' own readiness to incorporate new pedagogical approaches, the impact differs from school to school. In general, the investigation finds that STEM pedagogical competency is positive but unevenly impacted by multi-sector cooperation. To guarantee that these collaborations result in long-term enhancements in the caliber of instruction and learning outcomes for students in STEM fields throughout Lagos State, persistent cooperation, policy alignment, and regular monitoring are necessary.

#### Recommendations

Based on the conclusion, the following recommendations were made to enhance the effectiveness of multi-sector collaboration in strengthening primary school teachers' STEM pedagogical competence in Lagos State;

1. Government education authorities should establish clear coordination frameworks that define roles, responsibilities, and accountability mechanisms for all collaborating stakeholders.
2. Sustainable funding mechanisms should be developed to support multi-sector collaboration initiatives.
3. Policymakers should formulate and implement comprehensive policies that explicitly promote multi-sector collaboration in primary education.
4. Regular capacity-building programmes such as workshops, seminars, mentoring, and refresher courses should be institutionalized through collaborative efforts.
5. School administrators should adopt strategies to manage teachers' workload by providing time allowances or incentives for participation in collaborative programmes.

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