

Improving Life Science Learning in Rural Schools through Collaborative Teacher Professional Development - A Case Study of the Umkhanyakude District of South Africa



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ABSTRACT

The South African experience of teacher development aimed at professional growth has encountered significant challenges. Despite implementing various support programs within schools, there is limited evidence of meaningful professional development for teachers, as reflected in persistently low student performance outcomes. The effectiveness of specific intervention strategies in enhancing students' learning outcomes in Life Sciences (LS) remains ambiguous. This study, situated within an interpretive paradigm, employed a qualitative research approach to investigate the potential for collaboration between rural schools and educational stakeholders in the Umkhanyakude District of South Africa. Data was collected through open-ended questionnaires and semi-structured interviews with ten purposively selected teachers. Thematic analysis was applied to the qualitative data, guided by Community Participation Theory, to evaluate the viability of collaborative efforts between schools and educational stakeholders in upskilling in-service LS teachers in rural contexts. The findings identified several challenges, including negative attitudes among teachers toward Life Sciences and a lack of resources in rural schools. Additionally, teachers underscored an urgent need for collaborative professional development that involves subject matter experts and education department officials for effective support. This paper advocates for engaging a broader spectrum of educational stakeholders as essential to enhancing and sustaining the quality of science teaching and learning in rural schools. By identifying successful practices and areas for improvement, this research contributes to the broader discourse on equitable and effective teacher education, ultimately enhancing the teaching and learning of Life Sciences in rural schools.

Keywords: Collaboration, Life Science Education, Rural Schools, Teacher Professional Development

INTRODUCTION

In today's rapidly evolving educational landscape, ongoing professional development is essential, particularly in specialized fields like Life Sciences. The swift advancements in research and instructional methodologies necessitate that teachers engage in relevant professional development programs that

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adhere to established standards, ensuring the continuous enhancement of their knowledge and skills.¹ In this context, it is imperative to explore the professional development needs of teachers in rural areas, specifically within the uMkhanyakude district. This exploration aligns with Goal 4 (Quality Education) of the Sustainable Development Goals, underscoring the critical importance of equitable and inclusive learning opportunities.²

The need for effective professional development is especially pronounced in rural schools, where educators face unique challenges, including limited access to resources, professional isolation, and socioeconomic constraints. Such disparities lead to significant differences in teaching methodologies employed by educators in rural versus urban settings.³ As Ellen Abakah noted, despite regional and cultural variations, there are common characteristics regarding the evolving nature of teachers' professional learning globally.⁴ This highlights the necessity for innovative and collaborative approaches to teacher upskilling, ensuring educators are adequately prepared to foster student learning and engagement in Life Sciences.

Research consistently demonstrates that effective professional development (PD) is crucial for creating growth opportunities that enhance teacher learning and, consequently, improve student achievement.⁵ Over the past two decades, numerous studies have identified key elements contributing to successful PD programs. Gore et al. argue that effective PD should be grounded in research, coherence, and capacity-building.⁶ Critical characteristics of successful PD initiatives include a focus on the subject matter, active learning, coherence, sufficient duration, and group engagement.⁷ Evidence suggests that the primary objective of workshops led by collaborative mentors and subject advisors is to empower teachers to take ownership of their classroom practices.⁸ These cascade workshops emphasize a deep understanding of student learning, instructional strategies aligned with the curriculum, and the enhancement of teachers' theoretical and practical knowledge in their respective subjects.⁹

The Life Sciences subject cluster aims to facilitate meaningful discussions and actively engage teachers, enriching their pedagogical content knowledge in accordance with the guidelines established by the uMkhanyakude Department of Education.¹⁰ Life Sciences encompasses the comprehensive study of all living organisms, including plants and animals, their anatomy, and the intricacies of their life processes.¹¹ This field investigates growth, maturation, environmental adaptation, and critical life stages, from conception to reproduction, covering vital processes such as photosynthesis and cellular respiration, essential for understanding the life cycles of both plants and animals. Given its significance, Life Sciences serve as a foundational base in STEM education, acting as a gateway to elite careers in fields such as medicine, agriculture, and various scientific disciplines.¹²

¹ May Britt Postholm, "Teachers' Professional Development in School: A Review Study," *Cogent Education* 5, no. 1 (January 1, 2018): 1522781, <https://doi.org/10.1080/2331186X.2018.1522781>.

