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Digital Skills Acquisition, Reskilling and Upskilling Needs among Vocational Education Teachers for Effective Training in the Future Workplace

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ABSTRACT

The rapid growth of digital technologies and workplace innovations has increased demand for continuous skills development among vocational education teachers to prepare learners effectively for the future workplace. This study examines the acquisition, reskilling, and upskilling needs of vocational education teachers to train learners effectively for the future workplace. Specifically, the study determines the required digital competencies, assesses teachers' existing digital skills, identifies competency gaps, and examines the relevance of reskilling and upskilling programmes. The study population was 504, from which a sample of 220 was selected. 3 research questions guided the study. A descriptive survey research design was adopted, using a structured questionnaire titled "Digital Skill Needs Questionnaire (DSNQ".to collect data from vocational education teachers in selected tertiary institutions. Data were analyzed using mean, standard deviation, and need gap analysis to determine disparities between existing and required digital competencies. Findings established that vocational education teachers have substantial reskilling and upskilling needs to better integrate digital technologies into teaching and learning. The study also recommended redesigning vocational education teachers' professional development frameworks to include digital competency standards.

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INTRODUCTION

The rapid growth of digital technologies, automation, artificial intelligence, and other workplace innovations has significantly transformed work and the skills required for employment and career advancement. As industries increasingly adopt technology-driven processes, digital competencies have become essential for individuals to participate effectively in modern economies. This transformation has increased the responsibility of education and training systems, particularly Vocational Education and Training (VET), to develop learners with relevant digital, technical, and adaptive skills required for future workplaces (OECD, 2019; UNESCO, 2021). However, VET systems' ability to achieve this goal depends largely on vocational education teachers' ability to acquire, apply, and continuously update their digital competencies (European Centre for the Development of Vocational Training [Cedefop], 2020).

Vocational education teachers play a critical role in integrating technology into practical learning through digital platforms, online learning resources, virtual simulations, learning management systems, and digital assessment tools. Effective technology integration requires teachers to possess not only basic digital literacy but also advanced competencies for designing technology-supported instruction and facilitating digital learning environments (Redecker, 2017; European Commission, 2022). However, many vocational teachers face challenges, including limited access to digital infrastructure, inadequate professional development opportunities, and insufficient exposure to emerging technologies,

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which contribute to gaps between existing digital competencies and those required for effective technology-enhanced teaching (UNESCO, 2021; OECD, 2019).

Consequently, digital skills acquisition, reskilling, and upskilling have become essential strategies for helping vocational education teachers adapt to technological change, improve instructional practices, and prepare learners for future employment opportunities. While digital skills acquisition focuses on developing new competencies, reskilling and upskilling support individuals in acquiring emerging skills and strengthening existing abilities to remain effective in changing educational and workplace contexts (World Economic Forum [WEF], 2023; van Laar, van Deursen, van Dijk, & de Haan, 2020; Cedefop, 2020).

Against this background, this study investigates vocational education teachers' digital skills acquisition, reskilling, and upskilling needs for effective training in the future workplace**.** Specifically, the study examines teachers' existing digital competencies, the digital skills required for future-oriented instruction, competency gaps, and challenges affecting digital professional development. The findings are expected to provide evidence for developing strategies that enhance teachers' digital capacity and strengthen the relevance and responsiveness of vocational education in an increasingly digital society.

STATEMENT OF THE PROBLEM

The rapid advancement of digital technologies, automation, artificial intelligence, and other workplace innovations has significantly changed the skills required in the contemporary labour market. Consequently, vocational education teachers are expected to play a critical role in preparing learners with the digital competencies needed to succeed in technology-driven workplaces. However, many teachers still face challenges in acquiring and applying digital skills, which affects their ability to integrate emerging technologies, implement innovative teaching practices, and provide learners with relevant industry-based competencies.

Although digital transformation has become a major focus in education, challenges such as limited access to digital infrastructure, inadequate professional development opportunities, gaps in teachers' digital competencies, and insufficient reskilling and upskilling programmes continue to limit their ability to adapt to technological change. This gap between teachers' current digital capabilities and the skills required by evolving workplaces raises major concerns about the quality, relevance, and effectiveness of vocational education and training programmes.

