Journal of Vocational, Adult and Continuing Education and Training

JOVACET
Journal of Vocational, Adult and Continuing Education and Training

VOLUME 7
Issue 1 2024

This publication was produced with support from the National Research Foundation's South African Research Chairs Initiative. However, journal contents are the sole responsibility of the authors and do not necessarily reflect the views of funders.

Journal of Vocational, Adult and Continuing Education and Training

Volume 7, Issue 1
2024

The Journal of Vocational, Adult and Continuing Education and Training

The Journal of Vocational, Adult and Continuing Education and Training (JOVACET) recognises the need for critical engagement through studies in technical and vocational education and training (TVET) and adult and continuing education and training, and for encouraging critical scrutiny of this expansive knowledge area on the African continent.

The voices and experiences of practitioners, reflecting on all aspects of teaching and learning within vocational education and adult education settings, should be heard through the publication of empirical and robust research. While the journal wishes to take forward academic scholarship, it also seeks to strengthen opportunities for reflective practice that makes a scholarly contribution to the field. New knowledge emerging out of complex developmental contexts has significant value and needs to be showcased beyond existing geographical and political boundaries. The journal is therefore committed to also supporting the development of emerging researchers by providing them with a space to present and defend their research amongst a network of global scholars. Within the field of vocational and continuing education there is substantive 'grey literature' that remains in project report form. The journal is potentially a vehicle for the translation of this important work into an academic contribution to a wider community of practice, thereby enhancing its value.

ISSN 2663-3639 (print)
ISSN 2663-3647 (electronic)

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Conceptualised, typeset and proofread by COMPRESS.dsl | 800946 | www.compressdsl.com

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EDITORIAL

Joy Papier
Editor-in-Chief

This seventh regular issue of *JOVACET*, which we are pleased to present, raises a range of interrelated concerns in vocational education and training across a variety of contexts and research participants. It is heartening and perhaps indicative of the evolving post-school context in South Africa and further afield that subjects and/or disciplines such as electronic technology and digital learning in vocational teaching, learning and assessment (see Gregory and Zulu; Mouwers-Singh and Arendse; Prinsloo), the creation of pathways through further and higher education (see Mantashe; Norodien-Fataar) and work-related training (see Briante and Barabasch; Wenger and Lamamra; Wickramasinghe and Wickramasinghe) are the focus of the articles in this regular issue of 2024. These thematic strands are not distinctly separate; indeed, they intersect at various points in the trajectories of young and adult learners as they transition from initial training to work or to continuing higher education.

Wickramasinghe and Wickramasinghe, writing from Sri Lanka, deal with Industry 4.0 (colloquially referred to as the 'Fourth Industrial Revolution'), a topic that has preoccupied technical and vocational education and training (TVET) in South Africa for the past decade. Their study of TVET offerings in the STEM (science, technology, engineering and mathematics) fields investigated the implementation of Industry 4.0 competencies by tertiary institutions in 15 countries in the Indo-Pacific region. In it, the authors strive to identify critical success factors for promoting the desired competencies. Their findings indicate that staff capacity development, a supportive culture, the availability of resources, and public awareness are critical to the successful implementation of Industry 4.0 in institutions of higher education. In addition, the type of TVET institution played a significant role as implementing agent in putting in place the necessary elements that would serve to enhance the competencies being attained.

Picking up on the theme of technology-enhanced teaching and learning, **Gregory and Zulu** explore the use of an English vocabulary-building application to help TVET students in multilingual South African classrooms improve their verbal interactions in order to express

their ideas more confidently and also to support their reading and comprehension in English. The impact on academic achievement of studying in a second or third language has been well documented in the research literature. In South African TVET colleges, almost 90% of students have an African language as their first language, whereas the lingua franca of learning and assessment in TVET is English. Through applying a model of teacher change in this action research study, the authors' research produced promising outcomes for second-language learning. These outcomes served to highlight both the need for lecturers to engage with technology in their practices and the positive responses of those students who were exposed to more interactive teaching and learning methods.

Moving from college youths and technology-enhanced learning to an adult learner setting, **Mouwers-Singh and Arendse** investigated more closely older adult learners enrolled in an online master's programme at a university and the ways in which these adults coped with remote-learning studies that required them to become 'digital citizens'. Through in-depth interviews, this qualitative study obtained detailed information about the learning experiences of adults who were studying towards a postgraduate university qualification. While the older adult learners who participated in the study were achieving success, they revealed their anxieties about the use of digital technologies and expressed the need for more intensive assistance, mentorship and support in doing so. Innovative solutions and creative approaches were desired to increase their confidence in using technology, the use of which they believed came more naturally and easily to their younger counterparts. The participants acknowledged firmly, though, that enabling them to become proficient users of learning affordances would enable older adult learners to participate to their fullest capability in both education and society.

In a different post-school trajectory for digital learning, **Prinsloo**'s article takes us into the domain of work and occupational certification. The recognition of prior learning (RPL) of artisans who have substantial work experience but lack the formal qualification to take the trade test for certification has been a concern of those policymakers engaged in increasing the numbers of qualified artisans. E-RPL is a relatively new methodology in South Africa that came into prominence particularly after the onset of COVID-19. E-RPL has made it possible for electronic, digital and mobile web technologies to be used to collect and record evidence of prior learning acquired, whether formally, non-formally or informally. In his research, the author conducted a study of the artisan RPL (ARPL) assessment being implemented at public TVET institutions that are also recognised testing centres. Although ARPL and capacity-building appeared to be gaining purchase in the TVET college sector, funding and resource constraints were found to be significant impediments to taking E-RPL to scale. These constraints were considered to be hampering the intentions of the stated policy to achieve the projected target of a substantial number of individuals becoming qualified artisans by 2030.

The next article changes tack slightly to a focus on TVET college completers who wish to continue their studies at university but encounter institutional and programme obstacles in their attempts to gain access to higher education. Here, **Mantashe** examines the lack of

curriculum alignment (or outright curriculum misalignment) as a possible cause. Whereas government post-school education and training policies place a clear emphasis on TVET college and university alignment in pursuit of a 'seamless' system for articulation and progression, institutional practices reveal that this does not occur in reality. This is largely because what should be equivalent or compatible university and TVET college programmes still tend to be largely siloed, with little interface between their curricula. The evidence shows that without actors who are empowered to drive the relevant institutional policies, curriculum reviews have not been incorporating articulation principles that might otherwise result in alignment. What is more, overarching policies are not finding expression at the level of curriculum planning, resulting in institutional impediments to the goals of the national articulation policy.