² Gerda-Elisabeth Wittmann and Jako Olivier, "Professional Development in Fostering Self-Directed Learning in German Second Additional Language Teachers," *Per Linguam* 35, no. 3 (December 2019), <https://doi.org/10.5785/35-3-870>.

³ Sugata Sumida and Keisuke Kawata, "An Analysis of the Learning Performance Gap between Urban and Rural Areas in Sub-Saharan Africa," *South African Journal of Education* 41, no. 2 (May 31, 2021): 1–17, <https://doi.org/10.15700/saje.v41n2a1779>.

⁴ Ellen Abakah, "Teacher Learning from Continuing Professional Development (CPD) Participation: A Sociocultural Perspective," *International Journal of Educational Research Open* 4 (2023): 100242, <https://doi.org/10.1016/j.ijedro.2023.100242>.

⁵ Motoko Akiba and Guodong Liang, "Effects of Teacher Professional Learning Activities on Student Achievement Growth," *The Journal of Educational Research* 109, no. 1 (January 2, 2016): 99–110, <https://doi.org/10.1080/00220671.2014.924470>.

⁶ Jennifer Gore et al., "Effects of Professional Development on the Quality of Teaching: Results from a Randomised Controlled Trial of Quality Teaching Rounds," *Teaching and Teacher Education* 68 (November 2017): 99–113, <https://doi.org/10.1016/j.tate.2017.08.007>.

⁷ Linda Darling-Hammond, Maria E Hyler, and Madelyn Gardner, *Effective Teacher Professional Development*. (Palo Alto, CA: Learning Policy Institute, 2017).

⁸ Warawut Soipimai and Wirot Sanrattana, "Collaborative Practices to Empower Teachers' Capacities for the 21st Century.," *World Journal of Education* 13, no. 1 (2023): 30–44.

⁹ O.M. Ventista and C. Brown, "Teachers' Professional Learning and Its Impact on Students' Learning Outcomes: Findings from a Systematic Review," *Social Sciences & Humanities Open* 8, no. 1 (2023): 100565, <https://doi.org/10.1016/j.ssaho.2023.100565>.

¹⁰ Ntombekhaya Mxenge and Carol Bertram, "Teacher Learning and Collaboration in a Life Sciences Cluster in South Africa," *South African Journal of Education* 43, no. 4 (2023): 1–9.

¹¹ Muhammad Aqeel Ashraf and Maliha Sarfraz, "Biology and Evolution of Life Science," *Saudi Journal of Biological Sciences* (Elsevier, 2016).

¹² Yamrot Negussie, Amy Geller, and Jennifer E DeVoe, *Vibrant and Healthy Kids: Aligning Science, Practice, and Policy to Advance Health Equity* (Washington, DC: National Academies Press, 2019).

Despite the critical importance of this subject and ongoing support for educators, the 2023 diagnostic report from the Department of Basic Education (DBE) reveals persistent struggles in South African matric results for Life Sciences over the past five years (2019-2023). This trend remains troubling despite numerous interventions aimed at improving outcomes. Continuous Professional Teacher Development (CPTD) initiatives by the DBE have targeted areas such as content knowledge, pedagogical skills, and technology integration to enhance teaching effectiveness. However, many teachers report negative experiences with professional development, particularly in rural areas where support, resources, and opportunities for CPTD are scarce.

This context sets the stage for a collaborative intervention through a community engagement project (CE), aligning with the concept of community as a group of individuals connected within a system to achieve a common goal. Therefore, this study aims to investigate how subject clusters utilize Participatory Action Research as a model for Continuous Professional Teacher Development (CPTD) to enhance teacher learning.¹³ By exploring a collaborative approach to professional development for Life Sciences teachers in rural schools, this paper seeks to improve both teaching quality and student outcomes. The study emphasizes empowering educators with the latest pedagogical strategies, content knowledge, and practical skills necessary to navigate and excel within their unique educational contexts. Through train-the-trainer workshops, the effectiveness of collaborative professional development initiatives, including face-to-face workshops and mentorship programs tailored for rural educators, will be examined.

This study is guided by the following objectives:

1. To explore the challenges rural schools face in improving life science learning outcomes for students.
2. To identify effective means for revitalizing collaborative teacher professional development in rural schools to enhance life science learning outcomes.