Purpose of the Study

This study examines the digital skills acquisition, reskilling, and upskilling needs of vocational education teachers to support effective training for the future workplace. Specifically, the study aims to:

1. Identify the digital skills required by vocational education teachers to support effective instructional delivery and prepare learners for emerging workplace demands.
2. Assess the existing level of digital skills among vocational education teachers and determine the gaps between their current competencies and the digital skills required for future-oriented vocational training.
3. Determine the specific reskilling and upskilling needs necessary for vocational education teachers to effectively integrate emerging digital technologies into teaching and learning processes.

Research Questions

The following research questions were raised to guide the study:

1. What digital skills are required by vocational education teachers for effective training in the future workplace?
2. What is the current level of digital skills possessed by vocational education teachers, and what gaps exist between

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their current competencies and the skills required for future workplace training?

3. What reskilling and upskilling needs do vocational education teachers require for effective integration of digital technologies into teaching and learning?

LITERATURE REVIEW

The rapid advancement of digital technologies, artificial intelligence (AI), automation, and Industry 4.0 innovations has transformed workplaces and increased the demand for digital competencies. Digital skills enable individuals to adapt to technological changes, improve productivity, and remain competitive. In vocational education, digital skills acquisition involves teachers' ability to effectively use digital tools, platforms, and information systems for instruction, assessment, curriculum delivery, and practical skills training to enhance learners' workplace readiness (Bessen, 2019; OECD, 2021; UNESCO, 2022).

Vocational Education and Training (VET) teachers are critical to preparing learners for technology-driven occupations; however, Ayanwale and Ndlovu (2023) argued that emerging technologies such as AI, robotics, virtual reality, cloud computing, and digital learning platforms require teachers to continuously develop their digital competence. These competencies enable teachers to create innovative learning environments, utilize digital resources, develop technology-supported instructional materials, and integrate emerging technologies into practical training (European Commission, 2022; UNESCO-UNEVOC, 2023; UNICEF, 2026). Consequently, acquiring digital skills, reskilling, and upskilling are essential to keep vocational education relevant and responsive to future workplace demands.

The Fourth Industrial Revolution has reshaped occupational structures through automation, AI, big data analytics, and smart technologies, increasing the need for workers and educators with both technical and digital competencies. Therefore, vocational education systems must continuously adapt curricula, teaching strategies, and teacher development programmes to prepare learners for technology-intensive workplaces (Eynon & Malmberg, 2021; WEF, 2023; OECD, 2023). Continuous professional development through lifelong learning, reskilling, and upskilling enables teachers to acquire emerging skills, strengthen existing competencies, and improve vocational training quality (Cedefop, 2020; UNESCO, 2021).

According to Ayanwale and Ndlovu (2023), despite the growing importance of digital technologies, many vocational education teachers have limited exposure to emerging tools such as AI applications, digital fabrication, virtual and augmented reality, learning management systems, and online collaborative platforms. This creates digital competency gaps that may hinder effective technology integration in teaching and practical training (OECD, 2021; UNESCO-UNEVOC, **2023).** Effective integration requires not only teachers' competence and confidence but also adequate infrastructure, institutional support, technical assistance, and access to professional learning opportunities (European Commission, 2022; UNESCO, 2022).

Digital competencies among vocational education teachers extend beyond basic computer literacy to include digital content creation, online teaching, digital collaboration, cybersecurity awareness, data management, digital assessment, and discipline-specific technology applications. The DigCompEdu framework highlights key areas of educator digital competence, including professional engagement, digital resources, teaching and learning, assessment, learner empowerment, and development of learners' digital competence (Redecker, 2017; European Commission, 2022).

However, challenges such as inadequate professional development opportunities, limited funding, insufficient infrastructure, heavy workloads, rapid technological change, low confidence, and resistance to technology adoption constrain the acquisition, reskilling, and upskilling of digital skills. Addressing these challenges requires investment in digital infrastructure, continuous teacher training, supportive policies, and

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collaboration among educational institutions, governments, and industry stakeholders to strengthen teachers' digital readiness for effective vocational education in the future workplace (OECD, 2023; UNESCO, 2022).

