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Integrating Agricultural Science and Community Knowledge through Service-Learning to Enhance Food Security: A Participatory Lens

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ABSTRACT

Food security is a growing concern on the African continent. Creative ways are required to maximise the quantity and quality of food production in society to meet the needs of the community and learners that form part of the increasing population. As an approach, service-learning can potentially merge academic learning with community engagement to address food security issues. However, when community wisdom is disregarded as equal to formal education, significant information may be omitted, hindering all stakeholders' deep learning. This paper aimed to create a service-learning experience that allows learners and the community to learn agricultural science and practice sustainably to address food security. Data was generated in four cycles of a participatory action research design, using vegetable garden and livestock management strategies. The thematic analysis indicated that the process gave 10 participants a better understanding of managing vegetable gardens and livestock farming sustainably. The participants valued Western knowledge without neglecting the local wisdom perspectives shared throughout the process. This reciprocal learning boosted development on personal and professional levels. The study proposes that food security cannot be effectively addressed by favoring one dominant knowledge system. Instead, blending local wisdom and Western perspectives, when applied with care, could eradicate poverty and hunger and promote sustainable food production in Africa.

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INTRODUCTION

Food insecurity remains a persistent global crisis despite efforts by various organisations and governments to combat it.[1] In 2015, the United Nations issued a global call to action to address environmental crises such as water scarcity, poverty, and hunger by 2030 through sustainable practices. These practices align with the 17 Sustainable Development Goals (SDGs), which seek to tackle socio-

[1] FAO, *The State of Food Security and Nutrition in the World 2022* (Rome: FAO, 2022), https://doi.org/10.4060/cc0639en; FAO, *The State of Food Security and Nutrition in the World 2023* (FAO; IFAD; UNICEF; WFP; WHO, 2023), https://doi.org/10.4060/cc3017en.

economic challenges, including SDG 2, which aims to end hunger in all its forms.[2] Despite these efforts, approximately twenty-seven million people in West Africa are experiencing severe hunger, the highest number in ten years.[3] During the COVID-19 pandemic, the number of food-insecure households increased, worsening the current crisis in Africa. It is estimated that by 2030, about 670 million people, 8% of the world's population, will still face hunger.[4] The FAO, other organisational agencies, and the agriculture sector warn that "if extra measures are not put in place, the goal to end hunger will remain unachievable", particularly in the face of extreme climate variability and economic contractions.[5] In this context, education and community collaboration become increasingly imperative. Knowledge sharing and mutual learning are essential to enhancing the community's implementation of sustainable practices to address socio-economic issues such as hunger and poverty.[6] Empowering individuals through service learning enables them to contribute effectively to food security initiatives and resilience-building efforts. Service learning was introduced in education to enhance authentic collaboration by providing learners with real-world experiences that connect academic learning to community needs, fostering teamwork, empathy, and social responsibility.[7] Attempts at community engagement often become one-sided when lacking clear motives, interests, and purpose.[8] Research has highlighted challenges in service learning, which frequently appear one-sided. Scholars have emphasised shifting from a "philanthropic" and "paternalistic" approach to a more collaborative model grounded in mutual understanding, democratic participation, and dialogic relationships.[9] This approach fosters open communication, enabling the collaborative discovery of problems and solutions.

This study focused on creating knowledge partnerships between agricultural science learners in farm schools and local community farmers. The aim is to foster knowledge into this partnership to push towards sustainable backyard farming, which seems to be a challenge as many households are food insecure. Emphasis is placed on integrating classroom learning with community wisdom, allowing learners to benefit from formal education and practical, community-based knowledge. These partnerships in agricultural science seek to combat food insecurity more sustainably. Incorporating sustainable agriculture practices in class and community engagement projects, the researchers aimed to facilitate exchanges of mutual interest, ideas, and strategies. This approach encourages learners to examine their classroom knowledge critically, accept beliefs about the "other", and develop ideas on how "others" sustain vegetable gardens and livestock, regardless of their historical background, gender, race, and existing knowledge. Scholars have demonstrated much to learn from indigenous and community-based approaches to food insecurity, change adaptation, resilience and disaster preparedness.[10] However, Indigenous knowledge systems (IKS) are generally not foregrounded in primary education without clear instruction to incorporate them in school subjects such as agriculture. The South African Curriculum Assessment Statement Policy (CAPS) shows appreciation of

[2] UNDP, "SDG's in Action," Sustainable Development Goals, August 24, 2024, https://www.undp.org/sustainable-development-goals.
[3] Albert Sasson, "Food Security for Africa: An Urgent Global Challenge," *Agriculture & Food Security* 1, no. 1 (December 19, 2012): 2, https://doi.org/10.1186/2048-7010-1-2; A. Herforth et al., *Cost and Affordability of Healthy Diets across and within Countries*, 1st ed. (Rome, Italy: FAO, 2020), https://doi.org/10.4060/cb2431en.
[4] Herforth et al., *Cost and Affordability of Healthy Diets across and within Countries*.
[5] FAO, *The State of Food Security and Nutrition in the World 2023*.
[6] Mariantonietta Fiore et al., "Investigating the Role of Community of Practice for Sharing Knowledge in Agriculture Sector," *J. for Global Business Advancement* 13, no. 2 (2020): 162, https://doi.org/10.1504/JGBA.2020.10032926.
[7] Christine M. Cress, Vicki L. Reitenauer, and Peter J. Collier, *Learning Through Serving* (New York: Routledge, 2023), https://doi.org/10.4324/9781003445692.
[8] Andrew J. Martin and Martin Dowson, "Interpersonal Relationships, Motivation, Engagement, and Achievement: Yields for Theory, Current Issues, and Educational Practice," *Review of Educational Research* 79, no. 1 (March 1, 2009): 327–65, https://doi.org/10.3102/0034654308325583.
[9] Robert G. Bringle, Mathew Johnson, and Patrick M. Green, *Crossing Boundaries* (New York: Routledge, 2023), https://doi.org/10.4324/9781003443926.
[10] Eranga K Galappaththi and Anna Schlingmann, "The Sustainability Assessment of Indigenous and Local Knowledge-Based Climate Adaptation Responses in Agricultural and Aquatic Food Systems," *Current Opinion in Environmental Sustainability* 62 (June 2023): 101276, https://doi.org/10.1016/j.cosust.2023.101276.

