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FACTORS INFLUENCING PROFESSIONAL DEVELOPMENT AMONG PRE-SERVICE AGRICULTURE TEACHERS IN KENYAN SECONDARY SCHOOLS

(Research Article)

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Abstract

This study explores factors influencing professional development among pre-service agriculture teachers in Kenyan secondary schools. The Professional development is a crucial aspect of teacher preparation programs, including in the field of agriculture education. Pre-service agriculture teachers in Kenyan secondary schools face unique challenges like inadequate resources, the curriculum may not align with current agricultural practices and emerging technologies, creating a gap between classroom learning and real-world application, and lack of essential agricultural inputs, and the absence of well-equipped agricultural laboratory that may affect their ability to engage in effective professional development. This study is grounded on desktop research design. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines was used to ensure the transparency and rigor of the review process in articles selection. The results of the study indicate that curriculum and pedagogy, teaching practice duration, mentoring and supervision, professional learning opportunities and field experiences, Personal Characteristics and Motivation and School and Classroom Context are key factors influencing the professional development of pre-service agriculture teachers in Kenya. Adequate mentorship, improvement of pedagogical methods, supporting preservice teachers makes the practical implications of the study results. Therefore, to engage pre-service teachers in reflection and active learning, curriculum and pedagogy should use technology and experiential learning. Teacher education programs and institutes should concentrate on updating Kenyan agricultural education curricula. To help pre-service teachers improve, professional development could include mentoring and monitoring. Teacher educators and administrators should mentor and oversee classroom skills.

Keywords: Professional development, teaching practice, agriculture, pre-service teachers

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1. Introduction

Agricultural education in Kenya holds a central position in the nation's socio-economic development due to its heavy reliance on agriculture as a primary economic sector (Njura, Kubai, et al., 2020). Ensuring the preparation of the next generation of agricultural leaders and professionals is of paramount importance to safeguard food security, stimulate economic growth, and foster sustainable agricultural practices. At the heart of this critical mission lies the imperative cultivation of effective pre-service agriculture teachers who possess the competencies to impart the essential knowledge and skills to students. Pre-service play a pivotal role in equipping the agriculture students for careers within the agricultural sector and catalyzing innovation in agricultural practices (Sarfo & Mutepfa, 2021).

Kenya's economy heavily relies on agriculture, with a substantial portion of the population engaged in farming and related activities (Onyalo, 2019). The agriculture sector not only provides employment to a significant proportion of the workforce but also contributes significantly to the country's gross domestic product (GDP). Given this context, the quality of agricultural education is instrumental in determining the sector's growth, productivity, and sustainability. Without a well-prepared cadre of pre-service agriculture teachers, the transmission of crucial agricultural knowledge and skills to the next generation would be compromised, potentially leading to inefficiencies in the agricultural sector (Njura, Kaberia, et al., 2020).

Pre-service agriculture teachers serve as key conduits in transferring not only technical agricultural expertise but also the latest innovations and sustainable practices to students (Morey, 2020). These educators bridge the gap between traditional agricultural practices and modern, sustainable farming methods. In doing so, they equip students with the capacity to address contemporary agricultural challenges such as climate change, food security, and the adoption of cutting-edge technologies. Moreover, these educators play an instrumental role in instilling a passion for agriculture among students. Making agricultural education engaging and relevant, pre-service agriculture teachers can inspire the next generation to pursue careers in agriculture, agribusiness, and related fields (Hartmann & Martin, 2021). Professional development is a purposeful process aimed at equipping pre-service agriculture teachers with the necessary knowledge, competencies and attitudes required for effective teaching and facilitation of learning. It extends beyond initial teacher training and encompasses lifelong learning, growth, and adaptation to meet the evolving demands of the agricultural sector(Nousheen et al., 2020).

2. Review of Literature

This section presents literature on the components of professional development and the factors influencing professional development among preservice teachers.

