



# Modelling the Transformation of Agricultural Program Teaching and Learning into Technology Integration

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## ABSTRAK

Dunia saat ini tengah mengalami transformasi di sebagian besar bidang, termasuk dalam bidang pendidikan. Pengajaran dan pembelajaran program pertanian harus dimodelkan dan diselaraskan dengan transformasi tersebut. Pergeseran dari pengajaran dan pembelajaran di kelas tradisional memerlukan dukungan untuk melatih pertanian dengan integrasi teknologi. Oleh karena itu, tujuan dari penelitian ini adalah untuk menganalisis transformasi pengajaran dan pembelajaran program pertanian menggunakan teknologi. Penelitian ini menggunakan metode penelitian kualitatif. Ada 20 dosen dari tiga kampus perguruan tinggi Pendidikan dan Pelatihan Teknik dan Kejuruan (TVET) yang terlibat dalam penelitian ini. Temuan penelitian mengungkapkan bahwa transformasi program pertanian untuk mengintegrasikan teknologi sepenuhnya terhambat oleh kurangnya sumber daya, peralatan, dan infrastruktur. Dukungan pengajaran dan pembelajaran dengan sumber daya dan alat untuk menyesuaikan diri dengan pembelajaran pertanian dengan integrasi teknologi diperlukan. Penelitian ini menggarisbawahi perlunya dan pentingnya memberikan dukungan kepada lembaga yang sedang berjuang untuk memperoleh sumber daya pengajaran dan pembelajaran, peralatan, dan infrastruktur untuk menerapkan integrasi teknologi. Temuan ini menekankan perlunya memberikan dukungan untuk sumber daya teknis, peralatan, dan infrastruktur untuk meningkatkan integrasi teknologi. Temuan penelitian mengarah pada pengembangan model konseptual untuk integrasi teknologi dalam pendidikan pertanian TVET. Fitur-fitur utama yang saling terkait yang dapat digunakan untuk meningkatkan dukungan integrasi teknologi di perguruan tinggi TVET ditetapkan dengan jelas dalam model tersebut.

## ABSTRACT

The world is currently experiencing transformation in most areas, including in education. The teaching and learning of agricultural programmes ought to be modelled and aligned with transformation. The shift from traditional classroom teaching and learning requires support to train agriculture with technology integration. Therefore, the aim of this study is to analyze the transformation of the teaching and learning of agricultural programmes using technology. This study utilised a qualitative research method. There were 20 lecturers from three Technical and Vocational Education and Training (TVET) college campuses that were involved in this study. The findings revealed that transforming agricultural programmes to fully integrate technology is hampered by a lack of resources, equipment, and infrastructure. Teaching and learning support with resources and tools to acclimate to learning agriculture with technology integration is required. The study underscored the need for and the importance of providing support to institutions that are struggling to acquire teaching and learning resources, equipment, and infrastructure to implement the integration of technology. These findings emphasise the need to provide support for technical resources, equipment, and infrastructure to enhance the integration of technology. The research findings led to the development of a conceptual model for technology integration in TVET agricultural education. The key interrelated features that can be used to improve the support of technology integration in TVET colleges are clearly stipulated in the model.

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## 1. INTRODUCTION

The world is currently experiencing transformation in many areas, including in education. This has resulted in agriculture education transformation that is driven by new technologies. Agriculture education has witnessed changes in how teaching and learning spread out with the use of technology (Dlamini, 2015; Tiwari, 2008). Transformation requires support with technical resources, equipment, and infrastructure to facilitate the teaching and learning process in the learning institutions (Al-alawi & Elias, 2022; Daouk & Aldalaien, 2019). The rapid infusion of technology integration warrants unprecedented support in the learning programmes. This transformation process calls for every stakeholder to support teaching and learning in this shift towards the updated teaching and learning of programmes (Ari et al., 2022; George, 2023). Collaborating as a unit in the education system will help facilitate the establishment of the concrete support, that is needed in the Technical and Vocational Education and Training (TVET) colleges. The significant effects of providing technical resources,