Indigenous Knowledge as a vital part of the curriculum, and learners are encouraged to explore and understand it as part of their education.[11]

Encouraging learners and adopting community partnerships to share farming techniques and experiences can lead to a mutual understanding of food security, facilitated by providing farming expertise and services to the community.[12] Aligning with the call for democratic engagement between community members and education, the lack of formal integration of service learning in agricultural science education highlights the need to establish its educational benefits.[13]

The study explores the role of agricultural science learners' knowledge and community local farmer collaboration in combating food security through a service-learning approach. The study tasked learners with enhancing a farming area in local township schools, guided by these research questions: What can agricultural science learners and community participants learn from the process? What aspects of the democratic engagement process enhance mutually beneficial learning outcomes? What recommendations can inform the development of future service-learning initiatives in agricultural science programs to address food security? The study first conceptualises service learning as a transformative teaching approach, service learning for transformative teaching, agriculture science practices to promote social engagement and the role of indigenous knowledge from global, African and South African perspectives. In line with the focus of this special issue, this paper also reviews some of the works of Sechaba M. G. Mahlomaholo. It then outlines the research methods, followed by a critical discussion of emerging themes and their implications for integrating service learning into agricultural science education.

LITERATURE REVIEW

Service Learning for Transformative Teaching

This paper draws from the postmodern paradigm to explore the role of service learning in society, using experimental learning experience as the pedagogical foundation.[14] Experiential learning emphasises contextualisation, fostering partnerships between stakeholders (learners and the community) to transform beliefs, actions, and acceptance of social responsibility through community wisdom.[15] Mahlomaholo highlights that education should foster critical thinking and transformative learning, ensuring that knowledge goes beyond merely transmitting ideas to developing critical consciousness and capacity for social action.[16]

Thus, this study uses experiential theory to support teaching and learning through dialogical engagement rather than simply transferring undisputed scientific "truths".[17] The critical emancipatory theory views service learning from a post-positivist perspective, aiming to encourage questioning of

[11] Department of Basic Education (DBE), *Curriculum and Assessment Policy Statement Grades 7-9: Natural Sciences* (Cape Town: South Africa, 2011).
[12] Alexis Habiyaremye, "Co-Learning in University-Community Engagement for Sustainable Local Food Systems in South Africa," *Humanities and Social Sciences Communications* 10, no. 1 (November 14, 2023): 820, https://doi.org/10.1057/s41599-023-02350-1.
[13] Bekithemba Dube et al., "Creating Sustainable Learning Environments in the Era of the Posthuman: Towards Borderless Curriculum," *Journal of Curriculum Studies Research* 5, no. 1 (March 14, 2023): i–x, https://doi.org/10.46303/jcsr.2023.1; K. Resch and I. Schrittesser, "Using the Service-Learning Approach to Bridge the Gap between Theory and Practice in Teacher Education," *International Journal of Inclusive Education* 27, no. 10 (August 24, 2023): 1118–32, https://doi.org/10.1080/13603116.2021.1882053.
[14] Novella Zett Keith, "Community-Service-Learning-in-the-Face-of-Globalization," *Michigan Journal of Community Service Learning*, 2005, 5–24; Päivi Tynjälä and David Gijbels, "Changing World: Changing Pedagogy," in *Transitions and Transformations in Learning and Education*, ed. Päivi Tynjälä, Marja-Leena Stenström, and Marjatta Saarnivaara (Dordrecht: Springer Netherlands, 2012), 205–22, https://doi.org/10.1007/978-94-007-2312-2_13.
[15] Amrou Awaysheh and Drew Bonfiglio, "Leveraging Experiential Learning to Incorporate Social Entrepreneurship in MBA Programs: A Case Study," *The International Journal of Management Education* 15, no. 2 (July 2017): 332–49, https://doi.org/10.1016/j.ijme.2017.04.001.
[16] Sechaba Mahlomaholo, "Higher Education and Democracy: Analysing Communicative Action in the Creation of Sustainable Learning Environments: Part 1: Exploration of the Critical Relationship between Higher Education and the Development of Democracy in South Africa," *South African Journal of Higher Education* 28, no. 3 (2014): 678–96.
[17] David A. Kolb, Richard E. Boyatzis, and Charalampos Mainemelis, "Experiential Learning Theory: Previous Research and New Directions," in *Perspectives on Thinking, Learning, and Cognitive Styles* (Routledge, 2014), 227–48, https://doi.org/10.4324/9781410605986-9.

beliefs, attitudes, behaviors, norms, assumptions, and social structures.[18] Additionally, CER emphasises the political nature of education and promotes a dialectical approach to problem-solving within complex societal systems.[19] This theory has shifted our view of service learning from "expert help" to fostering democratic engagement and a shared knowledge pool to combat food security through reflective dialogue between learners and community members. This process ensures that all stakeholders validate decisions in the engagement process.[20] It is imperative to create a more equal balance of power, or democratic intimacy, which promotes fair social cohesion through participants' lived experiences.[21]

This paper allows agriculture science learners to engage with local farmers, sharing sustainable practices despite different life experiences. "Learning from community" helps learners appreciate classroom knowledge and local wisdom in addressing food security, aligning with SDG 2.[22] The South African CAPS curriculum aims to develop learners who are empathetic, democratic, and proactive in solving real-life problems.[23] Adopting service learning, this study challenges old assumptions and creates new knowledge, fostering collaboration to ensure equal access to nutritious food and promoting social engagement through agriculture science.[24]

Agriculture Science Practices to Promote Social Engagement

Agriculture is one of the sectors globally with the potential to unite people around common goals such as food production, sustainability, and community well-being. These initiatives encourage collaboration and create space for social interaction between stakeholders involved in food production by fostering group relationships and exploring collective experiences through farming.[25] Although food security itself was not the focus of the study, since neither group (learners and community farmers) were agriculture specialists, it served as a mediating tool to encourage goal-directed social interaction by creating awareness between two diverse groups of people and enhancing learners' knowledge with local insights that can be used to address real-life situations. As suggested, the researchers sought to create a convivial atmosphere to promote collaboration and participation as the participants worked together to plan, design, and implement their strategies for addressing food security in our communities.[26]

Community knowledge of farming is often situated outside the typical school environment, where learners do not learn about indigenous farming practices for sustainable food production. This includes the knowledge they gain from the classroom, which revolves around Western perspectives. On the other hand, community farmers may not have extensive knowledge of Western approaches to sustaining food. This discrepancy highlights the need for a community and learners willing to engage in dialogue to understand farming principles from both perspectives. This form of situational learning generates critical and experiential knowledge, leading to a better understanding of oneself and others.[27]