2.1. Components of Professional Development

Development of Professional Documents (Lesson Plans, Records of Work, and Schemes of Work)

The development of professional documents is a foundational aspect of pre-service teacher professional development, particularly in the context of agricultural education (Dos-Santos, 2020). These documents, which include lesson plans, records of work, and schemes of work, serve as essential tools that guide educators in their teaching endeavors and contribute to the overall effectiveness of the educational process. Lesson plans are crafted documents that outline the objectives, content, instructional strategies, and assessment methods for a specific lesson (Nurtanto et al., 2021). Pre-service agriculture teachers undergo training to design comprehensive lesson plans that align with curriculum objectives. Effective lesson planning ensures that instructional goals are clear, learning activities are engaging, and assessments are aligned with desired outcomes. Lesson plans also facilitate time management and organization in the classroom, allowing educators to cover the necessary content within the allocated time frame (Nagro et al., 2019). Records of work is another professional document that provide a systematic way for educators to document and keep track of what has been taught and learned (Hernández-Rodríguez et al., 2021). These records serve as a valuable reference for educators, enabling them to reflect on past lessons, track student progress, and adjust their teaching strategies as needed. Records of work ensure continuity and coherence in instruction, preventing unnecessary repetition of content and ensuring that all required topics are adequately covered over the course of the academic year.

Additionally, schemes of work offer a broader perspective, outlining the curriculum for an entire academic year or term (Calderhead, 2021). Pre-service agriculture teachers are trained to create schemes of work that provide an overview of the content to be covered, the sequence of topics, and the allocation of time for each unit. Schemes of work aid in long-term planning and curriculum alignment, ensuring that the educational program remains on track to meet its objectives. They also enable educators to identify connections between different units and ensure a logical progression of concepts throughout the academic year (Legrain et al., 2019).

Classroom instruction and management

Classroom instruction and management are pivotal components of professional development for pre-service agriculture teachers. Effective instruction methods and classroom management techniques significantly influence the quality of education delivered to students (Lekwa et al., 2019). In the realm of classroom instruction, pre-service teachers receive training on innovative pedagogical approaches and instructional strategies. They learn how to engage students actively in the learning process by incorporating active learning techniques, group activities, and hands-on experiences. These approaches foster student participation, critical thinking, and a deeper understanding of agricultural concepts. Moreover, pre-service teachers are equipped with the skills to adapt their instruction to meet the diverse needs of their students, ensuring that all learners have equitable access to educational opportunities (Kariuki et al., 2020). Classroom management

strategies are equally essential for creating and maintaining a positive and productive learning environment. Pre-service teachers learn how to establish clear expectations and rules in the classroom, which contribute to a well-structured and orderly atmosphere. Effective classroom management techniques enable educators to manage student behavior, address disciplinary issues, and facilitate smooth transitions between activities. A well-managed classroom not only enhances the learning experience but also creates a safe and respectful space for both educators and students (Franklin & Harrington, 2019).

Curriculum Enhancement

Curriculum enhancement stands as a cornerstone within the context of professional development in agricultural education. It revolves around the continuous improvement and alignment of educational curricula with contemporary agricultural practices and emerging technologies. This critical component is multifaceted and encompasses a range of significant aspects. Curriculum enhancement involves the updating of educational materials. Outdated textbooks, resources, and teaching aids are meticulously revised or replaced to incorporate the latest advancements and knowledge in the agricultural sector (Lee & Perret, 2022). This ensures that pre-service agriculture teachers have access to the most current and relevant materials for their teaching endeavors (Kariuki et al., 2020). Curriculum enhancement entails the incorporation of real-world examples into the teaching materials. This approach enriches the curriculum with practical relevance by including real-world case studies, success stories, and examples that illustrate the tangible application of theoretical concepts. Through connecting classroom learning to real-life scenarios, students gain a deeper understanding and motivation for their studies(Leary & Sherlock, 2020). In addition, ensuring the continued relevance of the curriculum is a central aspect. The content taught to students must align with the ever-evolving agricultural landscape. To achieve this, pre-service agriculture teachers and educational institutions must stay informed about emerging agricultural practices and technologies. Collaboration with industry experts and practitioners plays a vital role in this regard, ensuring that the curriculum remains in sync with the demands and needs of the agricultural sector (Ichsanudin et al., 2019). This not only benefits educators but also positions students to graduate with knowledge that is directly applicable to their future careers.