Norodien-Fataar continues on the theme of TVET students' pathways into higher education by examining the systemic processes needed to enhance access for aspirant university applicants. Her article reports on a high-level project specifically targeted at formalising transitions from college to university and establishing a 'more inclusive and adaptable higher education system'. The project that is the subject of this article is still in its infancy and relies on cultivating deliberate processes for collaboration between universities and TVET colleges in the interests of increasing access for vocational college students. One of the mechanisms being considered is that of collaboratively offered Higher Certificates (a university offering) developed with the needs of a particular occupation in mind and designed to integrate theory and practice. These mechanisms would effectively constitute a deliberate focus on the kind of curriculum alignment between TVET colleges and universities envisaged by Mantashe's contribution.

In this issue, we have two further international contributions, both emanating from Switzerland – those of **Briante and Barabasch** and of **Wenger and Lamamra** – which are both located in the area of workplace training, an essential feature of the success of the European vocational system. In the first of these contributions, Briante and Barabasch report on research conducted among Swiss postal service employees. They examine the ways in which workplaces might enhance the competence outcomes of their apprentices-in-training by satisfying people's basic psychological need for autonomy. The authors argue that gaining autonomy has been shown to have a positive impact on the development of young adults, leading to better learning and, ultimately, to work satisfaction. Their findings indicate that the practices aimed at fostering such autonomy among apprentices include encouraging learners to plan and direct their learning pathways in consultation with their coaches. This enables them to take greater responsibility for, and display more initiative in, workplace projects and adequately express their needs so that these may be responded to by employers.

The second of these two international articles shines a light on Swiss workplace trainers and their own need for continuing education. Despite the sophistication of the European 'dual vocational' education and training system, the authors hold that ongoing training for in-company educators remains limited. Their quantitative study focused on the attitudes of

these in-company trainers to continuing professional development and the offerings available to them. Applying a 'latent class analysis' approach, the researchers identified four descriptive categories of in-company trainer and highlighted the differences and preferences regarding the types of training needs that were revealed among them. The authors aver that their study emphasises the complex pedagogical role that workplace trainers perform rather than simply the perception of their role as being that of 'occupation transmitter' – the implication being that these trainers require ongoing and tailored training to suit their particular pedagogical needs.

In closing, we again need to thank the excellent reviewers among our editorial board members and those elsewhere who continue to ensure that the articles submitted to *JOVACET* meet the highest standards for publication. As allied contributors to maintaining the quality of our journal, we could not omit to mention our copy editor, John Linnegar (McGillivrayLinnegarAssociates), who has for years now meticulously corrected language imperfections in the articles accepted for publication; nor could we fail to acknowledge the expertise and attention to detail of our own managing editor, Catherine Robertson. Finally, we extend our grateful thanks to our publisher, Felicity Gallagher (COMPRESS.dsl), and our website manager, Ashley Richardson, who have since the inception of *JOVACET* ensured that our journal is published annually in both hard-copy and online formats, and who deal diligently with all the glitches associated with producing a publication.

We hope that you enjoy reading this the 2024 edition of *JOVACET* and are inspired by its research contributions. Thank you again for continuing to support our publication.

All the best for 2025.

JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Wickramasinghe, GLD & Wickramasinghe, V. 2024. Institutional implementation of Industry 4.0 competencies in TVET programmes in the Indo-Pacific: Critical success factors. *Journal of Vocational, Adult and Continuing Education and Training*, 7(1):1–27.
http://doi.org/10.14426/jovacet.v7i1.382

Institutional implementation of Industry 4.0 competencies in TVET programmes in the Indo-Pacific: Critical success factors

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ABSTRACT

This article responds to the question: What are the critical success factors that support the implementation of Industry 4.0 competencies in TVET (technical and vocational education and training) programme offerings? The scope of our study was programme offerings targeting STEM (science, technology, engineering and mathematics) fields at the tertiary level across 15 countries in the Indo-Pacific region. The study evaluated the 'actions already taken' to implement Industry 4.0 competencies, and a survey questionnaire was used to collect data. The findings identified staff capacity development, a supportive culture, the availability of resources, and public awareness as critical success factors. In addition, TVET institution type and the annual growth rate of real GDP (gross domestic product) per employed person were found to boost the relationship between these factors. This means that TVET colleges are in a weaker position in implementing Industry 4.0 compared with the other two types of institutions in the study.

KEYWORDS

Fourth Industrial Revolution (4IR); Indo-Pacific; Industry 4.0 competencies; technical and vocational education and training (TVET)

Introduction

Technical and vocational education and training (TVET) offers a combination of education, training and skills development opportunities in a wide range of occupational fields, production processes, services and livelihoods (ILO, 2020:21). The pedagogical approach of TVET is a mixture of theory, practice and work-based learning that leads to a qualification or other skills development options with a lifelong learning agenda at the secondary, post-secondary and tertiary levels. TVET institutions exercise the most influence and make the greatest contribution by incorporating qualifications and competencies into curricula, adopting appropriate teaching and learning practices, and building the capacity of staff – which are among the core functions of a TVET system (World Bank, 2021).

When TVET institutions set out to meet expectations, the incorporation of digital technologies tied to the Fourth Industrial Revolution (4IR) (commonly denoted as Industry 4.0) has become a necessity for two main reasons. First, to succeed in the volatile, uncertain, complex and ambiguous (VUCA) world that we currently live in (Millar, Groth & Mahon, 2018), TVET institutions must rely increasingly on Industry 4.0 technologies. This leads us to the second reason: Industry 4.0. Society has been undergoing dramatic transformations that are credited to Industry 4.0 digital technologies (World Economic Forum, 2016). In the context of work, Industry 4.0 technologies enable organisations to shift their operations as required by the VUCA world by creating smart workplaces. Shifting to Industry 4.0 technologies has become a part of national agendas; and the education sector as a whole should move forward with these agendas (World Bank, 2021).

Building on this context, we argue that the future of TVET is being shaped by Industry 4.0 technologies in two spheres. On the one hand, TVET should incorporate Industry 4.0 competencies into the curriculum of the existing and new programme offerings by defining learning objectives and mapping subject content onto learning outcomes. Here, TVET teachers possessing the subject content expertise in Industry 4.0 technologies and an understanding of the competencies to be incorporated into the curriculum are forming the core. On the other hand, Industry 4.0 technologies have been making a profound impact on the digitisation of pedagogies (Schröder, 2019; Spöttl & Windelband, 2021). Therefore, TVET should incorporate Industry 4.0 technologies into teaching, learning and assessment, and also into the development of teaching materials. In this respect, TVET teachers who possess the digital skills to use Industry 4.0 technologies and who also have the competencies to teach subject content using Industry 4.0 technologies form the core (World Bank, 2021).