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[18] Sechaba Mahlomaholo and Milton Nkoane, "The Case for an Emancipatory Qualitative Research s on Assessment of Quality," *Educational Change* 6, no. 1 (2002).
[19] Molebatsi Milton Nkoane, "Critical Emancipatory Research for Social Justice and Democratic Citizenship," *Perspectives in Education* 30, no. 4 (2012): 98–104.
[20] Lídia Puigvert, Miranda Christou, and John Holford, "Critical Communicative Methodology: Including Vulnerable Voices in Research through Dialogue," *Cambridge Journal of Education* 42, no. 4 (December 20, 2012): 513–26, https://doi.org/10.1080/0305764X.2012.733341.
[21] Sechaba Mahlomaholo and Milton Nkoane, "The Case for an Emancipatory Qualitative Research s on Assessment of Quality."
[22] Melanie Miller Foster, "Creating Space for Student Action and Reflection on Sustainable Development Goal 2: Zero Hunger," 2023, 47–57, https://doi.org/10.1007/978-3-031-22856-8_3.
[23] Department of Basic Education, *National Curriculum Statement (NCS): Curriculum and Assessment Policy Statement (CAPS)* (Pretoria: Department of Education, 2011).
[24] Resch and Schrittesser, "Using the Service-Learning Approach to Bridge the Gap between Theory and Practice in Teacher Education."
[25] Gail Feenstra, "Creating Space for Sustainable Food Systems: Lessons from the Field," *Agriculture and Human Values* 19, no. 2 (2002): 99–106, https://doi.org/10.1023/A:1016095421310; Molly D. Anderson, "Rights-Based Food Systems and the Goals of Food Systems Reform," *Agriculture and Human Values* 25, no. 4(December 15,2008):593–608, https://doi.org/10.1007/s10460-008-9151-z.
[26] Galappaththi and Schlingmann, "The Sustainability Assessment of Indigenous and Local Knowledge-Based Climate Adaptation Responses in Agricultural and Aquatic Food Systems."
[27] David A Kolb, *Experiential Learning: Experience as the Source of Learning and Development* (FT press, 2014).

When high school learners and community farmers encounter complex and unfamiliar situations, such as food insecurity, they should be able to cope effectively and farm sustainably, given that climate change is another challenge for food security in Africa.[28] Collaboration in farming requires understanding interpersonal dynamics, including power, dependence, conflict resolution, and relationship building. The author believes that through social engagement in agriculture, they could agree on a solution aptly suited to this environment rather than an abstract idea that could probably be difficult to apply to solve food insecurity in the future.

Global, African, and South African Views on IKS

Literature from global, African, and South African sources highlights various efforts to address food insecurity, with research showing that farmers are actively collaborating on innovative strategies and raising awareness.[29] However, as noted, African narratives on indigenous knowledge (IK) often remain marginalised and are frequently dismissed as inadequate for scientific solutions despite increasing recognition.[30] This paper explores the potential synergy between agricultural science and community knowledge in addressing food security in South Africa through enhanced knowledge sharing and collaboration. Drawing on Malapane et al., who conducted a bibliometric analysis from 1990 to 2022, this study highlights the persistent divide between local knowledge and mainstream sectors such as education.[31] The analysis emphasises the need to recognise IK as crucial for addressing food security and calls for further research to bridge this divide.

a.

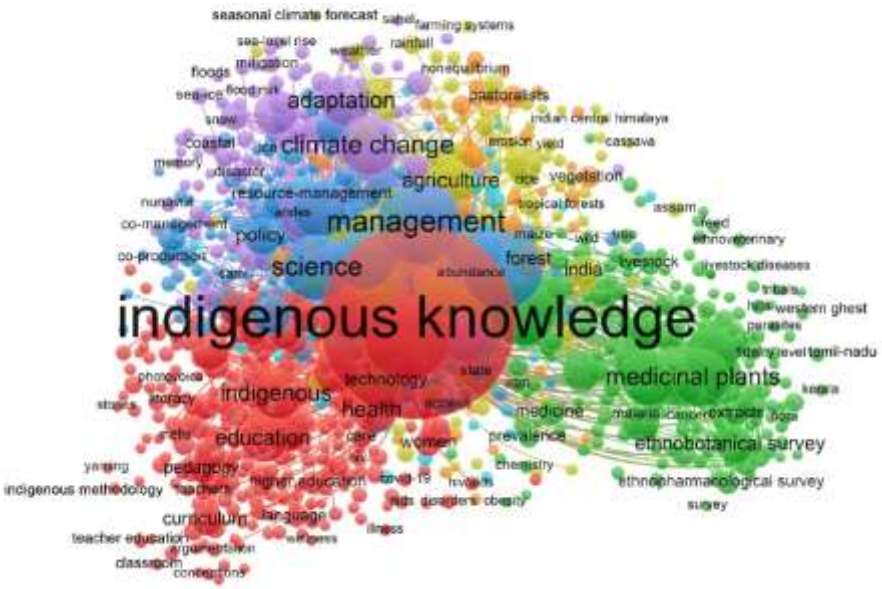

Figure 1a. Network visualisation map of co-occurring keywords in indigenous knowledge literature (a) global view, published from 1990 to 2020.[32]

[28] Hellen Joseph Njura, Isaac Kubai Kaberia, and Simon Thuranira Taaliu, "Teaching Secondary School Agriculture at the Psychomotor Domain: A Conceptual Framework for Enhanced Skills Development for Food Security," *The Journal of Agricultural Education and Extension* 27, no. 2 (March 15, 2021): 111–31, https://doi.org/10.1080/1389224X.2020.1816479.

[29] Alison Misselhorn and Sheryl L. Hendriks, "A Systematic Review of Sub-National Food Insecurity Research in South Africa: Missed Opportunities for Policy Insights," *PLOS ONE* 12, no. 8 (August 22, 2017): e0182399, https://doi.org/10.1371/journal.pone.0182399; Sandra Šūmane et al., "Local and Farmers' Knowledge Matters! How Integrating Informal and Formal Knowledge Enhances Sustainable and Resilient Agriculture," *Journal of Rural Studies* 59 (April 2018): 232–41, https://doi.org/10.1016/j.jrurstud.2017.01.020.

[30] Lerato Malapane et al., "Bibliometric Analysis and Systematic Review of Indigenous Knowledge from a Comparative African Perspective: 1990-2020," *Land* 11 (August 27, 2022): 1147, https://doi.org/10.3390/land11081167.

[31] Malapane et al., "Bibliometric Analysis and Systematic Review of Indigenous Knowledge from a Comparative African Perspective: 1990-2020."