Experiential Learning

Experiential learning constitutes a pivotal component of professional development in agricultural education. This component underscores the integration of hands-on, practical learning experiences into the curriculum, aiming to bridge the gap between theory and practice. Within experiential learning, several key aspects are of paramount importance. Use of field trips are organized to agricultural sites, farms, and research facilities (Delacruz, 2019). These excursions provide students with invaluable opportunities to witness real-world agricultural practices and interact with professionals in the field. Through exposing students to the practical aspects of agriculture, these field trips deepen their understanding and appreciation of the subject matter (Cosby et al., 2022).

In addition, practical exercises are designed to enable students to apply theoretical knowledge in simulated or actual agricultural settings. These exercises serve to develop practical skills and instill confidence in students, preparing them for the demands of real-world agricultural work. Experiential learning bridge the gap between abstract concepts and tangible skills (Fromm et al., 2021). Furthermore, hands-on activities form an integral part of experiential learning. These activities encompass a wide range of practical tasks, from soil testing to crop cultivation and livestock management. Engaging in hands-on activities allows students to actively apply their knowledge and gain practical experience (Yannier et al., 2020). This not only reinforces classroom learning but also prepares students for future careers in agriculture.

TechnologyIntegration

Technology integration is a pivotal component of professional development in agricultural education, acknowledging the essential role of technology in modern classrooms (Falloon, 2020). This component focuses on equipping pre-service agriculture teachers with the skills and knowledge necessary to effectively integrate technology into their teaching methodologies. Professional development programs provide educators with training on utilizing digital tools, software applications, and online resources that enhance the learning experience. This integration fosters digital literacy among students and facilitates access to a wealth of digital agricultural resources. In essence, technology integration ensures that students are prepared to thrive in a digitalized agricultural landscape, staying up-to-date with emerging technologies and practices (Farjon et al., 2019).

2.2 Factors influencing Professional Development

The professional development of pre-service agriculture teachers is influenced by various factors, as evidenced by a comprehensive review of the extant literature.

Curriculum and pedagogy

The educational program and teaching methods utilized in agricultural education programs have a significant impact on the professional growth opportunities of pre-service agriculture instructors in secondary schools in Kenya. The agricultural education program's content and structure are determined by the curriculum, whereas the instructional strategies, methods, and approaches employed to deliver the curriculum are encompassed by pedagogy(Ryu et al., 2019). When the curriculum and pedagogy are appropriately crafted and current, it is more probable that pre-service agriculture educators will participate in significant professional development endeavors that enrich their content knowledge, teaching abilities, and pedagogical methodologies (Sun, 2021). The incorporation of experiential learning prospects, including field trips, farm visits, and practical exercises, into the curriculum are some of the key pedagogical approaches that exposes pre-service teachers to the real world. As per the findings of Omare et al. (2020) the provision of experiential

learning opportunities to pre-service teachers can significantly augment their comprehension of agricultural concepts and practices by offering them practical, real-world experiences. The aforementioned experiences can also serve as a catalyst for the enhancement of their pedagogical aptitude, as they acquire knowledge on the efficient integration of experiential learning in their forthcoming teaching methodologies.

In the contemporary digital age, the assimilation of technology into agricultural education curricula helps educators with prospects to cultivate their digital literacy proficiencies, investigate pioneering pedagogical approaches in order to be updated with most recent agricultural methodologies and technologies. Kanyoi (2020) assert that the utilization of technology, including computer simulations, e-learning platforms, and agricultural applications, has the potential to augment the involvement, impetus, and self-regulated learning of pre-service educators. The integration of technology as a teaching and learning tool in the curriculum and pedagogy has a positive impact on pre-service agriculture teachers' engagement in professional development activities. This, in turn, enhances their ability to effectively incorporate technology into their future teaching practices.