LITERATURE REVIEW

The improvement of Life Science education in rural schools is essential to address educational disparities and equip students with critical skills needed for further education and the job market. Professional development (PD) for teachers, particularly through collaborative approaches. Collaborative Participatory Theory is employed in this study as a proven strategy for enhancing instructional quality and student learning outcomes.¹⁴ Collaborative theory fosters a sense of community, promotes the sharing of resources, and provides rural teachers with access to a network of support that compensates for limited local resources. Life Science, which includes disciplines such as biology, ecology, and environmental science, is a foundational subject that prepares students for STEM careers and helps them understand the natural world. Rural students often face additional challenges in accessing high-quality Life Science education due to limited access to resources, experienced teachers, and infrastructure.¹⁵ Without targeted support, rural students may struggle to achieve proficiency in Life Science, leading to a gap in STEM readiness compared to their urban peers.

Thus, enhancing Life Science education in rural areas is critical for student success and community development.¹⁶ Rural schools frequently encounter challenges that impact Life Science instruction, including teacher isolation, resource limitations, and logistical barriers to PD.¹⁷ Life Science teaching often relies on laboratories, hands-on activities, and access to up-to-date scientific information, which

¹³ K. Questa et al., "Community Engagement Interventions for Communicable Disease Control in Low- and Lower- Middle-Income Countries: Evidence from a Review of Systematic Reviews," *International Journal for Equity in Health* 19, no. 1 (December 6, 2020): 51, <https://doi.org/10.1186/s12939-020-01169-5>.

¹⁴ Marie-Claude Tremblay et al., "Can We Build on Social Movement Theories to Develop and Improve Community-Based Participatory Research? A Framework Synthesis Review," *American Journal of Community Psychology* 59, no. 3-4 (June 4, 2017): 333-62, <https://doi.org/10.1002/ajcp.12142>.

¹⁵ Catharine Biddle and Amy Price Azano, "Constructing and Reconstructing the 'Rural School Problem' a Century of Rural Education Research," *Review of Research in Education* 40, no. 1 (2016): 298-325.

¹⁶ Venicia A. Ferrell and Alexis S. Tharpe, "Enhancing Rural Science Education through School District-University Partnership," *Education Sciences* 14, no. 7 (June 30, 2024): 712, <https://doi.org/10.3390/educsci14070712>.

¹⁷ Aysel Şahin, Dilek Soylu, and Mohammadbagher Jafari, "Professional Development Needs of Teachers in Rural Schools," *Iranian Journal of Educational Sociology* 7, no. 1 (2024): 219-25, <https://doi.org/10.61838/kman.ijes.7.1.22>.

may be scarce in rural settings.¹⁸ Additionally, teachers in rural schools often experience professional isolation, limiting opportunities for peer learning and collaboration, which can lead to outdated teaching practices and reduced motivation. Collaborative PD has been shown to be an effective approach to overcoming these challenges, enabling teachers to enhance their skills, share best practices, and address specific instructional challenges in Life Science.¹⁹ Collaborative PD differs from traditional forms of PD by focusing on teamwork, peer interaction, and reflective practices that encourage teachers to learn from each other. Common models of collaborative PD include Professional Learning Communities (PLCs), peer mentoring, and teacher networks, each of which provides support that enhances teacher knowledge and instructional practices.

Studies indicate that collaborative PD positively impacts teaching practices in Life Science by fostering reflective practice, enhancing content knowledge, and improving pedagogical skills.²⁰ Collaborative PD settings allow teachers to discuss subject-specific challenges, such as laboratory setup, scientific experimentation, and student misconceptions in Life Science topics.²¹ This interaction builds teachers' confidence and motivation, which are particularly important for Life Science instruction, given its complexity and resource demands. For example, in a study on rural schools in South Africa, it was found that collaborative PD enabled teachers to incorporate locally relevant examples and experiments into the curriculum, making Life Science more engaging and accessible for students.²² This model also encouraged teachers to utilize more student-centered approaches, such as inquiry-based learning, which has been shown to improve student outcomes in science.²³ Collaborative PD has specific benefits in rural settings, as it helps to overcome teacher isolation by creating a professional community.²⁴ In these settings, teachers often form close-knit communities where they can freely share challenges and collectively brainstorm solutions. Teachers in rural schools are more likely to encounter similar instructional challenges, making peer advice and shared strategies directly applicable and highly relevant. Additionally, collaborative PD can incorporate local knowledge and resources, helping Life Science teachers develop culturally relevant and context-specific curricula.²⁵

Despite its benefits, there are barriers to implementing effective collaborative PD in rural areas. Limited access to technology, lack of funding for sustained PD programs, and time constraints are common obstacles.²⁶ Additionally, rural teachers may lack administrative support for engaging in collaborative PD due to scheduling conflicts or staffing limitations. Overcoming these barriers requires targeted policies and funding initiatives that prioritize rural education needs and ensure consistent support for teachers' ongoing professional growth.