[32] Malapane et al., "Bibliometric Analysis and Systematic Review of Indigenous Knowledge from a Comparative African Perspective: 1990-2020."

The figure above (1a) demonstrates the role of indigenous knowledge globally, emphasising the importance of incorporating indigenous methodologies into educational frameworks and environmental management practices. The red cluster, representing education and decolonisation, highlights the necessity of integrating IK into mainstream education to understand better and apply local community practices.[33] The blue cluster, focusing on environmental management, illustrates the critical role IK plays in sustainable development, suggesting that local wisdom should be more actively involved in global environmental strategies.

b.

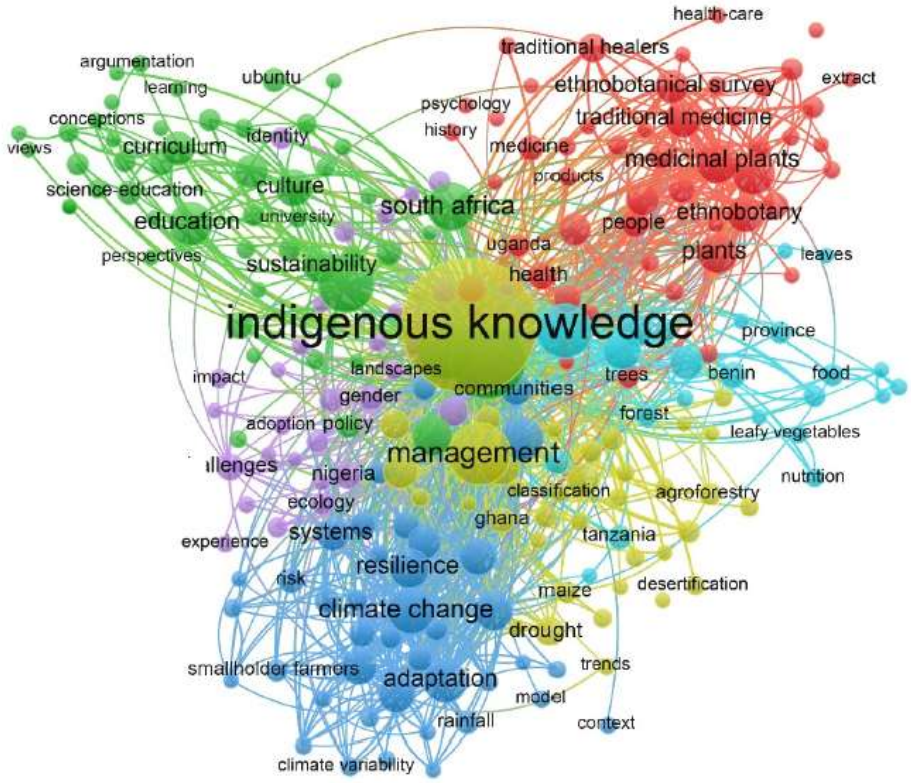

Figure 2b. Network visualisation map of co-occurring keywords in indigenous knowledge literature (b) African view published from 1990 to 2020.[34]

From an African viewpoint, figure (2b) above shows how IK is vital in managing environmental resources and supporting traditional health practices. The green cluster, which emphasises ethnobotany and traditional healing, highlights the significance of preserving and incorporating traditional knowledge into health and agricultural practices.[35] This figure also shows the relevance of IK in addressing climate change and environmental adaptation, with the purple cluster indicating that indigenous practices are crucial to resilience in the face of environmental challenges.[36] However, the analysis reveals that while IK is recognised in these areas, its full potential has not been fully integrated into African formal educational systems.

[33] Ahmad Cheikhyoussef et al., "Ethnobotanical Study of Indigenous Knowledge on Medicinal Plant Use by Traditional Healers in Oshikoto Region, Namibia," *Journal of Ethnobiology and Ethnomedicine* 7, no. 1 (December 9, 2011): 10, https://doi.org/10.1186/1746-4269-7-10.
[34] Malapane et al., "Bibliometric Analysis and Systematic Review of Indigenous Knowledge from a Comparative African Perspective: 1990-2020."
[35] Paul Sillitoe and Mariella Marzano, "Future of Indigenous Knowledge Research in Development," *Futures* 41, no. 1 (February 2009): 13–23, https://doi.org/10.1016/j.futures.2008.07.004.
[36] Julie L. Drolet, "Societal Adaptation to Climate Change," in *The Impacts of Climate Change* (Elsevier, 2021), 365–77, https://doi.org/10.1016/B978-0-12-822373-4.00011-2.

c.

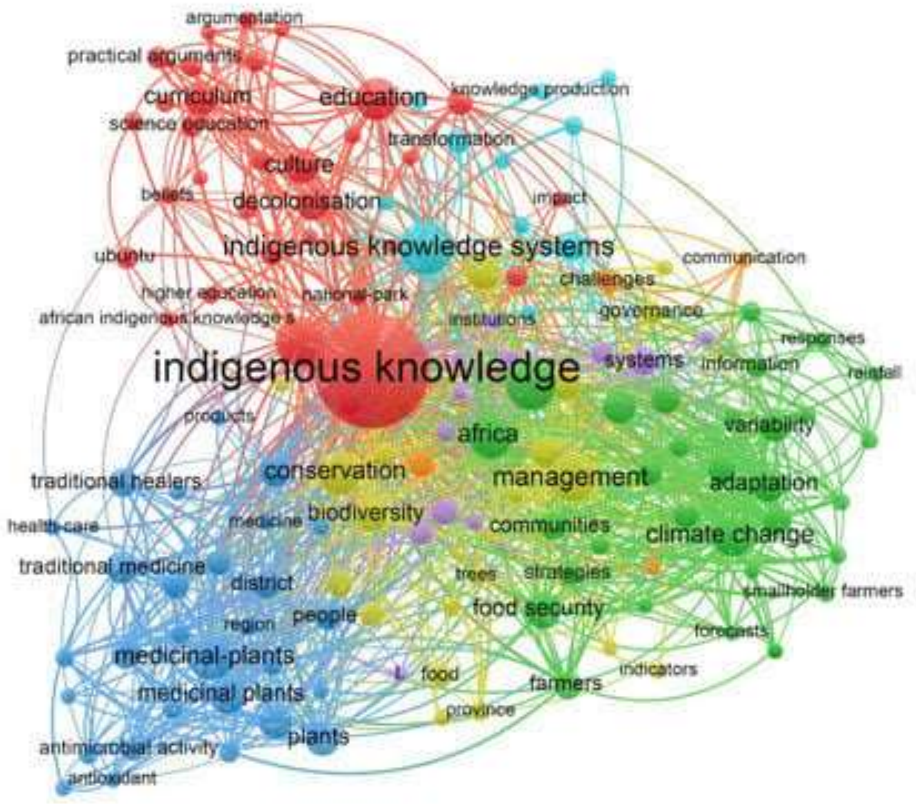

Figure 3c. Network visualisation map of co-occurring keywords in indigenous knowledge literature (c) South African view published from 1990 to 2020.[37]