METHODOLOGY

The study employed a descriptive survey research design. This design was suitable because it allowed the researcher to gather information from vocational education teachers about their existing digital skills, identify gaps between their current competencies and the skills required for future workplace training, and determine their reskilling and upskilling needs. The design enables the study to examine and describe existing conditions as they occur naturally without manipulating any variables.

Data were collected using a structured questionnaire titled *"Digital Skills Acquisition, Reskilling and Upskilling Needs Questionnaire (DSARUNQ)"*, developed based on the study objectives and research questions. Experts in Vocational Education, Educational Technology, and Measurement and Evaluation validated the instrument. The reliability of the instrument was established using Cronbach's Alpha, yielding a coefficient of 0.89. The questionnaire was administered through physical and electronic platforms, and the completed responses were retrieved

The data collected were analyzed using descriptive and inferential statistics. Mean and Standard Deviation were used to answer the research questions on vocational education teachers' current digital skills and required digital competencies. Need Gap Analysis (NGA) was employed to determine the difference between teachers' existing digital skills and the competencies required for effective training in the future workplace. The Need Gap Index was calculated as: Need Gap Index = Required Skill Mean – Current Skill Mean. A higher positive gap indicates a greater need for reskilling and upskilling. The findings were presented using tables, mean scores, standard deviations, and need-gap indices to support interpretation and discussion.

RESULTS

Table 1: Digital Skills Required by Vocational Education Teachers for Effective Training in the Future Workplace Using Needs Gap Analysis (N = 220)

S/N	Digital Skills Required	Current Level Mean (X_1)	Required Level Mean (X_2)	Need Gap Index (NGI)	Decision
1	Ability to use Learning Management Systems (LMS) for teaching and assessment	2.31	3.72	1.41	Highly Needed
2	Ability to use Artificial Intelligence (AI) tools for instructional support	2.08	3.81	1.73	Highly Needed
3	Digital content creation skills (videos, animations, multimedia materials)	2.45	3.76	1.31	Highly Needed
4	Online teaching and virtual classroom management skills	2.39	3.70	1.31	Highly Needed
5	Data literacy and ability to interpret educational data	2.22	3.65	1.43	Highly Needed
6	Cybersecurity awareness and safe digital practices	2.54	3.69	1.15	Needed
7		2.36	3.84	1.48	Highly Needed

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S/N	Digital Skills Required	Current Level Mean (X_1)	Required Level Mean (X_2)	Need Gap Index (NGI)	Decision
	Ability to integrate digital technologies into vocational curriculum delivery				
8	Use of simulation technologies (VR/AR) for practical training	1.98	3.63	1.65	Highly Needed
9	Digital collaboration and communication skills using online platforms	2.61	3.66	1.05	Needed
10	Ability to use cloud-based tools for teaching and resource sharing	2.34	3.71	1.37	Highly Needed
11	Use of digital assessment tools for evaluating learners	2.40	3.73	1.33	Highly Needed
12	Programming and computational thinking skills	1.87	3.42	1.55	Highly Needed
13	Ability to use emerging technologies (IoT, robotics, smart tools)	1.92	3.59	1.67	Highly Needed
14	Digital entrepreneurship and technology-enabled innovation skills	2.18	3.61	1.43	Highly Needed
15	Ability to conduct online research and access digital learning resources	2.72	3.78	1.06	Needed
Grand Mean	Overall Digital Skills Requirement	2.30	3.69	1.39	Highly Needed

Table 1 shows that vocational education teachers have a moderate-to-low level of existing digital skills (Grand Mean = 2.30), while they perceive the required level of competence for effective future workplace training as very high (Grand Mean = 3.69). The overall Need Gap Index of 1.39 indicates a substantial digital skills deficit among vocational education teachers and the need for targeted digital skills acquisition, reskilling, and upskilling programmes.