equipment, infrastructure, and training for teaching and learning contributors is an important need to let transformation govern (Deroncele-Acosta et al., 2023; Gunn, 2010). Teaching and learning support should be widely seen and understood as working together with all the stakeholders to allocate resources and equipment for implementing transformation (Asuman et al., 2018; Shevlin et al., 2008). The benefits of providing support to teaching and learning for transitioning into full operations help to maintain and fulfill the need to integrate technology in the learning programmes (Baidoo-anu & Ansah, 2023; Inagaki & Orehek, 2017). In general, the impact of giving technical support leads to an increase in the use of technology during teaching and learning, which clearly promotes transformation. The issue of transforming teaching and learning has been a subject of much research (Barakabitze et al., 2019; Bonfield et al., 2020; Engelbrecht et al., 2020). However, a few studies have focused on transforming the teaching and learning of agricultural programmes.

The theoretical basis for technology integration in agriculture was adopted from previous study (Kotrlik et al., 2003). This technology integration theory seeks to describe how the four instinctive factors, namely, the exploration of technology integration, the experimentation with technology integration, the adoption of technology integration, and advanced technology integration should unfold. However, this research has revealed a need to expand Kotrlik-Redmann's theoretical framework. This is because previous studies argue that technology integration in terms of the four instinctive factors does not advise who should report to whom or how the process of integration ought to unfold, especially in the TVET education system (Kotrlik et al., 2003). The South African TVET system has different role players, with different college campuses having different office bearers. Theoretical framework was not clear on the role players and their function in the four instinctive factors in the context of the TVET colleges. These are important aspects that need to be clear so that Kotrlik-Redmann's framework makes sense or is applicable to the TVET system (Hamzah et al., 2022; Ramli et al., 2020). Hence the need for an expansion and to propose a model that can change and enhance technology integration in the TVET agricultural education.

The use of technology in the teaching and learning of programmes requires stakeholders such as the Department of Higher Education and Training (DHET) as well as the TVET colleges to support factors including but not limited to technical resources, equipment, and infrastructure. However, a lack of these factors would hamper progress in transforming the teaching and learning of programmes including agriculture (Gkrimpizi et al., 2023; Kalugina & Tarasevich, 2018). Transforming agricultural programmes to integrate technology is hampered by a lack of resources, equipment, and infrastructure. Several researchers have reported the critical role of stakeholders (Ashaye & Irani, 2019; Journeault et al., 2021). The researchers have outlined the most important aspects such as ensuring constant training and the retraining of teachers and other staff via high quality professional development programmes that emphasise planning, implementation, monitoring, and evaluation, as well as supporting the sustainability practices within the institutions by coordinating and providing financial support. The researchers are concerned about the DHET and the TVET college stakeholders that they must provide support and resources for the implementation of technology integration in the teaching and learning programmes (Desai & Nomlomo, 2014; Harris et al., 2019). The lack of support can prevent transforming the teaching and learning of programmes including agriculture. However, educational institutions should make sure that students have access to the right tools, infrastructure, and resources for using technology (Masdoki et al., 2021; Thiel, 2018). Additionally, it was discovered that the implementation and evaluation of professional development programmes helped in the teachers' technology integration, highlighting the need of helping and enhance the teachers' use of technology in the classroom (Alemdag et al., 2020; Dede et al., 2009). Providing professional support to teachers is crucial because it helps in their adoption of new pedagogies. Therefore, there is a need for continuous support to encourage the implementation of technology integration during teaching and learning (Lomos et al., 2023; Peng et al., 2023). As a result, there would no longer be a significant disparity between a lack of technological resources and a lack of technology integration in most TVET colleges.

The transformation towards technology integration in learning programmes requires teaching support with relevant technical resources that would help to deliver and achieve the desired learning outcomes. There are strategies that include the funding for learning and teaching projects that would develop the lecturers to improve their technology integration (Ertmer et al., 2012; Sephokgole et al., 2023). The other strategies include the departmental purchase of their own technical resources and the agriculture tools that would be used to support different teaching styles and to complement the acquisition of knowledge and skills. Furthermore, the need for a pedagogical approach to agricultural education is crucial because the idea emphasises the demands of workshops to introduce the agriculture lecturers to new agriculture technologies in this new pedagogy approach (Şahin et al., 2016; Watson, 2006). The idea can be achieved through extensive training with the new agriculture equipment to help the lecturers to be comfortable with the new technology. New strategies to help acquaint the lecturers with new technology are crucial for the lecturers to move away from relying on outdated resources, equipment, infrastructure, and skills to train the students.