Mentoring and Supervision

Mentoring and supervision are critical factors that influence the professional development of pre-service agriculture teachers (Yalcin-Arslan, 2019). Mentoring involves an experienced teacher providing guidance, support, and feedback to a pre-service teacher, while supervision involves monitoring and evaluating the performance of pre-service teachers during their teaching practice. Effective mentoring and supervision can enhance the pedagogical skills, confidence, and overall professional development of pre-service agriculture teachers. However, research indicates that pre-service agriculture teachers in Kenya often lack adequate mentoring and supervision opportunities, which can hinder their professional growth (Githui, 2020).

Professional Learning Opportunities

Professional learning opportunities, such as workshops, seminars, conferences, and continuing education programs, are crucial for the professional development of pre-service agriculture teachers (Ogbuanya & Shodipe, 2022). These opportunities allow pre-service teachers to update their knowledge, learn new teaching strategies, and interact with other professionals in the field of agriculture and education (Peterson-Ahmad & Hovey, 2019).

Personal Characteristics and Motivation

The personal characteristics and motivation of pre-service agriculture teachers also play a crucial role in their professional development. Factors such as self-efficacy, intrinsic motivation, and professional identity can impact the engagement, commitment, and overall growth of pre-service teachers (Berger & Lê Van, 2019). Pre-service agriculture teachers who have higher levels of self-

efficacy, intrinsic motivation, and professional identity are more likely to engage in continuous professional development and become effective teachers (Huang & Wang, 2021). Therefore, it is essential to consider the personal characteristics and motivation of pre-service agriculture teachers in designing professional learning programs that can effectively enhance their professional development.

School and Classroom Context

The school and classroom context in which pre-service agriculture teachers work also influences their professional development (Dumlao et al., 2019). Factors such as school leadership, school resources, classroom environment, and student diversity can impact the opportunities and challenges that pre-service teachers encounter in their teaching practice. Research indicates that a supportive school and classroom context, characterized by effective leadership, adequate resources, conducive classroom environment, and diverse student population, can positively influence the professional development of pre-service agriculture teachers (Wang et al., 2022). On the other hand, a challenging school and classroom context, characterized by lack of resources, poor leadership, and classroom management issues, can hinder the professional growth of pre-service teachers. During teaching practice in Kenya, student-teachers of agriculture are expected to conduct actual classroom instruction and develop projects in either Biology or agriculture. However, the competence is likely to vary based on the extent to which the schools where students are conducing teaching practice offer them support in terms of teaching and learning resources.