The present study investigated 15 countries in the Indo-Pacific region. The literature from Indo-Pacific countries under study, on the one hand, suggests a lack of supply of skilled manpower (e.g. Bhattacharyya & Mitra, 2020; Butt et al., 2020) and questions the quality of the supply of skilled manpower delivered by TVET institutions (e.g. Jabarullah & Hussain, 2019). On the other hand, the literature highlights the challenges faced by TVET

institutions in areas such as financial and infrastructural (e.g. Gonçalves, 2019) matters, teacher capabilities (e.g. Mahdum, Hadriana & Safriyanti, 2019; Butt et al., 2020) and curriculum development (Butt et al., 2020). In addition, Gonçalves (2019) and Schröder (2019) suggest that the challenges faced by TVET institutions are common to Asia as a whole.

In the above context, we raise this question: What are the critical success factors that support the implementation of Industry 4.0 competencies in programme offerings? Accordingly, following the terminology introduced by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and used uniformly worldwide (2021:8) – specifically, *qualifications*, *competencies* and *implementation* – we investigated the factors that support the successful implementation of the competencies demanded by Industry 4.0 in programme offerings across 15 countries in the Indo-Pacific region. These are indicated in Table 1. The annual growth rate of real gross domestic product (GDP) per employed person is also identified because it is useful in understanding country ratings (Asian Development Bank, 2020:49).

TABLE 1: Countries and characteristics

COUNTRY	SAMPLE (% OF TOTAL RESPONSES)[1]	GDP GROWTH[2]
Bangladesh	10.75	5.9
Vietnam	7.00	5.8
Myanmar	6.07	5.4
Cambodia	7.00	5.3
Mongolia	1.64	5.3
India	14.95	4.8
Nepal	4.44	3.9
Bhutan	3.98	3.4
Philippines	12.85	3.3
Papua New Guinea	1.64	3.0
Thailand	6.78	2.7
Malaysia	5.37	2.6
Sri Lanka	9.58	2.5
Fiji	1.17	1.7
Pakistan	6.78	1.1

Notes: [1] = 428 (= 100%); [2] = Annual growth rate of real GDP per employed person.

Literature review

Implementation of Industry 4.0 competencies in programme offerings

The responses of TVET institutions to Industry 4.0 could inevitably move them towards digital transformation. Digital transformation involves digital adaptation, innovation and acceleration (ILO, 2020:25). With regard to digital adaptation, that is, 'how Industry 4.0 technology requires teaching new content' (ILO, 2020:25), the literature emphasises the need for Industry 4.0 technologies to become an integral part of TVET programme offerings (Schröder, 2019; Bhattacharyya & Mitra, 2020; Butt et al., 2020; Spöttl & Windelband, 2021). Industry expects, on the one hand, digital workflows currently in use to be reflected in programme offerings. On the other, with the continuing digitisation of work processes, industry requires workers to return to TVET institutions from time to time during their careers to remain relevant (ILO, 2020:60). This implies that TVET institutions must:

1. Update curricula and incorporate new content into their existing programmes;
2. Introduce new programmes to fulfil the requirements of new jobs, new occupations and new industry or to service sectors regularly and continuously; and
3. Introduce bridging programmes to reskill and upskill workers with lifelong learning in mind.

In doing so, forward-looking TVET systems must change their focus fourfold, that is, from:

- Academic pathways to applied learning pathways through internships for full-time courses;
- Classroom learning to work-based learning through work-study diploma pathways;
- Front-load learning to lifelong learning through accessible and bite-sized programmes for upgrading; and
- Technical skills to multidisciplinary skills through the integration of technical, transversal and citizenship skills.

With regard to digital innovation, that is, 'how Industry 4.0 technology enables new forms of teaching and learning' (ILO, 2020:25), Industry 4.0 technologies mediate knowledge in digital ways that enrich the teaching and learning process (ILO, 2020; TVET Academy, 2021). Industry 4.0 technologies can make a complete shift to the traditional teaching and learning practices of TVET. Today, students are expected either to learn theoretical aspects with the support of a variety of digital devices such as digitised textbooks, smart boards or tables and wearable gadgets, or to learn remotely through a digital platform, maintaining persistent learning by staying in near-constant contact with fellow students and teachers through mobile messaging apps (ILO, 2020). Students are expected to practise in a virtual, reality-based training environment provided by the TVET institution or its industry partners. This way of teaching and learning is a complete shift from learning theory

within the confines of a TVET institution's classroom, practising within the confines of its workshop, and refining and mastering capabilities by engaging in a real assignment on the site of an industry partner.

When both of these practical approaches are taken together – teaching new content and using new forms of teaching and learning – a student may learn the foundational content and skills through a TVET institution and then gain access to the labour market. They may continue to learn through opportunities provided by the employer or higher education institutions, depending on the requirements of the job and their career aspirations. These learning events may be integrated into their job as microlearning, and they may also engage in the learning using flexible learning avenues such as attending evening classes or using an online or distance mode. In line with this, therefore, Industry 4.0 technologies provide ample avenues for just-in-time learning.

In the present study, by 'implementation of Industry 4.0 competencies into programme offerings' we mean the extent to which institutions teach subject content by incorporating new content into existing programmes, introducing new programmes for newly emerged needs, introducing new programmes to reskill and upskill workers with lifelong learning in mind, and also the use of digital technology-based delivery modes in teaching and learning.

Critical success factors

Given the importance of the successful implementation of Industry 4.0 competencies, it is imperative for institutions embarking on the implementation to have a greater understanding of the conditions that lead to success. Therefore, by the expression 'critical success factors' we mean the enabling conditions that are conducive to success in incorporating Industry 4.0 competencies into programme offerings. Building on the literature that is reviewed in the following sections, the conceptual model shown in Figure 1 has been developed for the present study.

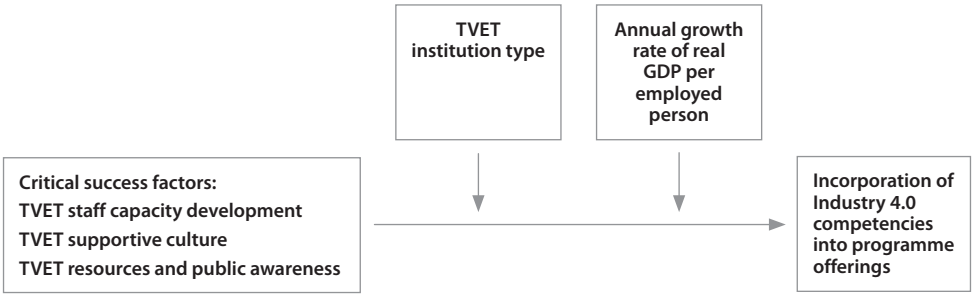

FIGURE 1: Research model

TVET staff capacity development

When putting the changes required by Industry 4.0 into practical effect, the key to success is TVET staff possessing the requisite capabilities. UNESCO (2021) has called on its member countries to develop mechanisms which ensure that TVET staff at all levels are given opportunities to prepare for the profession and engage in continuing training and professional development. With regard to areas of staff capacity development, three types of knowledge – content, pedagogical and technological – are vital. This means that staff competencies should be on a par with developments in Industry 4.0 technologies. However, the recent literature (e.g. Mahdum et al., 2019; Butt et al., 2020; ILO, 2020; Holler, Brändle & Zinn, 2023) suggests that TVET staff do not possess the requisite knowledge, especially technological knowledge, or the requisite level of digital competencies in particular. This has a direct impact on the potential of incorporating Industry 4.0 competencies into TVET programme offerings. Therefore, it is hypothesised that

H1: Staff capacity development enhances the incorporation of Industry 4.0 competencies into programme offerings.