In contemporary times, the students need learning that is influenced by technology, with the support of learning resources and tools that would facilitate the new knowledge and skills. The use of technology is required

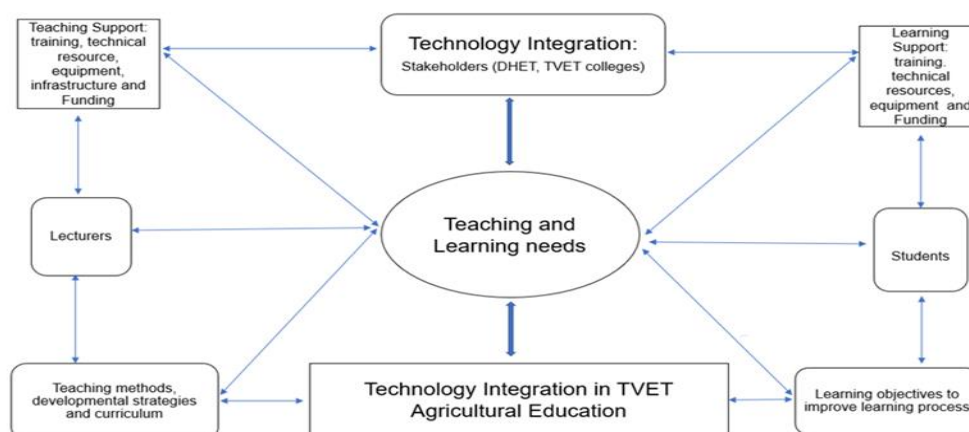
in the classroom or in the practical sessions as it allows the students to be exposed to a variety of skills and it creates an environment that is conducive to activity-based learning (Alenezi et al., 2023; Saydullaeva, 2021). However, the lack of learning support with technical resources and tools is a setback for the current students because technology is part of their lives. In today's world, everything needs technology, and the use of technology should also spread in the classroom (McKnight et al., 2016; Nnodim & W.I., 2023). Therefore, the students who are not yet exposed to technology due to their disadvantaged backgrounds should get a chance to experience learning using technology. Moreover, the agricultural programmes are practical in nature, and they require support to teach using technologies, and there is a strong push to use new technologies in the agricultural programmes (Bin et al., 2020; Gebresenbet et al., 2023). If colleges are to keep producing comparative graduates in their vocation sectors, the technical skills in the field of agriculture are crucial and they should always be equivalent to the recent technologies.

Technical resources and funding are essential for the educational institutions to support technology-integrated teaching and learning. Agriculture education is not exceptional because utilising technology is vital to the current teaching and learning processes to transfer the most recent required knowledge and skills for modern education. The authors revealed that both the lecturers and the students can benefit from the use of agricultural technology, but to acquire the required technical resources to meet the learning objectives, support with funding is needed (Murphrey et al., 2009; Nnodim & W.I., 2023). But to address the current challenges facing agriculture including the lack of financial support, it is necessary to have relevant stakeholders who understand the need to have the most recent technical resources and tools in teaching and learning. In addition, modern knowledge and skills should be incorporated into agriculture education for new technology like drones, electronics, and sensors to be applied to the problems facing agriculture today (Boursianis et al., 2022; Singh et al., 2024). It is obvious that this progressive step would contribute to elevating agriculture education to a new level of technological integration. The need to support agriculture education with technical resources and tools could play a key role in the move to technology integration by using agricultural robots, drones, electronics, and sensors as the next smarter generation of farm machines (Rose et al., 2016; Saiz-Rubio & Rovira-Más, 2020). This might be an exciting movement because the lecturers would achieve every learning objective that is desired to impart smart farming skills to the future generation. In addition, all the agricultural problems would be easily resolved with the use of modern resources and tools. Besides, technology integration is a key component of smart agriculture because of its present need and potential future development in the agricultural programmes (Khan et al., 2021; Odaral et al., 2015). For this reason, the need to support agricultural programmes with technical resources and tools has become crucial and demanding in learning institutions including TVET colleges.