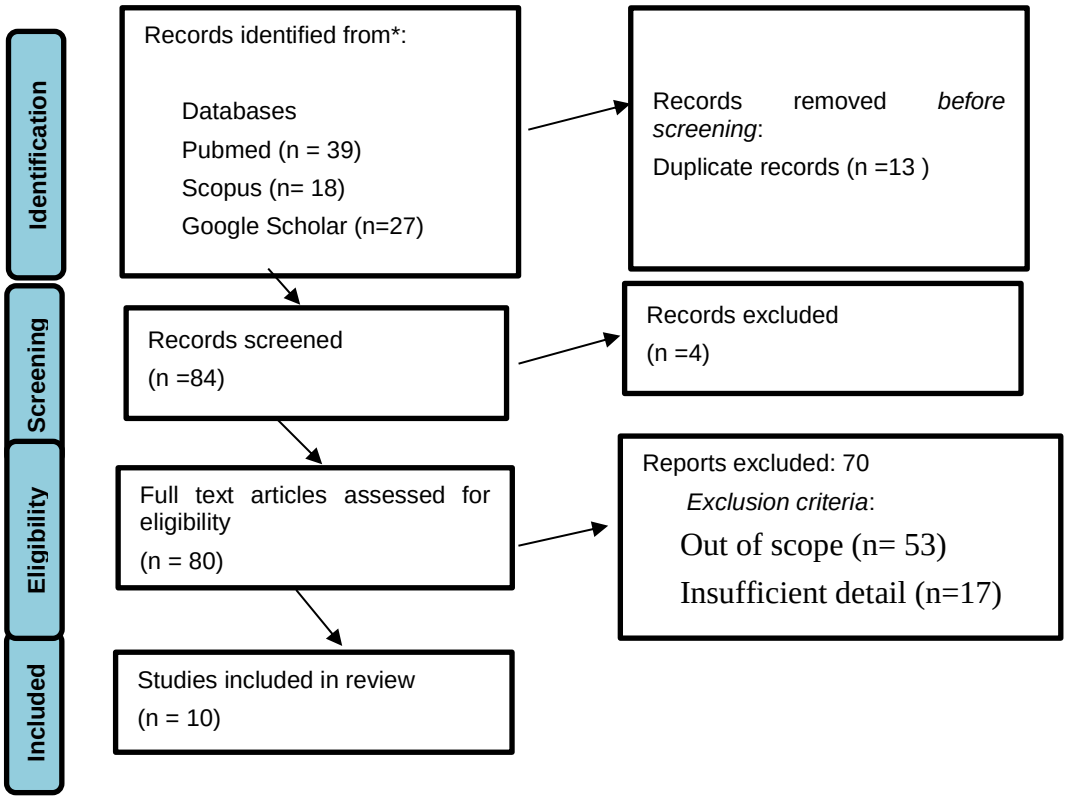
Teaching practice Duration

Several studies have investigated the influence of teaching practice duration on professional development among pre-service teachers in various contexts. For example, a study by Peterson-Ahmad & Hovey (2019) examined the perceptions of pre-service agriculture teachers towards the duration of teaching practice and its impact on their professional development. The study found that pre-service agriculture teachers who had a longer duration of teaching practice reported higher levels of professional development, including improved pedagogical skills, increased confidence, and better classroom management strategies. Similar findings were reported in other studies conducted in different countries and contexts, where a longer duration of teaching practice was associated with better professional development outcomes for pre-service teachers (Cilliers et al., 2020). However, not all studies have found a positive relationship between teaching practice duration and professional development. For example, a study by García-González et al. (2020) , found that the duration of teaching practice did not significantly influence the professional development of pre-service agriculture teachers. The study argued that other factors, such as the quality of mentoring, the nature of teaching practice tasks, and the support provided during teaching practice, might have a more significant impact on professional development than the duration of teaching practice alone.

Effective mentoring, feedback, and guidance during teaching practice can contribute to the development of teaching skills, pedagogical knowledge, and reflective practice (Nyanjom, 2020). Furthermore, the nature of teaching practice tasks and the opportunities provided to pre-service teachers during teaching practice can also impact their professional development. For example, pre-service teachers who are assigned a variety of tasks, such as lesson planning, classroom management, and assessment, during teaching practice may have a more comprehensive understanding of the teaching profession and develop a wider range of teaching skills (Nagro et al., 2019).

3. Methodology

3.1. Research Design: A systematic literature review was conducted to synthesize the existing research on the factors influencing the professional development of pre-service agriculture teachers in Kenyan secondary schools. Figure 1 followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure the transparency and rigor of the review process as shown.



. Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines

3.2. Search Strategy: A comprehensive search of the literature was conducted in electronic databases, including Google Scholar, ERIC, Scopus, and Web of Science, covering the years 2018

to 2023. The search was conducted using a combination of keywords and Boolean operators, including "pre-service teachers," "agriculture teachers," "professional development," "factors," and related terms. The search was limited to articles published in English.

3.3. Inclusion and Exclusion Criteria: Articles were included in the review if they met the following criteria: (a) focused on pre-service agriculture teachers in secondary schools, (b) examined factors influencing their professional development, (c) published in peer-reviewed journals between 2018 and 2023, (d) written in English, and (e) included empirical research, theoretical papers, and systematic reviews. Articles that did not meet these criteria or were duplicates were excluded.