Figure (3c) above highlights the South African perspective, which narrows the focus to the local context, where IK is deeply embedded in agricultural practices such as soil fertility, pest control, and crop management. The olive cluster in this figure illustrates how traditional knowledge directly impacts sustainable farming practices in South Africa. Despite its critical role, IK is often sidelined in mainstream education, which limits the effectiveness of efforts to promote food security and social engagement.[38] The analysis suggests that to address this gap, there must be a concerted effort to integrate IK into the educational curriculum, thus empowering both learners and community farmers to apply this knowledge collaboratively to real-life challenges.

METHODOLOGY

This qualitative study adopted participatory action research (PAR) to enhance the researchers' understanding of how to make the service-learning experience more aligned with their transformational goals. The researchers used the PAR model of looking, thinking, acting, and reflecting to guide the participative cycles of (i) relationship-building, (ii) planning, (iii) skills application, and (iv) reflecting, as illustrated in Figure 4.

[37] Malapane et al., "Bibliometric Analysis and Systematic Review of Indigenous Knowledge from a Comparative African Perspective: 1990-2020."
[38] Miguel A. Altieri, "Agriculture, Traditional," *Encyclopedia of Biodiversity*, 2001, 109–18.

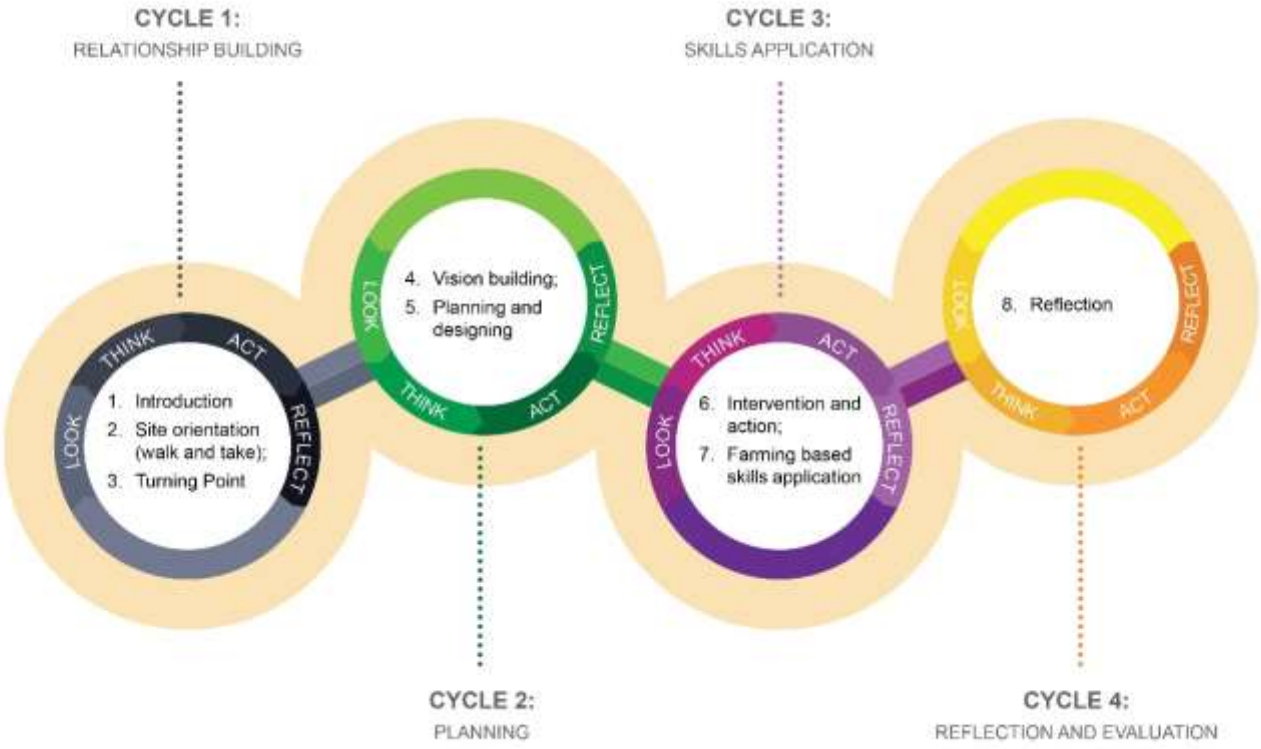

Figure 4: The cycling structure

Volunteers from an agriculture science school in a farming area and community farmers from the same region were invited. One teacher and approximately 45 learners, with six randomly selected participated in the discussions . Two farmers with over 15 years of experience in backyard farming were chosen. All participants were fluent in English and Sesotho, so there were no translation issues as discussions were conducted in both languages. The focus was on the Further Education and Training (FET) phase, which lacks specialised training for integrating Western and local knowledge to address food security.

Data Generation Process

Data generation was achieved through eight practical, participatory activities, as detailed in Table 1, involving a relational and interactive process among participants. Additionally, field notes were collected from observations and reflections on the process.[39]

[39] John W. Creswell and Cheryl N. Poth, *Qualitative Inquiry and Research Design: Choosing among Five Approaches*, 5th ed. (Sage Publications, 2016).