Table 2: Current Digital Skills Competency Level and Need Gaps among Vocational Education Teachers (N = 220)

S/N	Digital Skills Competencies	Current Competency Mean (X_1)	Required Competency Mean (X_2)	Need Gap Index (NGI)	Rank	Interpretation
1	Ability to integrate digital technologies into vocational teaching and learning	2.36	3.84	1.48	6	Highly Needed
2	Ability to use Learning Management Systems (LMS) for instructional delivery	2.28	3.76	1.48	7	Highly Needed
3	Ability to use Artificial Intelligence (AI) applications for teaching support	2.05	3.82	1.77	1	Highly Needed

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S/N	Digital Skills Competencies	Current Competency Mean (X_1)	Required Competency Mean (X_2)	Need Gap Index (NGI)	Rank	Interpretation
4	Digital content development using multimedia tools (video, graphics, animation)	2.47	3.75	1.28	10	Highly Needed
5	Online teaching and virtual classroom management skills	2.41	3.71	1.30	9	Highly Needed
6	Data literacy and ability to analyze learners' performance data	2.18	3.67	1.49	5	Highly Needed
7	Digital assessment and evaluation skills using online platforms	2.44	3.72	1.28	11	Highly Needed
8	Cybersecurity awareness and protection of digital learning resources	2.58	3.65	1.07	14	Needed
9	Cloud computing skills for storing and sharing educational resources	2.32	3.70	1.38	8	Highly Needed
10	Use of Virtual Reality (VR) and Augmented Reality (AR) simulation tools	1.96	3.62	1.66	3	Highly Needed
11	Internet research skills and access to online educational resources	2.73	3.78	1.05	15	Needed
12	Digital communication and collaboration skills using online platforms	2.65	3.69	1.04	16	Needed
13	Programming and computational thinking skills	1.89	3.51	1.62	4	Highly Needed
14	Ability to use emerging technologies (IoT, robotics, smart devices)	1.92	3.68	1.76	2	Highly Needed
15	Digital entrepreneurship and innovation skills	2.21	3.63	1.42	12	Highly Needed
Grand Mean	Overall Digital Skills Competency	2.31	3.70	1.39	—	Highly Needed

Table 2 shows that vocational education teachers' current digital skills are relatively low (Grand Mean = 2.31) compared with the required competency for future workplace training (Grand Mean = 3.70). The overall Need Gap Index of 1.39 indicates a considerable gap between teachers' current digital competencies and the skills needed

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to effectively prepare learners for technology-driven workplaces.

Table 3: Reskilling and Upskilling Needs of Vocational Education Teachers for Digital Technology Integration (N = 220)

S/N	Reskilling and Upskilling Competency Areas	Current Competency Mean (X_1)	Required Competency Mean (X_2)	Need Gap Index (NGI)	Rank	Decision
1	Training on the use of Artificial Intelligence (AI) tools for lesson planning and instructional support	2.08	3.86	1.78	1	Highly Needed
2	Capacity building on integrating digital technologies into vocational curriculum delivery	2.31	3.84	1.53	6	Highly Needed
3	Training on Learning Management Systems (LMS) for online and blended learning	2.27	3.76	1.49	8	Highly Needed
4	Development of digital instructional materials using multimedia applications	2.43	3.78	1.35	11	Highly Needed
5	Training on virtual classroom management and online facilitation skills	2.39	3.72	1.33	12	Highly Needed
6	Upskilling in digital assessment tools and online evaluation techniques	2.42	3.74	1.32	13	Highly Needed
7	Training on Virtual Reality (VR), Augmented Reality (AR), and simulation technologies	1.94	3.68	1.74	2	Highly Needed
8	Reskilling in emerging technologies (IoT, robotics, smart manufacturing technologies)	1.88	3.65	1.77	3	Highly Needed
9	Training on data analytics and interpretation for improving teaching effectiveness	2.15	3.70	1.55	5	Highly Needed
10	Capacity development in cybersecurity and protection of digital resources	2.52	3.66	1.14	15	Needed
11	Training on cloud-based educational tools for resource sharing and collaboration	2.34	3.71	1.37	10	Highly Needed
12	Digital entrepreneurship and innovation skills for workplace-oriented training	2.21	3.67	1.46	9	Highly Needed

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S/N	Reskilling and Upskilling Competency Areas	Current Competency Mean (X_1)	Required Competency Mean (X_2)	Need Gap Index (NGI)	Rank	Decision
13	Continuous professional development programmes on emerging digital technologies	2.19	3.82	1.63	4	Highly Needed
14	Peer learning and collaborative platforms for sharing digital teaching practices	2.63	3.69	1.06	16	Needed
15	Training on online research skills and digital learning resource management	2.70	3.75	1.05	17	Needed
Grand Mean	Overall Reskilling and Upskilling Needs	2.28	3.73	1.45	—	Highly Needed

Table 3 indicates that vocational education teachers reported a low current level of reskilling and upskilling competencies (Grand Mean = 2.28) compared with the required competency level for effective digital technology integration (Grand Mean = 3.73). The overall Need Gap Index of 1.45 indicates a substantial need for targeted professional development programmes to improve teachers' capacity to integrate digital technologies into teaching and learning.