TVET supportive culture

The creation of a culture of innovation involving TVET staff at all levels (ILO, 2020), the promotion of exchanges between internal and external stakeholders (TVET Academy, 2021), the establishment of a multi-stakeholder collaboration system (ILO, 2020; TVET Academy, 2021; Amegah, 2023) and being open to change (ILO, 2020) were commonly identified as prerequisites for the survival and growth of TVET institutions. Furthermore, recent literature (e.g. Mahdum et al., 2019; Butt et al., 2020; World Bank, 2021) suggests the value of TVET institutions providing support for sharing experiences on Industry 4.0 competencies and technologies. In addition, the literature stresses the importance of TVET institutions providing support to effect changes to programme offerings (Alade & Windapo, 2020; World Bank, 2021). Therefore, it is hypothesised that

H2: A supportive culture enhances the incorporation of Industry 4.0 competencies into programme offerings.

TVET resources and public awareness

The availability of resources such as equipment, computer hardware, software and a communication network for digital delivery, in addition to having the freedom to hire new staff with up-to-date competencies, are vital prerequisites. In this regard, the ILO (2020), the TVET Academy (2021) and the World Bank (2021) emphasise the importance of TVET institutions having the ability to identify appropriate technological infrastructure and also the autonomy to invest in such infrastructure. However, recent literature (e.g. Oketch, 2016; Gonçalves, 2019; ILO, 2020; McGrath et al., 2020; World Bank, 2021; TVET Academy, 2021) suggests that TVET institutions are experiencing financial and infrastructural shortages. Public awareness of Industry 4.0 technologies and changes to

programme offerings and academic pathways can also increase the demand for TVET programmes for beginner, intermediate or advanced learners and for bridging programmes with the intention of upskilling and reskilling the workforce. Therefore, it is hypothesised that

> H3: The availability of resources and public awareness enhance the incorporation of Industry 4.0 competencies into programme offerings.

Contextual factors

TVET institution type

TVET institutions are at the front line of programme delivery (World Economic Forum, 2016; UNESCO, 2021). The literature also suggests the existence of different types of TVET institution, such as universities, polytechnics and colleges, that are involved in offering programmes in their entirety and/or their components (UNESCO-UNEVOC International Centre for TVET, 2020; World Bank, 2021). These TVET institutions are expected to offer quality, relevant and timely programmes that respond to labour market demands. However, recent literature (e.g. Persson & Hermelin, 2018; ILO, 2020; UNESCO, 2021) suggests that TVET institutions' capacity to respond may vary by institution type. For example, the ILO (2020:71) states:

> [I]n most countries – even in advanced economies – basic pedagogies, such as those enabled by distance learning or by digitally enhanced classrooms, have not yet been mainstreamed across the entire educational system.

Recent studies, such as those by Yaakob (2017), Bai and Paryono (2019) and Marzuki et al. (2022) also provide evidence to suggest possible differences between TVET institutions in the Indo-Pacific region. Therefore, it is hypothesised that

> H4: Institution type enhances the incorporation of Industry 4.0 competencies into programme offerings.

In line with Figure 1, the following hypotheses are also proposed:

> H4a: Institution type moderates the relationship between staff capacity development and the extent of incorporation of Industry 4.0 competencies into programme offerings.

> H4b: Institution type moderates the relationship between supportive culture and the extent of incorporation of Industry 4.0 competencies into programme offerings.

> H4c: Institution type moderates the relationship between the availability of resources and public awareness and the extent of incorporation of Industry 4.0 competencies into programme offerings.

Annual growth rate of real GDP per employed person

A country's TVET system and its capacity to provide skilled labour are central components of the political economy. The design and development of the system of TVET could vary from country to country due to the prevailing characteristics of the market economy and labour market relations. Furthermore, a country's status in technological upgrading or innovation, economic growth and employment growth go hand in hand. Sustainable Development Goal 8 (SDG 8) propounds the importance of promoting economic growth and labour productivity (UN, nd). One of the targets of SGD 8 is 'achieving higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high-value added and labour-intensive sectors', which is depicted for each country by the indicator 'annual growth rate of real gross domestic product (GDP) per employed person' (identified as SDG8–8.2.1). This indicator conveys the idea of labour productivity.

The literature identifies an important connection between individuals participating in the labour market who have attained a tertiary education (vocational and university) and a country's annual growth rate of real GDP per employed person (Jongen, 2004; Marattin & Salotti, 2011). Bosler et al. (2019) referred to this as 'labour quality' and asserted this to be the value of educational attainment of those who participate in the labour market. Jongen (2004) referred specifically to the importance of adult education and training and suggested the existence of an important connection between returns from training and education efforts and a country's annual growth rate of real GDP per employed person. Therefore, it is hypothesised that

H5: The annual growth rate of real GDP per employed person enhances the incorporation of Industry 4.0 competencies into programme offerings.

In line with Figure 1, the following hypotheses are also proposed:

H5a: The annual growth rate of real GDP per employed person moderates the relationship between staff capacity development and the extent of incorporation of Industry 4.0 competencies into programme offerings.

H5b: The annual growth rate of real GDP per employed person moderates the relationship between supportive culture and the extent of incorporation of Industry 4.0 competencies into programme offerings.

H5c: The annual growth rate of real GDP per employed person moderates the relationship between the availability of resources and public awareness and the extent of incorporation of Industry 4.0 competencies into programme offerings.

Overall, the following hypotheses are proposed in line with Figure 1:

H6: Institution type and the annual growth rate of real GDP per employed person moderate the relationship between staff capacity development and the extent of incorporation of Industry 4.0 competencies into programme offerings.

H7: Institution type and the annual growth rate of real GDP per employed person moderate the relationship between a supportive culture and the extent of incorporation of Industry 4.0 competencies into programme offerings.

H8: Institution type and the annual growth rate of real GDP per employed person moderate the relationship between the availability of resources and public awareness and the extent of incorporation of Industry 4.0 competencies into programme offerings.

Methodology

We collected data from 15 countries in the Indo-Pacific region using a survey questionnaire. The details of the measures used, sample, method of data collection and methods of data analysis are presented in this section.