	Data generation activities	Purpose	Data generation methods
CYCLE 1: RELATIONSHIP BUILDING Activity 1	Introduction of agriculture science Teachers, Learners and community participants to know each other. Discussion the research process of expectations and process.	Introduction and orientation about project and to each other.	Informal group discussions, audio recorded and transcribed.
Activity 2 a/b	"Walk-and-talk" activity: icebreaker: walk around the site (backyard gardens and livestock) while talking to each other and the site. Turning point exercise: participants share three life experiences that they learnt from.	Orientation to site and purpose of engagement: Mapping the problem/area: find out how participants experienced the learning environment, talking about real-life issues in an area. Start to think about challenges and how they can be solved. Reflect on experience. Building trust and sharing commonalities in both parties' lives to establish solid base for working processes.	Participatory group discussions Own observations
CYCLE 2: PLANNING Activity 03	The participants shared a common vision to build activities which are going to take part in this phase. Themes and need analysis were identified by the participants. Also, how" the benefits of Local knowledge in farming and western ideas future? Agendas and research purpose discussed- challenges, expectations and possibilities mentioned.	Critical skills development. Determine commonalities of thought which factors can facilitate or hinder the process of incorporating local knowledge and western perspective into farming towards food security. Which factors can facilitate and hinder the process of partnership between participants? Do they have common goals and similar outcomes? Discuss, reflect and compromise.	Informal group discussions:
Activity 4	Interactive conceptual working process. Own ideas/planning and combine with existing farming ideas and approaches to sustain vegetable gardens and livestock. Discuss and analyse designs and cooperate in finding solutions and mutual platform to start the experimental work.	Technical skills development: establish a working relationship: identify own strengths-expectations, each other's contribution, knowledge sharing, critical thinking, Negotiating process and positions, working relations, simulate own ideas and get a broader picture of the overall project.	Informal group discussions: Brainstorming
CYCLE 3: INTERVENTION AND ACTION Activity 5a	Intervention Implementation	This involves examining how participants use their skills and apply the interventions in practical settings.	Systematic observations, field notes, and audio recordings of sessions.
Activity 5 b	Action analysis	To assess the effectiveness of the interventions and identify any challenges faced by participants. This includes evaluating the impact on local knowledge used to enhance leader understanding of farming for sustainably.	Detailed observation notes, participant feedback, and reflective discussions.
Activity 06	Experimental work's skills application	To evaluate how participants implement and apply their experimental skills in farmland. The focus is on practical application and problem-solving abilities.	Continuous observation, documentation of experimental processes, and analysis of participant performance.
CYCLE 4: REFLECTION AND EVALUATION Activity 7	Focus-group interviews conducted Learners, teachers and local farmers.	To gather detailed reflections on the interventions and their impact, evaluate the overall effectiveness of the research activities, and discuss lessons learned.	Semi-structured separate group interviews

For this paper, the authors used community farmers' techniques to enhance learners' understanding of food security to reach a consensus.[40] Triangulation, re-coding, and detailed description of the research process increased trustworthiness.[41] Ethical clearance ensured adherence to informed consent, voluntary participation, and the right to withdraw. Although not involved in data generation, teachers maintained order and ensured proper conduct during interactions. Learner participation was not part of the formal assessment.

DISCUSSION OF FINDINGS

This section discusses findings from focus group interviews and three main themes from the data analysis that helped us construct answers to our research questions. The themes, supported by *verbatim* extracts from the data and relevant literature are discussed below. The codes, L= Learners and CP= community participants, are used to identify the origin of the extracts .

Theme 1: Insight into each other's worlds and disrupt stereotypical assumptions

The initial discourse between the two groups revealed their stereotypical perceptions of each other and their expected roles in the study. Community farmers viewed learners as the "educated ones" while learners considered the local farmers' ideas "old" and potentially irrelevant to their current situation. The two local farmers (CP1 and CP2) were prepared to share their extensive practical knowledge and farming tips, which they rely on for food security. Despite their experience, they regarded themselves as "non-experts" and relied solely on their hands-on experience in farming:

> CP1: *"These learners are fortunate to have the opportunity to study agriculture science, and they are very smart. Everything they bring along is fine."*
>
> CP2: *"Then we can help each other. For instance, one of them could assist with mistakes in our vegetable gardens."*
>
> CP1: *"I also want to learn about their farming experiences from a classroom perspective.).*
>
> L1: *"Thank you, Sir. As a learner, I also want to learn about farming from your indigenous perspectives."*
>
> L5: *"For most of us, the ideas we've been given are often labelled as 'old farmers' ideas,' which we thought might not be as helpful in our situation.".*

The interaction between community farmers and learners revealed a deep conversation with the potential to challenge and dismantle the stereotypical assumptions they held about each other. In a diverse and unequal society, understanding the experiences and perspectives of those from different backgrounds is a vital life skill, particularly for learners who are future farmers.[42] Efforts should be made through various platforms, such as education, to change attitudes, behaviors, and values toward using indigenous knowledge systems in farming, ensuring that divisive worldviews and practices are not perpetuated.[43] This study pushed both groups (community farmers and learners) out of their

[40] Victoria Clarke and Virginia Braun, "Thematic Analysis," *The Journal of Positive Psychology* 12, no. 3 (May 4, 2017): 297–98, https://doi.org/10.1080/17439760.2016.1262613.
[41] Creswell and Poth, *Qualitative Inquiry and Research Design: Choosing among Five Approaches*.
[42] Georgina Guzmán, "Learning to Value Cultural Wealth Through Service Learning: Farmworker Families' and Latina/o University Students' Mutual Empowerment via Freirean and Feminist Chicana/o-Latina/o Literature Reading Circles by Georgina Guzmán," *A Journal of Public Rhetoric, Civic Writing & Service Learning* 18, no. 2 (2018).
[43] Christopher Ndlovu, Angela James, and Nadaraj Govender, "Viewpoint: Towards an IK-SCIE Integrative Model, A Theoretical Reflection on the Agricultural College Curriculum in Zimbabwe," *Southern African Journal of Environmental Education* 35, no. 1 (May 14, 2019), https://doi.org/10.4314/sajee.v35i1.7.

comfort zones, encouraging them to shift their stereotypical views and tendencies through fair, critical, and transparent engagement toward sustainable agricultural practices. Learners were prompted to rethink learning dynamics, challenging the traditional roles of 'servers and served' and how these boundaries keep the two groups apart. Food security served as a mediator, disrupting conventional thinking, with practical work providing a platform for all stakeholders to collaboratively address food security issues while fostering a better understanding of one another. It could be argued that participants initially used stereotypical discourse because they were processing each other's methods in a "complex environment." Introducing them to each other simplified these complexities by providing a "cognitive schema" to process the situation.[44] At the end of the engagement, learners admitted they had assumed that local community farmers relied on the 'old ideas for farming' discourse because they were unsure how to engage with the local farming community or believe in their ideology.

> *"We didn't know what to call you," she said, referring to the community farmers. "We thought 'old farmers' ideas' would be the correct term since you use traditional practices to sustain agriculture"* (L6).

While appreciating that learners are privileged to study agriculture formally, the local community farmers noticed that they still lack the hands-on skills to manage a vegetable garden without relying solely on theoretical knowledge. The local community farmers realised that the stereotypical view of learners as "smart" was just an assumption, recognising the need to support them with basic hands-on activities to plant a simple vegetable garden.