Technology integration in TVET agriculture education is crucial to teaching and learning the current needed knowledge and skills for self-employment and to fit-into the labour markets. Technology integration is a new solution to address social problems that are caused by a lack of knowledge and skills (Haleem et al., 2024; Nungu et al., 2023). The provision of the needed technological resources and tools could help in the integration of technology, hence mitigating the prevalence of the social problems. However, other strategies including being proactive, improvising, professional development, and seeking assistance was found to enhance technology integration during the teaching and learning process (Bosica et al., 2021; Ross & Bruce, 2007). This information was discovered during their quest to devise innovative strategies for incorporating technology into agricultural programmes that would also assist the TVET graduates in reducing the frequency of social problems. A significant step towards eliminating the absence of self-employment and preparing the graduates from TVET colleges for the workforce is the production of capable, technical proficient graduates (Sern et al., 2021; Yadav et al., 2020). It is crucial to have a proposed model for technology integration in the TVET agricultural education if there is to be transformation that is delivered throughout the process of teaching and learning. This study aims to analyze the transformation of the teaching and learning of agricultural programmes using technology. The novelty of this study is offers a model for the comprehensive transformation of traditional agricultural teaching and learning programs into technology integration. This is an innovative response to the challenges of modernizing the agricultural education sector which is faced with the need to adapt to the digital era.

## 2. METHOD

The proposed conceptual model for technology integration in the TVET agriculture education was employed in this qualitative study. The interrelated features of this model can be employed to enhance the TVET colleges' support for technology integration (Sephokgole et al., 2023). The model suggests that in TVET agriculture education, technology integration involves the stakeholders to support the fact that agricultural program teaching and learning must be used to meet educational needs, and technology integration to achieve the teaching methods and to meet the learning objectives of agricultural education. The conceptual model for technology integration in TVET agriculture education can be seen in Figure 1.



**Figure 1.** Conceptual Model for Technology Integration in TVET Agricultural Education

Transformation has forced people to move away from traditional teaching methods towards a contemporary approach to teaching and learning with technology integration. Therefore, it was crucial to propose this conceptual model which has the following interrelated features that can be used in the agricultural program’s teaching and learning: (a) Technology integration; (b) Teaching support; (c) Learning support; (d) The teaching and learning needs; (e) Technology integration in TVET agricultural education. Face-to-face interviews were used to collect in-depth information and evidence from the participants (Mashuri et al., 2022). The participants responded to the research questions stated in Table 1.

**Table 1 - Research Questions For Semi-Structured Interview**

- Question 1:** What current technologies are you integrating into your agriculture classroom teaching?  
**Question 2:** What changes need to be made to agricultural education to better include innovative technology?  
**Question 3:** What are the challenges for integrating innovative agriculture training technology?  
**Question 4:** How can integrating technology be adopted while maintaining agriculture learning objectives?

All the interview sessions were recorded with the participants’ permission to allow the researcher to obtain information and be more engaged in the interviews without worrying about taking notes. There were 20 lecturers from three TVET college campuses that were involved in this study. Purposive and convenient sampling have been used to identify the participants for the interview sessions. The participants were deemed to possess the information that is relevant for the study. A semi-structured interview method allowed the researcher to collect data from the participants by answering open-ended questions that were designed by the researcher (Jamshed, 2014). The interview questions were designed to gain an in-depth understanding of the research topic. The validity of the interview questions was checked by experts, and a pilot study was conducted to test whether the changes that were incorporated into the final version would increase the value of the findings.

The data gathering procedure involved the participants conveniently indicating their availability at the correct place and at the right time for the interview sessions. The interview would commence with a social talk to create a conducive atmosphere and to allow open sharing of information. This approach helped the researcher to gain more information based on the participants’ knowledge and experience. The strategy was encouraged by the semi-structured questions, which allowed for probing, clarification, and the confirmation of responses. A request to gain access to the college campus was granted by the TVET college campus managers. A consent form was provided to the participants, and they were informed of the need for voice recording. All the participants were fully informed about the research procedures. The participants' anonymity and confidentiality were protected; and no names were revealed but instead state codes, such as “participant numbering” were utilised. The processes of data analysis were guided by method of organising, transcribing, coding, interpreting, and reducing, presenting, as well as drawing conclusions from the analysed (Braun et al., 2021). The collected data was categorized into different themes, using thematic analysis as the basis for presenting and discussing the results.