METHODOLOGY

Research Paradigm

This study adopted an interpretive paradigm to investigate the effectiveness of collaborative professional development initiatives in enhancing instructional practices and improving student learning outcomes in life sciences. Creswell and Poth postulate that interpretive paradigm prioritizes exploring how

¹⁸ Ferrell and Tharpe, "Enhancing Rural Science Education through School District–University Partnership."

¹⁹ Greg Smith and Michael Browne, "Using an 'Effective' Model of Professional Development in Science Education to Improve Primary Teachers' Classroom Practice: The CSSP Experience," *Irish Educational Studies*, June 3, 2024, 1–21, <https://doi.org/10.1080/03323315.2024.2361794>.

²⁰ Berit S. Haug and Sonja M. Mork, "Taking 21st Century Skills from Vision to Classroom: What Teachers Highlight as Supportive Professional Development in the Light of New Demands from Educational Reforms," *Teaching and Teacher Education* 100 (April 2021): 103286, <https://doi.org/10.1016/j.tate.2021.103286>.

²¹ Johanna Kranz, Armin Baur, and Andrea Möller, "Learners' Challenges in Understanding and Performing Experiments: A Systematic Review of the Literature," *Studies in Science Education* 59, no. 2 (July 3, 2023): 321–67, <https://doi.org/10.1080/03057267.2022.2138151>.

²² Blessing Nemadziva, Steven Sexton, and Catherine Cole, "Science Communication: The Link to Enable Enquiry-Based Learning in under-Resourced Schools," *South African Journal of Science* 119, no. 1/2 (January 31, 2023), <https://doi.org/10.17159/sajs.2023/12819>.

²³ Nicholas Bremner, Nozomi Sakata, and Leanne Cameron, "The Outcomes of Learner-Centred Pedagogy: A Systematic Review," *International Journal of Educational Development* 94 (October 2022): 102649, <https://doi.org/10.1016/j.ijedudev.2022.102649>.

²⁴ Bremner, Sakata, and Cameron, "The Outcomes of Learner-Centred Pedagogy: A Systematic Review."

²⁵ Darling-Hammond, Hyler, and Gardner, *Effective Teacher Professional Development*.

²⁶ Darling-Hammond, Hyler, and Gardner, *Effective Teacher Professional Development*.

individuals perceive their world to gain insights into the phenomenon under study.²⁷ By utilizing this paradigm, this study seeks a comprehensive understanding of how teachers perceive the effectiveness of collaborative professional development initiatives to manage their students' learning outcomes in life sciences.

Research Approach

The research utilized a Participatory Action Research (PAR) approach, which emphasizes collaboration between researchers and participants. This framework allowed for the identification of pertinent issues and the development of actionable solutions.²⁸ By centring the voices of teachers in the research process, the study fostered an environment conducive to dialogue and reflection, thereby enhancing participant engagement and collective problem-solving Research Design. A qualitative research design was employed to explore participants' experiences and perspectives regarding the collaborative professional development initiatives.²⁹ This design facilitated a comprehensive exploration of the educational practices within the Ubumbo circuit, ensuring that the findings would be grounded in the realities of the participants' lived experiences.

Participants Selection

The study focused on one rural high school within the Umkhanyakude District, using purposive sampling to engage only teachers who have at least three years of teaching life sciences to participate. Enabling participants with knowledge and experience of the subject matter becomes crucial as they could provide rich and detailed information relevant to the study's objectives.³⁰ The selection criteria aimed to represent various instructional practices and professional backgrounds, thereby enriching the data collected and enhancing the study's validity.³¹

Data Collection Instruments

Data collection involved the use of open-ended questionnaires and semi-structured interviews, which allowed participants to articulate their thoughts and experiences in their own words. This qualitative approach provided a broad understanding of the challenges faced by teachers, facilitating a more nuanced understanding of the context in which they operate.³²

Data Analysis

Thematic analysis was employed to interpret the qualitative data, encompassing several key steps: familiarization with the data, generating initial codes, grouping these codes into broader themes, reviewing and refining the themes, and finalizing them to align with the research objectives.³³ This enabled the researchers to construct a coherent understanding that reflects the teachers' experiences and insights, providing valuable implications for enhancing life sciences educational practices.