Measures

As shown in Figure 1, the study had three independent variables, one dependent variable and two moderators. All the measures used in the study were developed by the authors. Furthermore, all the measures are based on a seven-point Likert scale ranging from strongly agree to strongly disagree (strongly agree = 7, agree = 6, more or less agree = 5, moderate = 4, more or less disagree = 3, disagree = 2, strongly disagree = 1). Furthermore, all the measures evaluated the 'actions already taken' instead of 'intend to do' or 'identified as important to do'. In addition, the scope was limited to the micro-level of programme implementation, that is, the TVET institutions, and used the terminology proposed by UNESCO (2021). The dependent variable was measured using the six-item scale shown in Table 3. The independent variables were measured by means of the 23-item scale shown in Table 4. The data point of the annual growth rate of real GDP per employed person applicable to each country was identified as per the Asian Development Bank (2020:49).

Sample and method of data collection

We followed the definitions of the ILO (2020:60) and the UNESCO-UNEVOC International Centre for TVET (2020:7) for TVET staff. The sample comprised TVET staff at the tertiary level in the science, technology, engineering and mathematics (STEM) fields belonging to four broad categories – academic staff, academic support staff, technical staff and administration.

The Colombo Plan Staff College for Technician Education, located in the Philippines, allowed us access to its member directory of around 2 000 TVET staff from the countries selected for the study who had attended its in-country teacher training programmes during the past three years (see Table 1). We received 428 valid responses, as shown in Table 1, which represents a 21% response rate. The characteristics of the respondents are shown in Table 2.

TABLE 2: Characteristics of respondents

	%
GDP growth:[1]	
Less than 4% (low GDP growth)	52.88
4% or more (high GDP growth)	47.12
Institution type:	
TVET teacher training/research institute	30.9
Polytechnic/TVET university	22.6
TVET college	46.5
Job type:	
Administration	47.4
Academic staff	38.6
Academic support staff	2.1
Technical staff	11.9
Highest education level:	
Doctorate	23.2
Master's degree	49.1
Bachelor's degree	17.9
Certificate/diploma/higher diploma	9.8
Sex:	
Female	24.9
Male	75.1
Age (in years):	
Mean	44.47
Standard deviation	9.059
Minimum	25.00
Maximum	68.00
Skewness	0.064

Notes: [1] = refer to Table 1.

Methods of data analysis

We tested the data for any differences by country using Wilks' Lambda statistic; the statistic showed the non-existence of significant differences ($p > 0.05$), which was vital to proceeding with the data analysis. The data were tested for reliability, validity and factor structure, as shown in Tables 3 to 5.

TABLE 3: Incorporation of Industry 4.0 competencies into programme offerings

	FACTOR LOADING
My institution has incorporated Industry 4.0 competencies into the existing curriculum	0.894
My institution has incorporated Industry 4.0 competencies into the existing modules	0.897
My institution has introduced additional modules to incorporate Industry 4.0 competencies into the existing programmes	0.852
My institution has introduced programmes on digital skills to improve general digital literacy	0.896
My institution uses digital/technology-based delivery in teaching and learning	0.865
My institution has introduced lifelong learning courses to reskill and upskill TVET diplomates/graduates on Industry 4.0 competencies	0.871
Eigenvalue	4.716
Total variance explained	78.594
Cronbach's Alpha	0.904
Average variance extracted	0.773
Construct reliability	0.953

TABLE 4: Critical success factors

	F1: TVET STAFF CAPACITY DEVELOPMENT	F2: TVET SUPPORTIVE CULTURE	F3: TVET RESOURCES AND PUBLIC AWARENESS
My institution facilitates staff to update subject-content knowledge in line with Industry 4.0 requirements	0.894		
My institution facilitates staff to learn new pedagogies in line with Industry 4.0 requirements	0.843		
My institution facilitates staff to learn new technological capabilities in line with Industry 4.0 requirements	0.851		

	F1: TVET STAFF CAPACITY DEVELOPMENT	F2: TVET SUPPORTIVE CULTURE	F3: TVET RESOURCES AND PUBLIC AWARENESS
My institution has introduced programmes on digital skills to improve the general digital literacy of staff	0.908		
My institution recommends relevant training programs on Industry 4.0 competencies and technologies for staff	0.897		
My institution encourages the use of digital/ technology-based delivery in teaching and learning		0.846	
My institution provides an understanding of competencies that should be developed for Industry 4.0		0.892	
My institution provides guidance and support to address the needs of Industry 4.0		0.896	
My institution provides opportunities for staff to share their experiences on Industry 4.0 competencies and technologies		0.843	
My institution promotes close partnerships with academia, industry, and other stakeholders for mutual learning to address the needs of Industry 4.0		0.894	
My institution encourages us to learn from past experience and deal effectively with Industry 4.0 challenges		0.833	
Overall, strategic goals of my institution are people-oriented, purpose-oriented and process-oriented towards Industry 4.0		0.889	
My institution hires new staff with capabilities in Industry 4.0 competencies and technologies			0.890
My institution has adequate resources (equipment, computer hardware, software and communication network) for on-line/ digital delivery			0.853
My institution conducts awareness programmes for the industry on the importance of Industry 4.0 competencies and technologies			0.890
TVET regulating bodies in my country have consultants to advise on Industry 4.0 competency implementations			0.899

	F1: TVET STAFF CAPACITY DEVELOPMENT	F2: TVET SUPPORTIVE CULTURE	F3: TVET RESOURCES AND PUBLIC AWARENESS
My institution has consultants to advise on Industry 4.0 competency implementations			0.901
Eigenvalue	5.972	4.302	4.013
Total variance explained	32.678	28.437	21.821
Cronbach's Alpha	0.911	0.904	0.919
Average variance extracted	0.773	0.758	0.786
Construct reliability	0.944	0.956	0.948

TABLE 5: Correlations

		MEAN	SE	1	2	3	4	5	6
1	TVET institution type[1]	–	–	–					
2	GDP growth[2]	–	–	0.183**	–				
3	TVET staff capacity development	5.14	0.086	0.268**	0.118*	*0.879*			
4	TVET supportive culture	5.20	0.085	0.257**	0.090	0.521**	*0.871*		
5	TVET resources and public awareness	4.97	0.088	0.274**	0.140*	0.582**	0.514**	*0.887*	
6	Incorporation of Industry 4.0 competencies into programme offerings	5.08	0.084	0.327**	0.194*	0.668**	0.670**	0.529**	0.879

*Notes: [1] = Nominal (multi-categorical – refer to Table 2); [2] = Nominal (binary coded – refer to Table 2); SE = Standard error of the mean; Diagonal entries are square root of average variance extracted; *p < 0.05, **p < 0.01 (2-tailed).*

The research model shown in Figure 1 was tested with a Hayes (2013) Process Macro for SPSS. We used 5 000 bootstrapped samples at bias-corrected 95% confidence intervals to test moderation effects. When coding moderators, the annual growth rate of real GDP per employed person (referred to as GDP growth) was binary coded (0 = less than 4% (low GDP growth) and 1 = 4% or more (high GDP growth) – refer to Table 2). Institution type was coded as a nominal variable having three categories (1 = TVET college, 2 = Polytechnic/ TVET university and 3 = TVET teacher training or research institute).