> *"I realized that we weren't necessarily there to be helped by community members because most of our parents didn't complete Grade 12. I thought their knowledge wouldn't really help us understand the science we learn in the classroom"* (L1).

The learners' views were initially somewhat patronising, likely influenced by our deep-rooted colonial and Apartheid history, which often devalues Indigenous Knowledge Systems (IKS) and assumes that life in the community is not desirable.[45]

> *"Our parents should create a safe space to teach us agricultural literacy, like watering plants, planting vegetables, and caring for livestock in backyard farming. My parents have livestock and a vegetable garden, but I never realised that what they do could help with what my teachers teach every day"* (L3).

However, they gradually became more understanding of the community's local farmers' reality and even expressed admiration:

> *"If what you're saying is accurate, then if anything happens to our parents, we'll know how to look after our livestock and vegetable gardens, and we'll be able to provide food for ourselves"* (L1).

An almost envious tone emerged as learners started recognising the value of community farmers' knowledge. They saw it as essential for enhancing their agricultural literacy, particularly in preserving vegetable gardens and using traditional medicine to protect livestock during disease outbreaks.

> *"I always thought it was the least safe place to learn about basic agriculture. My parents used garlic, 'khonofolo,' to deworm our animals"* (L3).

[44] Paul R. Falzer, "Cognitive Schema and Naturalistic Decision Making in Evidence-Based Practices," *Journal of Biomedical Informatics* 37, no. 2 (April 2004): 86–98, https://doi.org/10.1016/j.jbi.2004.02.002.
[45] Altieri, "Agriculture, Traditional," 109-111.

CP2 responded,

> *"Yes, that's correct. Garlic is a natural antibiotic and dewormer. It helps improve overall health and prevent infections. This is what we use when we can't afford the expensive medicine you learn about in schools."*
>
> *"Wow! Ntate, I didn't know that garlic performs the same functions as an antimicrobial agent and vaccinations used to control diseases in livestock. This helps me better understand that antibodies, which develop to prevent illness, can be found in natural remedies, not just in vaccinations like we were taught"* (L3).

People are shaped by their cultures, molded by the values and morals instilled by families, friends, communities, and Indigenous Knowledge Systems.[46] Such knowledge can only be effectively learned in a safe yet challenging interactive environment. Learners compared what they had learned in class with the insights shared by community farmers, which helped them critically reflect on their social values and behaviors, challenging their prejudicial attitudes and stereotypical expectations of Indigenous Knowledge Systems in farming.[47] This aligns with the fundamental aims of Critical Emancipatory Research (CER) theory.[48] Through experiential learning and relationship-building exercises in the community setting, participants began developing higher-level problem-solving skills in farming, such as protecting animals and plants from diseases, using Western perspectives and Indigenous Knowledge Systems.[49] This process revealed a growing desire among learners to learn more from each other.

The students understood the importance of establishing a rapport with the community participants:

> *"We had to get to know each other better and understand how our parents farm with knowledge different from what we learn in school daily. I think that makes it easier for us to grasp agricultural concepts and practices"* (L3).
>
> *"I wouldn't know what to do if we ran out of vaccinations or fertilizers, as schools might sometimes lack funds for these supplies. If that happens, we won't know how to manage"* (L1).
>
> *"However, what community farmers teach us shows how we can use alternatives like khala (aloe) and organic mulch. Traditional farmers use locally available materials such as dried grass, maize stalks, and leaves to mulch and fertilize their fields. This information is useful in case we can't access vaccinations and fertilizers"* (L4).

Not appreciating that the existing knowledge within their communities could exacerbate the degradation of plants and the survival of livestock due to reliance solely on classroom-based agricultural practices, learners began to recognise their privileged access to formal education.[50] In this study, food security issues acted as a mediator for knowledge sharing, problem-solving, critical skills development, and social engagement, contributing to building trust in Indigenous Knowledge Systems in farming. This interaction allowed community local farmers to take a more active role in planning, designing, and creating farming techniques. Becoming part of this collaborative process has adaptive dimensions, such as nurturing individuals and fostering a caring society. Learners must learn how to farm using textbooks and indigenous practices to address food insecurity. They can become sustainable

[46] Jo-ann Archibald, *Indigenous Storywork: Educating the Heart, Mind, Body, and Spirit* (UBC press, 2008).
[47] Ndlovu et al., *Towards an IK-SCIE integrative model*.
[48] Mahlomaholo, "Higher Education and Democracy: Analysing Communicative Action in the Creation of Sustainable Learning Environments: Part 1: Exploration of the Critical Relationship between Higher Education and the Development of Democracy in South Africa."
[49] Kolb, Boyatzis, and Mainemelis, "Experiential Learning Theory: Previous Research and New Directions," 227-247.
[50] Ndlovu, James, and Govender, "Viewpoint: Towards an IK-SCIE Integrative Model, A Theoretical Reflection on the Agricultural College Curriculum in Zimbabwe."

farmers by integrating Western ideas with Indigenous Knowledge Systems.[51] Such interactions challenge deep-seated assumptions and encourage individuals to rethink their relationships with others in farming.

Theme 2: Balancing of power relation through PAR

Learners initially assumed that only classroom-based knowledge was valuable, dismissing any other knowledge or systems as irrelevant. This perspective was evident during the interactive process with local community farmers. The evidence showed that while community participants were initially quiet and perceived as "passive acceptors," they gradually began to voice their opinions as the process evolved:

> *"They were afraid to share their ideas because they weren't sure if they were right or wrong. They automatically assumed that because they didn't receive formal education in agriculture as we did, we must always be right and they must be wrong"* (L2).

It became evident that community farmers initially viewed learners as more knowledgeable, while learners believed they had superior ideas and that the farmers would be content to follow their lead. The Participatory Action Research (PAR) process, guided by Critical Emancipatory Theory, seeks to foster a non-hierarchical approach through dialogic conversations.[52] This shift occurred on a micro-level between learners and community farmers. As learners began to engage less and listen more, they allowed the farmers more significant opportunities to showcase their farming techniques. This exchange helped learners appreciate the sustainable food systems the farmers had developed in their backyard gardens to combat hunger. Every sector or environment emphasises that power is relational and changes a relationship.[53] The students started to question the value of 'expert' power, showing a preference for a more democratic relation and value towards Indigenous knowledge systems:

> *"Everybody gets a chance to talk, everybody decides what this person must do, and he must also decide"* (L1).