Ethical Considerations

In response to ethical considerations surrounding conducting research with humans, the researchers in this paper strictly adhere to ethical guidelines to ensure that the involved participants are treated with

²⁷ John W Creswell and Cheryl N Poth, *Qualitative Inquiry and Research Design: Choosing among Five Approaches* (Sage publications, 2016).

²⁸ Bunmi Isaiah Omodan and Nontyatyambo Pearl Dastile, "Analysis of Participatory Action Research as a Decolonial Research Methodology," *Social Sciences* 12, no. 9 (September 8, 2023): 507, <https://doi.org/10.3390/socsci12090507>.

²⁹ Iris Estévez, Alba Souto-Seijo, and Mercedes González-Sanmamed, "Learning from and with Others: Analysis of Interactions as Opportunities for Teacher Professional Development," in *New Trends in Qualitative Research, 2022*, <https://doi.org/10.36367/ntqr.12.2022.e728>.

³⁰ Lawrence A. Palinkas et al., "Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research," *Administration and Policy in Mental Health and Mental Health Services Research* 42, no. 5 (September 6, 2015): 533–44, <https://doi.org/10.1007/s10488-013-0528-y>.

³¹ Triana Aguirre et al., "Challenges for Teachers' and Students' Digital Abilities: A Mixed Methods Design Study," *Sustainability* 14, no. 8 (April 14, 2022): 4729, <https://doi.org/10.3390/su14084729>.

³² Cassie Wallwey and Rachel L Kajfez, "Quantitative Research Artifacts as Qualitative Data Collection Techniques in a Mixed Methods Research Study," *Methods in Psychology* 8 (2023): 100115.

³³ Virginia Braun and Victoria Clarke, "Reflecting on Reflexive Thematic Analysis," *Qualitative Research in Sport, Exercise and Health* 11, no. 4 (2019): 589–97.

respect and that their identities are kept confidential. Our research shows compliance with ethical standards aligning with the Declaration of Helsinki by asking and obtaining approval from the ethics committee of the University of Zululand before it started. The participants' identities were kept confidential and anonymous through pseudonyms and named as T1-T10 to protect them from any potential harm during the research processes. The issuing of informed consent was regarded as central to participants' voluntary participation, and they understood the details of the study and signed before the study commenced.

PRESENTATION OF FINDINGS AND DISCUSSION

This study was guided by the following objectives, which yielded two themes as presented in Table 1 below:

- i. Explore challenges rural schools face in improving life science learning outcomes for students.
- ii. Identify effective means for revitalizing collaborative teacher professional development in rural schools to enhance life science learning outcomes.

Table 1. The objectives and emerging themes

Objectives	Emerging Themes
To investigate challenges rural schools face in improving life science learning outcomes for students.	Challenges that impede a teacher’s professional development.
To identify effective means for revitalizing collaborative teacher professional development in rural schools to enhance life science learning outcomes	Enhanced Collaborative teachers’ professional development

Source: Authors' table

Objective 1: To investigate challenges rural schools face in improving life science learning outcomes for students

Theme 1: Challenges that impede teachers’ professional development

In analyzing data from open-ended questionnaires, participants identified several challenges that hinder teachers' professional development in facilitating life sciences education for learners. These challenges primarily include teachers’ negative attitudes and a lack of resources in rural schools.

Teachers’ Negative Attitudes Towards Life Sciences

Participants noted that teachers’ negative attitudes towards life sciences represent a significant barrier to effective learning outcomes. For instance, one participant stated:

“Most teachers specializing in life sciences have a negative attitude towards the subject because life sciences are treated as general subjects, and therefore, we are compelled to teach all science subjects even if they are not our speciality area.” (T3)

Another participant expressed:

“These challenges us in mastering the subject; I am no longer interested in teaching this subject.” (T1)

These responses illustrate how negative attitudes can undermine teachers' efforts to achieve positive outcomes in life sciences education. Participants indicated that the perception of life sciences as a general subject complicates their ability to master the content.³⁴ Existing literature supports this finding, indicating that negative attitudes can hinder teachers' professional skills. Therefore, the current study underscores the importance of professional development in supporting effective life sciences teaching.

³⁴ Şahin, Soylyu, and Jafari, “Professional Development Needs of Teachers in Rural Schools.”