### 3. RESULT AND DISCUSSION

#### Result

A total of five themes or interrelated features emerged from the study analysis, and they were used for developing the technology integration model to guide the teaching and learning of agricultural programmes. The themes or interrelated features are clearly stipulated in the method section. This section is structured to investigate each identified theme in this paper.

The technology integration theme pointed to the stakeholders that are supposed to support the lecturers and the students with the needed resources, equipment, and infrastructure that would improve the integration of technology in the agricultural programmes. When the lecturers were asked about the current technologies that they are integrating into their agriculture classroom teaching, lecturers indicated the challenges that were affecting the integration of technology in the TVET college. The lecturers indicated that the lack of resources, equipment, and infrastructure are among the challenges that hampered the integration of technology in the TVET colleges, and they have an impact on the teaching and learning of agricultural programmes. Lecturer 2 stated that they do not have machines in their agriculture TVET college. Lecturer 5 stated that there were no drones, and there were no agriculture machines for planting, ploughing, and harvesting, but some of the classes have projectors and they are busy with connectivity. So far, the students do not have access to gadgets. Lecturer 17 stated that currently, they do not have technological resources and equipment because one cannot use a laptop in a big class. The majority of the participants revealed that the lack of technological resources and equipment led to no integration of the current technologies. The finding revealed that the lecturers are hampered by the lack of technological resources, equipment as well as infrastructure and thus they cannot transform the agricultural programmes to fully utilise technology.

The support for teaching agricultural programmes theme focuses on providing support to finance the infrastructure, technical resources, training, and the equipment that is needed to integrate technology into their teaching. When the lecturers were asked about the changes that must be made to agricultural education to better include innovative agricultural technology, the verbatim responses of the lecturers' perceptions about the support of integrating technology include Lecturer 9 who stated that they do not have a farm or even the arrangement for them to take students for several months for practicals. They sometimes go to certain place to do practical without support. Lecturer 17 stated that they need support to procure resources and they want the management to act quickly when it comes to the procurement of resources. Lecturer 20 also stated that the relevant stakeholders must give support to both the lecturers and the students. A shift in approach is needed, as the assistance in the form of enough resources and equipment will ensure that the agricultural programmes are supported. This would help the lecturers to impart the most needed agricultural skills to their students.

The learning support theme focuses on providing the students with technical learning resources, equipment, and financial support to purchase suitable learning tools that are required for agricultural programmes. Furthermore, for students to understand how to operate some of the contemporary agricultural technologies, training is essential. To answer the research question in this paper, the researcher asked the lecturers about the challenges they met while integrating innovative agriculture training technology. Lecturer 4 stated that they had Moodle as their Learning Management System (LMS) but the main challenge with the students is that they do not have data to connect to the portal. Furthermore, Lecturer 10 stated that they still experience challenges talking about the data issue and they are still having issues with poor network. The issue of load shedding is also one of those factors that the students are complaining about, and they are not getting along with online learning or the use of technology. Lecturer 16 explained how the lack resources contributed to the challenges they face. Only those who are coming from advanced families can afford to buy some technical tools, but the students who are from disadvantaged families still lack support.

The teaching and learning need's theme focus on funding the TVET lecturers to finance their own training and to obtain their desired technical materials and equipment. When the lecturers were asked about how they can integrate technology while maintaining the agriculture learning objectives, Lecturer 1 stated that they need to train the students on the use of technology in the class, such as teaching them online, and after that, the learners are also supposed to be in the field doing practical activities with technological resources and equipment. Lecturer 2 stated that it is important to train the students on using the new technology, because there are some advantages with new technology. Furthermore, Lecturer 3 went further to give an example of a chemical mixing tool which was supposed to be done by using a certain technology. The findings above revealed that most lecturers prefer their own way of purchasing resources and equipment which is different from the institutional procedures. However, the process should be carefully applied to consider acquiring the required modern teaching and learning resources and equipment that are used to impart skills.