3.4. Data Collection and Analysis: The selected articles were screened for relevance based on their titles and abstracts. The full texts of the relevant articles were then retrieved and assessed for eligibility based on the inclusion and exclusion criteria. Data from the included articles were extracted, including authors, year of publication, research design, sample size, data collection and analysis methods, and findings related to the factors influencing the professional development of pre-service agriculture teachers in secondary school.

4. Results and Discussion

The results of the study are presented in a tabulated format below followed by the discussions of the findings.

Table 1. The matrix that depicts the identified factors influencing professional development

Author(s)/year	Research topic	Study variables/Objectives/ Questions	Methodology	Results	Conclusion	Implication
Njura, Kubai, et al. (2020)	The Relationship between Agricultural Teaching Approaches and Food Security in Kenya	Experiential learning (Agricultural class projects, Field trips, problem solving and digital learning)	Descriptive survey employing quantitative method using mixed sampling method (random and non-random sampling)	Agriculture teachers felt that experiential learning was significant in skill development and promotion of food security in Kenya	Some teaching approaches like lecturing had a negative effect on agricultural skills development	The selected teaching method has not only an influence on agricultural skill development but also on food security
Lekwa et al. (2019)	Measuring Teacher Practices and Student Academic Engagement: A Convergent	What is the relationship between teacher instruc- tional and behavior management strategies as measured by the CSAS-O and academic engagement as measured by Cooperative Learning Obser-	Quantitative (107 teachers and 2000 students too part in the study)	Effective instruction methods and classroom management techniques significantly influence the quality of	Classroom Strategies Assessment System CSAS scores indicating higher quality instruction	Student engagement is influenced by teachers, or more precisely by the strategies they use, and this in turn affects

	Validity Study	vational Code for Kids (CLOCK), and (2) does assessment of teacher instructional and behavior manage- ment strategy use predict patterns of academic engagement when lesson format and class size are controlled?		education delivered to students	and behavior management were associated with higher student engagement	learning and social behavior. For this reason, direct evaluation of particular behavior control and instructional strategies may be a useful tool for directing and assessing teachers' P.D.
Ryu et al. (2019)	Preservice teachers' experiences of STEM integration: challenges and implications for integrated STEM teacher preparation	Integrated STEM education, Preservice teachers' learning experiences from a situative perspectives and structure and instructional practices	Semi structured Interviews where six respondents were interview	The results indicated that lack of role models and the nature of curriculum was too rigid to promote agricultural professional skills.	Establishing partnerships with teachers and increasing role models will contribute to agricultural skills like class room management lesson development and technology integration	Limited time, rigid curriculum, lack of interdisciplina ry understanding limits preservice teachers' professional development.
Coenders and Verhoef (2019)	Lesson Study: professional development (PD) for beginning and experienced teachers	Lesson study cycle for collaboration between experienced and beginning teachers	Qualitative multiple case study was used for this study. The study used video recordings and interview to collect data	Two groups for Lesson Study emerged, where participants exchanged ideas, opinions, and experiences about teaching and learning. Lesson Study aided in the PCK development of both beginner and experienced educators.	The beginning teachers in teaching profession are more flexible in adopting various skills as opposed to experienced teachers.	Despite professional development being a continuous process, initial teacher training (at university/coll ege) has a great influence on the way teachers promote their teaching.
Chai (2019)	Teacher Professional Development	1).Notable trends of research in STEM TPD? 2. The rationales for the	The study used Desktop approach with	The results indicated that the teachers	Hands on activities requires	This study was based on destop study