Findings and discussion

The results of the correlation analysis together with descriptive statistics are shown in Table 5. Table 6 indicates the results for the effect of staff capacity development on the dependent variable having both moderators.

TABLE 6: Effects of TVET staff capacity development on the incorporation of Industry 4.0 competencies into programme offerings

	R-sq	R2-chng	*F*	*P*
Overall effect on DV	0.7740	–	93.4676	0.0000
Highest-order unconditional interaction effects:				
IV1* Institution type	–	0.0073	3.0916	0.0577
IV1* GDP growth	–	0.0113	9.5341	0.0023
Effect of both moderators	–	0.0157	4.4116	0.0050

COEFFICIENTS:						
Variable	*B*	SE	*T*	*p*	LLCI	ULCI
IV1	0.9820	0.0711	14.1006	0.0000	0.8618	1.1421
W1	0.9628	0.4343	2.6774	0.0081	0.3062	2.0194
W2	0.9742	0.4843	2.5280	0.0123	0.2690	2.1794
Int_1	–0.1741	0.0844	–2.0640	0.0504	–0.3406	0.0077
Int_2	–0.1698	0.0857	–1.9816	0.0590	–0.3389	0.0008
GDP growth	0.9785	0.3885	3.0332	0.0028	0.4121	1.9448
Int_3	–0.2201	0.0713	–3.0877	0.0023	–0.3607	–0.0795

CONDITIONAL EFFECTS OF IV1 AT THE VALUES OF MODERATORS:							
Institution type	GDP growth	Effect	SE	*t*	*P*	LLCI	ULCI
1.0000	0.0000	1.0020	0.0711	14.1006	0.0000	0.8618	1.1421
1.0000	1.0000	0.7819	0.0502	15.5720	0.0000	0.6828	0.8809
2.0000	0.0000	0.8278	0.0852	9.7118	0.0000	0.6597	0.9959
2.0000	1.0000	0.6077	0.0738	8.2403	0.0000	0.4623	0.7532
3.0000	0.0000	0.8321	0.0694	11.9910	0.0000	0.6952	0.9690
3.0000	1.0000	0.6120	0.0809	7.5677	0.0000	0.4525	0.7716

BOOTSTRAP RESULTS FOR REGRESSION MODEL PARAMETERS:					
	B	BootMean	BootSE	BootLLCI	BootULCI
Int_3	–0.2201	–0.2189	0.0874	–0.3915	–0.0466

Notes: DV = Incorporation of Industry 4.0 competencies into programme offerings; IV1 = Staff capacity development; Reference category of institution type = TVET college, W1 = Polytechnic/TVET university vs TVET college; W2 = TVET teacher training/research institute vs TVET college; Int_1 = Product term of IV1 and W1; Int_2 = Product term of IV1 and W2; Int_3 = Product term of IV1 and GDP growth.

Statistics for the overall model involving IV1, moderators (institution type and GDP growth), interactions and DV show that the overall model is significant (R-sq = 0.7740, $p < 0.001$). First, when considering the main effects, the effect of IV1 on DV is significant ($t = 14.10$, $p < 0.001$), where IV1 increases, DV also increases. This supports H1.

When considering the effect of institution type on DV, the difference in DV between Polytechnic/TVET universities and TVET colleges is significant (W1, $t = 2.68$, $p < 0.01$): Polytechnic/TVET universities have implemented more in comparison with TVET colleges. Furthermore, the difference in DV between TVET teacher training/research institutes and TVET colleges is significant (W2, $t = 2.53$, $p < 0.05$): TVET teacher training/research institutes have implemented more in comparison with TVET colleges.

When considering the effect of GDP growth on DV, the difference in DV between low-GDP-growth countries and high-GDP-growth countries is significant (GDP growth, $t = 3.03$, $p < 0.01$): high-GDP-growth countries have implemented more in comparison with low-GDP-growth countries.

Second, considering the interaction effects, both the interaction effects of institution type are not significant (Int_1, $p > 0.05$; Int_2, $p > 0.05$). In detail, although the impact of IV1 on DV in Polytechnic/TVET universities is considerably different (lower) from that of TVET colleges (Int_1, $t = -2.06$, $p > 0.05$) and the impact of IV1 on DV in TVET teacher training/research institutes is considerably different (lower) from that of TVET colleges (Int_2, $t = -1.98$, $p > 0.05$), these differences are not significant. These results do not support H4a.

However, the interaction effect of GDP growth is significant (Int_3, $t = -3.09$, $p < 0.01$). Int_3 negatively moderates the relationship between IV1 and DV, that is, the impact of IV1 on DV in high-GDP-growth countries is considerably different (lower) from that of low-GDP-growth countries. This supports H5a.

Third, the results of the test of unconditional interaction effects show that the change in R-sq due to the interaction of GDP growth (IV1*GDP growth, i.e. Int_3, $p < 0.05$) is significant. Although the change in R-sq due to the interaction of institution type (IV1* Institution type, $p > 0.05$) is not significant, overall, the change in R-sq due to both interactions is significant ($p < 0.01$). The conditional effects (or simple slopes) for IV1 to DV at a given level of institution type and GDP growth show that, at all levels of institution type and GDP growth, IV1 significantly predicts DV. For example, IV1 predicting DV is significant at the institutional type 1 (i.e. TVET college) and GDP growth group 0 (i.e. low-GDP-growth countries). Likewise, IV1 predicting DV is significant at the institutional type 1 (i.e. TVET college) and GDP growth group 1 (i.e. high-GDP-growth countries), and so on.

Finally, the bootstrap confidence intervals (BootLLCI and BootULCI) for Int_3 do not include zero, where both have negative values. Therefore, the regression weight significantly

differs from zero, fulfilling the condition for moderation (refer to Hayes, 2013). This supports H6.

Table 7 shows the results for the effect of supportive culture on the dependent variables having both moderators.