Technology integration in the TVET agricultural education theme is necessary for agriculture education to thrive and impart up-to-date knowledge and skills. When the lecturers were asked how integrating technology can be adopted while maintaining the agriculture learning objectives, Lecturer 4 stated that technology integration

is also essential when conducting experiments because certain technical tools or resources are needed for the completion of the agriculture experiments. Lecturer 17 went further to give an example that technology can be used for a lot of agricultural activities. When discussing irrigation systems, for instance, computerised systems are available to be utilised. Lecturer 11 went on to explain that the lecturers can use a plethora of internet resources to help them to accomplish any goal they have for utilising technology in the classroom. Lecturer 18 continued by suggesting that the lecturers should train the students in the use of technology. In fact, since agriculture is mostly a practical subject, the lecturers should start each class by ensuring that at least 50% of the content is presented through technology integration.

## Discussion

In the context of the fourth industrial revolution, modelling how agriculture program teaching and learning would transform by integrating technology is now of crucial value. From the perspective of the conceptual model for technology integration in TVET agricultural education, there are interrelated features that could be applied to enhance the TVET colleges' support for technology integration (Li et al., 2023; Sephokgole et al., 2023). The results of this research showed the need to support agriculture teaching and learning with technical resources, equipment, and infrastructure. This is consistent with study who state that new technologies must be used in agricultural education to support and enhance practical teaching and learning (Bin et al., 2020). The results show that technology integration is hampered by a lack of technological resources, equipment, and infrastructure that can be used to transform the agricultural programmes to fully integrate technology. It was found that without the integration of technological resources, equipment, and infrastructure, the teaching and learning of agricultural programmes would remain theoretical and students would be unable to respond to the new ways of practicing agriculture. This finding supports the arguments by researchers who state that a lack of infrastructure, equipment, and resources creates a delay in the transformation of teaching and learning through the integration of technology. Globally, the traditional teaching systems have been pushed out by the fourth industrial revolution to the modern ways of teaching and learning with technology integration (Kalugina & Tarasevich, 2018). As a result, it is important to include the stakeholders in providing infrastructure, equipment, and resources to assist education so that the agricultural programmes can completely integrate technology into their teaching and learning.

There must be support for teaching agricultural programmes with technological resources and equipment as well as frequent developmental strategies to improve the teaching of agriculture. Financial support is crucial because the lecturers would procure the required resources, as well as equipment and get the level of training that would allow them to use the new technologies. The findings indicated that providing lecturers with the equipment and support that they require will allow them to teach the recent techniques. This finding is in line with study who stress that it is crucial to provide support while embarking on the training programmes to increase the quality of technology integration in vocational training (Bonnes & Hochholdinger, 2020). In this era of the 4IR, the lecturers should urgently be provided with support to keep up with the modern way of teaching and learning agricultural programmes. The lecturers ought to be supported with technological tools to reach their learning outcomes. The lecturers expected support with resources, equipment, and infrastructure to better implement technology integration into their teaching. This is a clear indication that, without teaching support, it would take ages to reach the full potential of integrating technology into the teaching and learning of agricultural programmes. The agricultural training colleges will forever rely on outdated infrastructure, resources, and skills to train the students (Daqar & Constantinovits, 2021; Misbah et al., 2020). This would mean that the students would lack recent agricultural skills for producing food using modern tools. Therefore, supporting the lecturers with the necessary technical resources and equipment would help to impart modern skills for the students to fit into the current labour market.

On the other hand, learning support with the necessary technical resources and equipment to acquire practical knowledge and skills is crucial for the agriculture students. Student training as part of learning support should cover how to use technology in agricultural education, which includes the use of online resources, educational software, and other technology tools. Providing learning support to the students helps to improve the students' understanding of what they learn in their learning programmes (Brick et al., 2021; Saydullaeva, 2021). Established resources and infrastructure may exist, however, learning support is vital to facilitating the new normal of technology integration. In fact, agriculture education presents the training needs that require support in acquiring the technical knowledge and relevant skills that are required in the modern labour market (Bin et al., 2020; Rawat, 2023). The finding revealed that the students need learning support with resources and tools to acclimatise to learning agriculture with technology integration. The technical skills that demonstrate technological integration into agricultural operations are beneficial. Although infrastructure and educational materials were discovered to be available, technical resources and equipment support are essential for understanding the operation procedures. As a result, it is crucial to emphasise the necessity of providing the students with educational resources that are technically advantageous to their study of agricultural programmes.