	for Science, Technology, Engineering and Mathematics (STEM) Education: A Review from the Perspectives of Technological Pedagogical Content (TPACK)	conduct of STEM TPD? 3. pedagogical/theoretical foundations of teacher professional development for STEM? 4. What are the content foci? 5. What are the roles of technology?	much focus on STEM course	conducting hands on activities required more time, which was a limiting factor. The teaching and learning resources also contributed to the teaching methods and professional development. Integration of technology in education not only promotes communication but collaboration	teachers to integrate technology and lesson improvements in their teaching	which may be limited in scope. The study recommends empirical studies to examine the study variables.
Gore and Rosser (2022)	Beyond content-focused professional development: powerful professional learning through genuine learning communities across grades and subjects	The impact of pedagogy-focused approach to Professional Development -Quality Teaching Rounds (QTR)	The study utilized qualitative method which was informed by interviews	Using Quality Teaching (QT) and Quality Teaching Rounds QTR, pedagogy-focused professional development provided teachers with valuable information into their students and pedagogy. Even when QTR ended, it improved collegiality, altered their attitudes and behaviors, and encouraged continued professional collaboration within the larger school community.	QTR is a significant way of improving professional development through advancing pedagogical approach	School reform is greatly aided by a professional development strategy that engages teachers in transformative professional learning across traditional boundaries, rather than just emphasizing subject.
Easterly III et al. (2021)	Exploring How	Teacher resources, Instructional resources	Qualitative method where	School factors, individual	Inability of schools to	Administrators at schools

	COVID-19 Impacted Selected School-based Agricultural Education Teachers in the United States	and pedagogical design capacity	four teachers were interviewed	factors (teacher wellbeing, fatigue) greatly influenced agriculture teachers' professional skills especially during COVID-19. During COVID-19, most schools were not able to offer adequate resources like technology and other instructional resources thus making teachers' classroom management a challenge.	provide resources negatively impacted Future Farmers of America FFA opportunities and PDC models	should review their rules and resource distributions to ensure they are better equipped to handle a similar issue in the future.
Toombs et al. (2022)	The Impact of a Project-Based Learning Experience on the SAE Self-Efficacy of Preservice Teachers	students' perceived SAE self-efficacy change over the semester, students' perceptions of the Supervised Agricultural Experience (SAE) components of the course and How does the qualitative data explain the quantitative changes in SAE self-efficacy	Mixed methodology where both qualitative and quantitative data was collected	The mentorship and the instructors' teaching experience greatly influenced the pre-service teacher's professional development in SAE projects	Institutions that prepare preservice school-based agricultural education (SBAE) instructors should be encouraged to integrate project-based, real-world SAE supervision activities into their existing curricula, even though the experiential learning activity might not be applicable	Use of project based learning greatly increases the skill and professional development among preservice agriculture teachers.

					to all of them.	
Kosko et al. (2021)	Preservice Teachers' Professional Noticing When Viewing Standard and 360 Video	utilization of a novel format (360-degree video) in relation to the professional observation of preservice teachers	Mixed methods (qualitative and quantitative methods)	The quality and depth of preservice teachers (PSTs') professional noticing may be enhanced by employing 360-degree video as opposed to traditional video, according to this study's empirical findings.	Advanced technology integration in classroom instruction requires quality preservice training and provision of ICT resources.	These results imply that 360-degree video could be a promising tool for enhancing teacher preparation.
Roberts et al. (2020)	The Dimensions of Professional Development Needs for Secondary Agricultural Education Teachers Across Career Stages: A Multiple Case Study Comparison	Presage variables, context variables and product variables	Cross case analysis that involved 66 agriculture teachers	Presage variables (personal struggle, work life balance and content knowledge), context variables (building agricultural education, diverse students in class and facility management) and product variables (pedagogy, technology and student motivation) had a positive influence on students' academic performance.	Supervised agricultural experiences (SAE) positively motivates preservice teacher's professional development as they learn through hands on activities.	For mid-career and career teachers, the growing need for advocacy training, instruction of diverse pupils, and assistance with grant applications could provide a foundation for investigating professional development opportunities.