Lack of Resources in Rural Schools

A significant challenge impeding professional development in teaching life sciences is the lack of resources prevalent in rural schools. Participants pointed to disparities in the availability and quality of educational resources. For example:

“Most of our rural schools experience limited supportive resources needed for teaching life sciences.” (T4)

Another participant remarked:

“Our schools lack resources like well-equipped laboratories for smooth facilitation and teaching of life sciences.” (T5)

Yet another noted:

“Insufficient laboratories impede us from performing to our best ability and contribute to the low pass rates of learners in life sciences.” (T6)

These sentiments highlight that a lack of resources hampers effective teaching in life sciences, particularly in conducting practical activities. Research by Sahin et al. corroborates these challenges, attributing deficiencies in rural schools to resource limitations.³⁵ The findings align with recent literature that highlights the impediments faced by teachers in predominantly rural settings.³⁶

Objective 2: Identifying Effective Means for Revitalizing Collaborative Teacher Professional Development in Rural Schools to Enhance Life Science Learning Outcomes

Theme 2: Enhanced Collaborative Teacher Professional Development

Participants emphasized that enhanced collaborative professional development is crucial for successful life sciences education, highlighting the importance of working together to achieve desired outcomes. One participant noted:

“It is very important to see improvement in teaching learners for success in all areas, including life sciences. I suggest that collaboration with stakeholders, such as subject experts and educators from various institutions, can assist in creating effective teaching environments.” (T9)

Another participant added:

“Working together with people who have more knowledge will help in promoting teaching the subject.” (T2)

Regarding the vision of successful collaborative professional development, participants revealed that collective efforts from all stakeholders are essential for fostering success in teaching life sciences. This perspective underscores the need for collaborative professional development to overcome the challenges teachers face. Further supporting this view, one participant stated:

“In my opinion, collaboration is the best strategy for helping teachers build their professional skills and master the subject.” (T10)

Another participant emphasized:

“If teachers' professional skills and development can be managed through collaboration, the benefits can enhance instructional quality and student learning outcomes.” (T7)

This collective efficacy aligns with the collaborative participatory framework adopted in this paper, which emphasizes the importance of collaborative efforts to achieve common goals. Moreover,

³⁵ Ferrell and Tharpe, “Enhancing Rural Science Education through School District–University Partnership.”

³⁶ Tremblay et al., “Can We Build on Social Movement Theories to Develop and Improve Community-Based Participatory Research? A Framework Synthesis Review.”

collaborative participatory theory advocates for such collective engagement as essential for enhancing support services in developing communities.³⁷

Discussion Summary

The purpose of this paper was to identify effective means for revitalizing collaborative teacher professional development with the aim of overcoming challenges rural schools face in improving life science learning outcomes for learners. Thematic analysis of data was done in alignment with open-ended questionnaires and semi-structured interviews, revealing that some challenges that impede teachers' professional development in teaching life sciences include teachers' negative attitudes to the life sciences and lack of resources. These confirm the idea of rurality deficiency that most rural schools are subjected to limited resources. It is therefore necessary to note that the participants in this study realized a need for collaborative professional development involving subject experts and education department officials for support and improvements in learners' life sciences learning. These findings also resonate with the employed collaborative theory, which values individual capacity building as a result of the network of support and sharing of resources crucial for life science teachers' professional development.

RECOMMENDATIONS

Drawing from the context of the findings in this paper, the authors recommend that all educational stakeholders need to recognize the significance of an enhanced collaborative approach in assisting teachers' professional development. This could be done through participatory engagement within rural communities and schools in which learners' provision of education is facilitated. The authors also recommend that the potential skills of subject experts within rural schools, including teachers, should be tapped into and utilized for life sciences teaching and the provision of learners' learning. Embracing these collaborative strategies through participatory engagement in rural schools in Africa can continue to be a vital tool for promoting equity in education and ensuring responsible societies.

CONCLUSION

This study has investigated the potential for collaboration between rural schools and educational stakeholders in the Umkhanyakude District. Improving Life Science learning in rural schools through collaborative PD is a promising approach to addressing existing educational gaps. Collaborative PD empowers rural teachers to develop and implement effective teaching strategies, access peer support, and enhance content knowledge, ultimately benefiting learners. Investing in sustainable, collaborative PD methods and leveraging educational stakeholders' capabilities can assist in supporting Life Science teachers in rural areas, creating more equitable educational opportunities and fostering learners' success in the sciences.

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