Agriculture science learners began to appreciate the collaborative process and were impressed by the depth of information they gained, which could assist them in sustaining their vegetable gardens and livestock. This knowledge provided them with skills they could apply even after completing their education, incorporating Western and African perspectives. The learners' accommodating attitude reflected their willingness to listen and engage in meaningful dialogue, a critical quality for effective teaching. They recognised their potential and expressed it openly while fostering an environment where everyone was treated as equal partners. This approach encouraged a positive interactive experience for all. The learners moved towards a shared form of leadership, learning to negotiate their positions rather than adopting dominant stances and imposing their viewpoints. Their common goal was to address food security through collaborative efforts.

Theme 3: Personal and professional development through collaboration work

During their engagement, learners and community farmers learned to share their life experiences and visions, focusing on the skills needed to address food security. Meaningful service-learning provided participants with a sense of belonging, purpose, relevance, and connection to the harsh realities faced in their communities. This approach necessitates collaborative effort and recognition of every voice in

[51] Cheikhyoussef et al., "Ethnobotanical Study of Indigenous Knowledge on Medicinal Plant Use by Traditional Healers in Oshikoto Region, Namibia."
[52] Mahlomaholo, "Higher Education and Democracy: Analysing Communicative Action in the Creation of Sustainable Learning Environments: Part 1: Exploration of the Critical Relationship between Higher Education and the Development of Democracy in South Africa," 678 -696.
[53] Cathy MacDonald, "Understanding Participatory Action Research: A Qualitative Research Methodology Option," *The Canadian Journal of Action Research* 13, no. 2 (2012): 34–50.

planning, evaluating, and implementing actions.[54] Participatory Action Research (PAR) as the methodology facilitated this study by connecting participants towards a common goal: addressing food security.[55] It created space for mutual learning, problem-solving, and critical thinking, contributing to achieving SDG 2 and ensuring personal and professional development.[56] The democratic nature of the experience helped learners realise the importance of being "lifelong learners," understanding that learning is an ongoing process not confined to any specific location and emphasising the need to adhere to empathetic principles.

> *"It was humbling to realize how much I learned about planting vegetables and vaccinations from both textbooks and the knowledge shared by our parents"* (L3).

> *"I gained a deeper appreciation for how our parents work to provide food for the community and learned to value my education without undermining others who contribute in different ways"* (L2).

Empathy and personal responsibility are crucial for effective farming.[57] The CAPS document highlights the need for learners to develop interpersonal skills, including collaboration and respect for diverse perspectives.[58] Interaction within the group enhanced personal and professional competencies, such as teamwork, appreciation of indigenous farming practices, and community respect.

> *"They learned that we use traditional methods alongside weather forecasts. For example, observing nature, such as the flowering of the "legala" tree, helps us predict the rainy season"* (CP2).

CP1 also explained pest control using natural substances like ash and chili pepper or crushed aloe leaves, which are eco-friendly and do not harm the soil.

L5 and L2 were impressed by these practices and found them educational and sustainable. Learners saw the value of practical experience in complementing their theoretical knowledge from agriculture classes. This hands-on approach enhanced their understanding of sustaining vegetable gardens and livestock and exposed them to new resources and methods that could enrich their future in farming. The study emphasised the importance of integrating diverse perspectives to foster meaningful dialogue and change, which aligns with critical emancipatory theory, which values the complexity of knowledge shaped by various contexts.[59] Hands-on agricultural education is crucial for developing sustainable farming and food security skills.[60] It boosts personal resilience and career readiness while equipping learners with practical problem-solving skills. Learners valued the community farmers' insights on weather prediction, vaccinations, and soil fertilisation, realising how to apply these lessons in their future lives. The project allowed participants to express their creativity and build confidence. Learners began to see their potential for sustainable farming and became more critical and dialogical in their approach, preparing them for effective and innovative agricultural practices.

CONCLUSION

This study explored how integrating agriculture science with community knowledge through service learning can enhance food security. The findings indicate that a participatory approach, rather than

[54] Keith, "Community-Service-Learning-in-the-Face-of-Globalization," 5-24.
[55] MacDonald, "Understanding Participatory Action Research: A Qualitative Research Methodology Option."
[56] Vasiliki Kioupi and Nikolaos Voulvoulis, "Education for Sustainable Development: A Systemic Framework for Connecting the SDGs to Educational Outcomes," *Sustainability* 11, no. 21 (November 2, 2019): 6104, https://doi.org/10.3390/su11216104.
[57] Agatha Herman, "Enchanting Resilience: Relations of Care and People–Place Connections in Agriculture," *Journal of Rural Studies* 42 (December 2015): 102–11, https://doi.org/10.1016/j.jrurstud.2015.10.003.
[58] Department of Basic Education (DBE), *Curriculum and Assessment Policy Statement Grades 7-9: Natural Sciences*.
[59] Joe L. Kincheloe, *Knowledge and Critical Pedagogy*, ed. Joe L. Kincheloe (Dordrecht: Springer Netherlands, 2008), https://doi.org/10.1007/978-1-4020-8224-5.
[60] Alison R. Gill et al., "Physiological and Morphological Responses of Industrial Hemp (Cannabis Sativa L.) to Water Deficit," *Industrial Crops and Products* 187 (November 2022): 115331, https://doi.org/10.1016/j.indcrop.2022.115331.

hierarchies, promotes knowledge partnerships , enabling shared power and democratic decision-making, which was also advocated by Prof Sechaba Mahlomaholo. This engagement allowed learners and community farmers to reflect on their assumptions and collaborate on sustainable food production. The study highlighted the importance of involving learners and community members in mutually beneficial experiences that promote a socially just society. Participatory service learning was instrumental in building relationships and promoting democratic engagement, particularly given the time constraints within the South African curriculum. A curriculum which incorporates diverse knowledge perspectives enables learners to apply theoretical knowledge to practical situations, emphasising the importance of experiential learning in managing vegetable gardens and livestock using both indigenous and classroom knowledge.

RECOMMENDATIONS

Schools should develop tools to support learners in integrating indigenous knowledge into the curriculum and encourage regular reflection on their experiences. The curriculum should be flexible to address learners' needs, including access to nutritious food, and accommodate various hands-on activities rather than focusing solely on Eurocentric perspectives. Practical work should be prioritised to equip learners with the necessary skills for managing sustainable agricultural projects. Making service learning a compulsory curriculum content can help bridge the knowledge gap between learners and communities. Addressing challenges such as time constraints, language barriers, cultural differences, and conflict management can enhance the effectiveness of participatory service learning. Integrating participatory service learning into Further Education and Training (FET) agriculture science curricula can contribute to achieving SDG 2, fostering social change, and promoting a more inclusive society.

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