Experiential learning opportunities, such as field trips, farm visits, and practical exercises, are highlighted as key pedagogical approaches that expose pre-service teachers to real-world experiences (Marttinen et al., 2020). These experiences can enhance their comprehension of

agricultural concepts and practices, as well as their pedagogical aptitude, by providing them with practical, hands-on learning opportunities. The integration of technology into agricultural education curricula is also emphasized as a way to cultivate digital literacy skills and explore innovative pedagogical approaches that incorporate the latest agricultural methodologies and technologies (Manning et al., 2022). Mentoring and supervision are identified as critical factors that influence the professional development of pre-service agriculture teachers. Effective mentoring, provided by experienced teachers, and supervision, which involves monitoring and evaluating the performance of pre-service teachers during their teaching practice, can enhance their pedagogical skills, confidence, and overall professional development. However, the lack of adequate mentoring and supervision opportunities in Kenya is identified as a hindrance to the professional growth of pre-service agriculture teachers (Njenga, 2023).

Professional learning opportunities, such as workshops, seminars, conferences, and continuing education programs, are recognized as crucial for the ongoing professional development of pre-service teachers. These opportunities allow them to update their knowledge, learn new teaching strategies, and interact with other professionals in the field of agriculture and education. The personal characteristics and motivation of pre-service teachers, such as self-efficacy, intrinsic motivation, and professional identity, are also identified as influential factors in their professional development (Karaolis & Philippou, 2019). Higher levels of these characteristics are associated with increased engagement in continuous professional development and effectiveness as teachers. The school and classroom context in which pre-service agriculture teachers work is acknowledged as another significant factor that can influence their professional development. A supportive school and classroom context, characterized by effective leadership, adequate resources, conducive classroom environment, and diverse student population, can positively influence their professional growth (Okilwa et al., 2022). On the other hand, a challenging school and classroom context, characterized by lack of resources, poor leadership, and classroom management issues, can hinder their professional development (Park & Son, 2022). Some studies have found that a longer duration of teaching practice is associated with better professional development outcomes, including improved pedagogical skills, increased confidence, and better classroom management strategies (Karataş & Tuncer, 2020).

5. Conclusions

In conclusion, the results of this discussion highlight the significant impact of curriculum, pedagogy, mentoring and supervision, professional learning opportunities, personal characteristics and motivation, school and classroom context, and teaching practice duration on the professional development of pre-service agriculture teachers in Kenya. When the curriculum and pedagogy are appropriately designed, incorporating experiential learning opportunities and technology, pre-service teachers are more likely to engage in meaningful professional development activities that enrich their content knowledge and teaching skills. Adequate mentoring and supervision, supportive school and classroom contexts, and longer teaching practice durations also positively

influence the professional growth of pre-service teachers. Furthermore, considering the personal characteristics and motivation of pre-service teachers is crucial in designing effective professional learning programs. These findings highlight the importance of a comprehensive approach to professional development in agricultural education programs in Kenya to ensure the preparation of competent and effective agriculture instructors for secondary schools. Further research and efforts are needed to address the challenges and gaps in professional development opportunities for pre-service agriculture teachers in Kenya and other similar contexts.

6. Implications of the Study

Curriculum and pedagogy should be carefully designed to incorporate experiential learning opportunities and technology, promoting active engagement and reflective practice among pre-service teachers. Teacher education programs and institutions should prioritize the development of relevant and up-to-date curricula that align with the needs of the agricultural education sector in Kenya. Additionally, mentoring and supervision should be integrated into the professional development process, providing pre-service teachers with guidance, feedback, and support as they develop their teaching skills. Teacher educators and school administrators should establish effective mentoring and supervision systems that facilitate the transfer of theoretical knowledge to practical classroom skills. Efforts should also be made to create supportive school and classroom contexts that foster a positive learning environment for pre-service teachers. School administrators should create conducive environments that encourage innovation, collaboration, and continuous professional growth among teachers, while ensuring access to necessary classroom resources.

7. Declaration of Conflicting Interests and Ethics

The authors declare no conflict of interest.

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