DISCUSSION OF FINDINGS

The study revealed significant needs for digital skills acquisition, reskilling, and upskilling among vocational education teachers to effectively train the future workforce. The overall Need Gap Index (NGI = 1.39) indicated a substantial disparity between teachers' existing digital competencies and the skills required for technology-driven vocational training. The highest digital skill gaps were identified in artificial intelligence (AI) applications, Internet of Things (IoT), robotics, and virtual/augmented reality (VR/AR) simulation technologies. This finding supports the view that Industry 4.0 technologies are transforming workplace skill requirements and necessitating advanced digital competencies among educators (Schwab, 2016; European Commission, 2022; International Labour Organization [ILO], 2023).

The study also found that vocational education teachers reported the largest competency gaps in using AI for instructional support (NGI = 1.77), emerging technologies such as IoT and robotics (NGI = 1.76), and VR/AR simulation technologies (NGI = 1.66). These findings suggest a need for intensive digital reskilling and upskilling to help teachers integrate emerging technologies into teaching, assessment, and practical skills training. This aligns with Redecker (2017), Ayanwale and Ndlovu (2023), and the World Economic Forum (2023), who emphasized that digital competency gaps and inadequate digital pedagogy remain major challenges affecting educators' readiness for future-oriented education.

Conversely, the study found smaller competency gaps in digital communication, online research skills, access to digital learning resources, and cybersecurity awareness, suggesting that teachers have basic digital literacy but need to advance toward higher-level digital competence. This supports the argument that vocational teachers must move beyond basic technology use to develop advanced skills for digital instructional design, technology-supported assessment, and workplace simulation activities (Caena & Redecker, 2019; European Commission, 2022).

Regarding reskilling and upskilling needs, the findings revealed the greatest training

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requirements in AI tools for lesson planning and instructional support (NGI = 1.78), IoT, robotics, smart technologies (NGI = 1.77), and VR/AR simulation technologies (NGI = 1.74). However, teachers reported lower training needs in online research skills and digital learning resource management (NGI = 1.05) and digital collaboration platforms (NGI = 1.06). These results indicate that while teachers have foundational digital skills, they still need ongoing professional development in advanced technologies, digital pedagogy, data-driven instruction, and technology-enhanced training strategies.

Overall, the findings highlight the importance of integrating digital skills development, reskilling, and upskilling programmes into vocational teacher education. Continuous professional learning, supported by adequate infrastructure and institutional policies, is essential for preparing vocational education teachers to deliver industry-relevant training and equip learners with competencies required in the future workplace (Chin & Ahmad, 2022; World Economic Forum, 2023; UNESCO, 2022; International Labour Organization, 2023).

CONCLUSION

Based on the study's findings, it was concluded that digital skills acquisition, reskilling, and upskilling are critical requirements for vocational education teachers to effectively prepare learners for the demands of the future workplace. The study established that although vocational education teachers possess some basic digital competencies, significant gaps exist between their current digital skills and the advanced competencies required for technology-driven vocational training.

The study also concluded that vocational education teachers need substantial reskilling and upskilling to better integrate digital technologies into teaching and learning. Continuous professional development programmes focusing on digital pedagogy, AI applications, digital content creation, online teaching, digital assessment, and emerging workplace technologies are necessary to improve teachers' instructional effectiveness and responsiveness to changing occupational demands.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

1. Vocational education institutions should establish continuous digital skills development programmes for teachers.
2. Teacher professional development frameworks should be redesigned to include digital competency standards.
3. Government and education stakeholders should provide funding support for digital transformation initiatives in vocational education.
4. Dedicated resources should be allocated for teacher reskilling programmes, acquiring digital facilities, maintaining equipment, and developing digital learning materials.

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