TABLE 7: Effect of TVET supportive culture on the incorporation of Industry 4.0 competencies into programme offerings

	R^2_{sq}	**R2-chng**	***F***	***P***
Overall effect on DV	0.7981	–	131.5714	0.0000
Highest-order unconditional interaction effects:				
IV2*Institution type	–	0.0065	3.7658	0.0246
IV2*GDP growth	–	0.0022	2.5293	0.1131
Effect of both moderators	–	0.0076	2.9125	0.0352

COEFFICIENTS:						
Variables	*B*	SE	*T*	*p*	LLCI	ULCI
IV2	0.9385	0.0522	17.9952	0.0000	0.8357	1.0412
W1	0.8826	0.3972	2.2222	0.0272	0.1001	1.6651
W2	0.9849	0.3941	3.2856	0.0012	0.5184	2.0714
Int_1	–0.1310	0.0765	–1.7134	0.0880	–0.2817	0.0196
Int_2	–0.1805	0.0704	–2.5638	0.0110	–0.3191	–0.0418
GDP growth	0.4677	0.3108	1.5047	0.1338	–0.1447	1.0800
Int_3	–0.0924	0.0581	–1.5904	0.1131	–0.2068	0.0221

CONDITIONAL EFFECTS OF IV2 AT VALUES OF MODERATORS:							
Institution type	GDP growth	Effect	SE	*t*	*p*	LLCI	ULCI
1.0000	0.0000	0.9385	0.0522	17.9952	0.0000	0.8357	1.0412
1.0000	1.0000	0.8461	0.0472	17.9158	0.0000	0.7531	0.9392
2.0000	0.0000	0.8075	0.0724	11.1536	0.0000	0.6648	0.9501
2.0000	1.0000	0.7151	0.0701	10.1959	0.0000	0.5769	0.8533
3.0000	0.0000	0.7580	0.0583	12.9973	0.0000	0.6431	0.8730
3.0000	1.0000	0.6657	0.0688	9.6737	0.0000	0.5301	0.8013

BOOTSTRAP RESULTS FOR REGRESSION MODEL PARAMETERS:					
	B	BootMean	BootSE	BootLLCI	BootULCI
Int_2	–0.1805	–0.1819	0.0731	–0.3232	–0.0383

Notes: DV = Incorporation of Industry 4.0 competencies into programme offerings; IV2 = Supportive culture; Reference category of institution type = TVET college, W1 = Polytechnic/TVET university vs TVET college; W2 = TVET teacher training/research institute vs TVET college; Int_1 = Product term of IV2 and W1; Int_2 = Product term of IV2 and W2; Int_3 = Product term of IV2 and GDP growth.

Stated succinctly, the overall model is significant. First, the effect of IV2 on DV is significant. This supports H2. The difference in DV between Polytechnic/TVET universities and TVET colleges is significant; the difference in DV between TVET teacher training/research institutes and TVET colleges is significant. The difference in DV between low-GDP-growth countries and high-GDP-growth-countries is not significant.

Second, considering the interaction effects, the impact of IV2 on DV in Polytechnic/TVET universities versus TVET colleges is not significant. However, the impact of IV2 on DV in TVET teacher-training/research institutes versus TVET colleges is significant. Overall, the results partly support H4b. The interaction effect of GDP growth is not significant, though, which result does not support H5b.

Third, the results of the test of unconditional interaction effects show that the change in R-sq due to the interaction of institution type is significant ($p < 0.05$); the overall change in R-sq due to both interactions is significant ($p < 0.05$). At all levels of institution type and GDP growth, IV2 significantly predicts DV. Finally, bootstrap confidence intervals show that the condition for moderation is satisfied. This supports H7.

Table 8 shows the results for the effect of availability of resources and public awareness on the dependent variable having both moderators.

TABLE 8: Effect of TVET resources and public awareness on the incorporation of Industry 4.0 competencies into programme offerings

	R-sq	**R2-chng**	***F***	***P***
Overall effect on DV	0.7286	–	73.2523	0.0000
Highest-order unconditional interaction effects:				
IV3*Institution type	–	0.0080	2.8037	0.0631
IV3*GDP growth	–	0.0041	2.9041	0.0900
Effect of both moderators	–	0.0103	2.4249	0.0670

COEFFICIENTS:						
Variables	*B*	SE	*T*	*p*	LLCI	ULCI
IV3	0.9171	0.0742	12.3648	0.0000	0.7708	1.0634
W1	0.9725	0.4521	3.0802	0.0024	0.5008	2.2842
W2	0.9585	0.5002	2.1160	0.0356	0.0718	2.0452
Int_1	–0.2083	0.0923	–2.2561	0.0252	–0.3905	–0.0262
Int_2	–0.1362	0.0908	–1.5002	0.1352	–0.3153	0.0429
GDP growth	0.7265	0.3949	1.8397	0.0674	–0.0524	1.5054
Int_3	–0.1274	0.0748	–1.7042	0.0900	–0.2749	0.0201

CONDITIONAL EFFECTS OF IV3 AT VALUES OF MODERATORS:							
Institution type	GDP growth	Effect	SE	*t*	*P*	LLCI	ULCI
1.0000	0.0000	0.9171	0.0742	12.3648	0.0000	0.7708	1.0634
1.0000	1.0000	0.7896	0.0577	13.6967	0.0000	0.6759	0.9034
2.0000	0.0000	0.7087	0.0852	8.3226	0.0000	0.5408	0.8767
2.0000	1.0000	0.5813	0.0827	7.0320	0.0000	0.4182	0.7444
3.0000	0.0000	0.7809	0.0746	10.4692	0.0000	0.6337	0.9280
3.0000	1.0000	0.6534	0.0843	7.7528	0.0000	0.4872	0.8197

BOOTSTRAP RESULTS FOR REGRESSION MODEL PARAMETERS:					
	B	BootMean	BootSE	BootLLCI	BootULCI
Int_1	–0.2083	–0.2121	0.1077	–0.4209	–0.0017

Notes: DV = Incorporation of Industry 4.0 competencies into programme offerings; IV3 = Resources and public awareness; Reference category of institution type = TVET college, W1 = Polytechnic/TVET university vs TVET college; W2 = TVET teacher training/research institute vs TVET college; Int_1 = Product term of IV3 and W1; Int_2 = Product term of IV3 and W2; Int_3 = Product term of IV3 and GDP growth.

Stated succinctly, the overall model is significant. First, the effect of IV3 on DV is significant. This supports H3. The difference in DV between Polytechnic/TVET universities and TVET colleges is significant; the difference in DV between TVET teacher training/research institutes and TVET colleges is significant. The difference in DV between high-GDP-growth countries and low-GDP-growth countries is not significant.

Second, considering interaction effects, the impact of IV3 on DV in Polytechnic/TVET universities versus TVET colleges is significant. However, the impact of IV3 on DV in TVET teacher training/research institutes versus TVET colleges is not significant. Overall, the results partly support H4c. Furthermore, the interaction effect of GDP growth is not significant. This result does not support H5c. Third, the results of the test of unconditional interaction effects show that the change in R-sq due to the interaction of institution type

is significant ($p < 0.10$); the overall change in R-sq due to both interactions is significant ($p < 0.10$). At all levels of institution type and GDP growth, IV3 significantly predicts DV.

Finally, bootstrap confidence intervals show that the condition for moderation is satisfied. This supports H8.

In Table 9 the findings of the study are summarised, indicating, overall, those effects that supported which hypothesis and the corresponding table in which the data are presented.