It is obvious that there are unmet teaching and learning needs because the lecturers would rather buy their own resources and equipment to complete their lesson plans, while the students also do not acquire the skills they need from the course material. Teaching and learning require regular integration of technology to remain relevant with the latest implementation of agricultural education (Murphrey et al., 2009; Widiansyah, 2017). The use of new technology during teaching and learning programmes was found to be the current need in agricultural programmes. Today's agricultural education requires the use of the "internet of things" technologies for teaching and learning, including robotics, networks, intelligent sensors, and other types of sensors (Boursianis et al., 2022; Wu & Chen, 2020). Using these new technologies improves agricultural education and it also increases the relevance of teaching and learning to the demands of the modern educational environment.

It is also clear that technology integration in TVET agricultural education is relevant in these modern days. On the other hand, transforming agricultural program teaching and learning is the future and relevant path for addressing the climate change issue. In fact, technology integration can be utilised to increase the precision of other agricultural tasks including but not limited to yield monitoring, identifying insect pests, determining soil moisture, and determining when to harvest (Sern et al., 2021; Sung, 2018). The respondents also stated that while some agricultural operations are experimental and require the use of new technologies, the others require technological resources to access online activities. This implies that appropriate technology integration strategies should be employed while implementing learning programmes to produce competent graduates (Haleem et al., 2024; Yadav et al., 2020). This view would help the TVET colleges offering agricultural programmes to implement relevant agriculture education. The integration of technology was found to be crucial when conducting agricultural experiments and online activities that correspond to imparting relevant knowledge and skills. This shows the value of technology integration because it can complement practical experiments and online activities that can also replace physical operations.

The need for technology integration in the teaching and learning process would help to achieve the desired objectives of the agricultural programmes. Therefore, the proposed conceptual model can be an improved model of the theoretical framework that can guide technology integration in the TVET colleges offering agricultural programmes in the Limpopo Province. This model recognised the need to support institutions that are situated in deep rural areas. This is because providing support is a crucial requirement for the successful integration of technology into the learning programmes. The researcher is confident that using this strategy would enhance the agriculture education offered in the TVET colleges. Additionally, this model will add new knowledge on the implementation of technology integration, and it will strengthen the integration of technology in higher education and make it more resilient and successful. This study was restricted to the agricultural programmes that are offered at the TVET colleges in the Limpopo Region of South Africa. Agricultural education needs to change to keep up with the latest technological and skills advancements. Technology has been adopted into agricultural education due to the growing prevalence of climate change and the lack of the necessary agricultural skills to practice agriculture in these harsh conditions. Therefore, more research is needed to extend the findings of this study to other programmes that are offered by various TVET colleges.

#### 4. CONCLUSION

The findings of this study demonstrated the potential benefits of using a conceptual model for technology integration in TVET agriculture education, as it can improve the transformation of agricultural program teaching and learning. The findings of this study revealed that transforming agricultural programmes to fully integrate technology is hampered by a lack of resources, equipment, and infrastructure. To enhance the teaching and learning of agricultural programmes through technology integration, the researcher proposed a model for technology integration in TVET agricultural education. This study has realised the need for and the importance of providing support to the institutions struggling to acquire technical resources, equipment, and infrastructure. The study recommends that teaching and learning be fully supported with technical resources and tools to acclimate to learning agriculture with technology integration. The study emphasises the need for the stakeholders to participate concurrently to support the lecturers and the students with technical resources, equipment, and infrastructure if the desired objectives of technology integration are to be realised. To enhance the teaching and learning of agricultural programmes, the support system should allow the TVET colleges that offer agricultural programmes to use money independently to purchase their own technical resources and equipment and to initiate their own training and build infrastructure. By adopting this proposed model, people can align agricultural programmes with the fourth industrial revolution. This will ensure that stakeholder support is effectively incorporated into agriculture education, improving the use of technology. This study serves as a valuable reference for future research on transforming agricultural programmes to fully integrate technology.

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