TABLE 9: Summary of findings

EFFECT	HYPOTHESIS	RESULT	CORRESPONDING TABLE	DESCRIPTION
Staff capacity development –> DV	H1	Supported	Table 6	Staff capacity development enhances DV ($p < 0.001$)
Supportive culture –> DV	H2	Supported	Table 7	Supportive culture enhances DV ($p < 0.001$)
Resources and public awareness –> DV	H3	Supported	Table 8	Resources and public awareness enhance DV ($p < 0.001$)
Institution type –> DV	H4	Supported	Table 6	Institution type on DV is significant between Polytechnic/TVET universities and TVET colleges ($p < 0.01$) and between TVET teacher training/research institutes and TVET colleges ($p < 0.05$)
			Table 7	Institution type on DV is significant between Polytechnic/TVET universities and TVET colleges ($p < 0.05$) and between TVET teacher training/research institutes and TVET colleges ($p < 0.01$)

EFFECT	HYPOTHESIS	RESULT	CORRESPONDING TABLE	DESCRIPTION
			Table 8	Institution type on DV is significant between Polytechnic/TVET universities and TVET colleges ($p < 0.05$) and between TVET teacher training/research institutes and TVET colleges ($p < 0.05$)
Staff capacity development –> DV having institution type as a moderator	H4a	Not supported	Table 6	Interaction effects of institution type are not significant at all levels
Supportive culture –> DV having institution type as a moderator	H4b	Partly supported	Table 7	Interaction effect in Polytechnic/TVET universities versus TVET colleges is not significant; TVET teacher training/ research institutes versus TVET colleges is significant ($p < 0.05$)
Resources and public awareness –> DV having institution type as a moderator	H4c	Partly supported	Table 8	Interaction effect in Polytechnic/TVET universities versus TVET colleges is significant ($p < 0.05$); TVET teacher training/research institutes versus TVET colleges is not significant
GDP growth –> DV	H5	Partly supported	Table 6	GDP growth is significant ($p < 0.01$) between low-GDP-growth countries and high-GDP-growth countries
			Table 7	GDP growth is not significant ($p > 0.05$) between low-GDP-growth countries and high-GDP-growth countries
			Table 8	GDP growth is not significant ($p > 0.05$) between low-GDP-growth countries and high-GDP-growth countries

EFFECT	HYPOTHESIS	RESULT	CORRESPONDING TABLE	DESCRIPTION
Staff capacity development –> DV having GDP growth as a moderator	H5a	Supported	Table 6	Interaction effects of GDP growth is significant ($p < 0.01$)
Supportive culture –> DV having GDP growth as a moderator	H5b	Not supported	Table 7	Interaction effect of GDP growth is not significant
Resources and public awareness –> DV having GDP growth as a moderator	H5c	Not supported	Table 8	Interaction effect of GDP growth is not significant
Model 1 – Staff capacity development on DV having both institution type and GDP growth as moderators	H6	Supported	Table 6	ΔR^2 due to the interaction of GDP growth is significant ($p < 0.05$); ΔR^2 due to the interaction of institution type is not significant ΔR^2 due to both interactions is significant ($p < 0.01$) At all levels of institution type and GDP growth, staff capacity development significantly predicts DV ($p < 0.001$ for all levels)
Model 2 – Supportive culture on DV having both institution type and GDP growth as moderators	H7	Supported	Table 7	ΔR^2 due to the interaction of institution type is significant ($p < 0.05$) ΔR^2 due to the interaction of GDP growth is not significant ΔR^2 due to both interactions is significant ($p < 0.05$) At all levels of institution type and GDP growth, supportive culture significantly predicts DV ($p < 0.001$ for all levels)

EFFECT	HYPOTHESIS	RESULT	CORRESPONDING TABLE	DESCRIPTION
Model 3 – Resources and public awareness on DV having both institution type and GDP growth as moderators	H8	Supported	Table 8	ΔR^2 due to the interaction of institution type is significant ($p < 0.10$) ΔR^2 due to the interaction of GDP growth is not significant ΔR^2 due to both interactions is significant ($p < 0.10$) At all levels of institution type and GDP growth, resources and public awareness significantly predict DV ($p < 0.001$ for all levels)

Implications of the findings

The study found that the three critical success factors – TVET staff capacity development, TVET supportive culture and the availability of resources and public awareness – significantly predict the implementation of Industry 4.0 competencies positively into programme offerings. It was also found that institution type and annual growth rate of real GDP per employed person boost the relationship between these factors. Of the three institution types, TVET colleges were in a weaker position compared with the other two (see Table 9). Regarding the annual growth rate of real GDP per employed person, countries with high growth rates have implemented more in comparison with countries with low growth rates. The findings have important implications for the literature, practice and policymaking across countries, regions and continents.

With regard to the theoretical contributions, first, while there is widespread agreement that Industry 4.0 technologies are having a profound impact on the agenda of education, the literature, such as Spöttl and Windelband (2021) and Schröder (2019), suggests that limited research attention has been paid so far to investigating the success factors behind the implementation of Industry 4.0 competencies in higher education programmes. Therefore, our research is an attempt to make a valuable contribution to the literature at the regional or even a global level.

Second, the World Bank (2021) and UNESCO (2021) have proposed the establishment of almost uniform TVET systems within and across countries. Still, there can be differences due to certain characteristics within countries. We investigated two such characteristics: TVET institution type and annual growth rate of real GDP per employed person. We found that institution type has a direct effect on the implementation of Industry 4.0 competencies (DV); and it is also an important moderator which can have a significant impact on the variables of

interest (IVs) (see Table 9). Regarding the annual growth rate of real GDP per employed person, when a country is behind in economic development and performs poorly in maintaining labour markets, there could be limited job openings for those with middle-level technical expertise, with accompanying attractive labour market rewards. This suggests the importance of assessing the impact of the annual growth rate of real GDP per employed person. We have not found any previous studies that have tried to integrate such country-context variables into cross-country investigations. Our proposition was that when a country's annual growth rate of real GDP per employed person is higher, that country could place a higher weight on its TVET system for lower- and middle-level job creation, in this way helping to relieve poverty and unemployment in the country. The findings of the present study provide evidence to suggest that the annual growth rate of real GDP per employed person affects the implementation of Industry 4.0 competencies (DV) and operates as an important moderator (see Table 9). We therefore believe that our incorporation of this indicator as a moderator would possibly provide novel insights and make valuable contributions to the literature.

Third, since the sample covered 15 countries, there is much potential to generalise the findings across countries – the importance of generalisability across countries having been constantly expressed in the literature on TVET (e.g. Schröder, 2019; World Bank, 2021). Our research provides empirical findings at a critical time in research on TVET with the dawning of Industry 4.0. Moreover, the critical success factors we have identified in the Indo-Pacific region could be extended beyond this region: researchers from other regions and continents could use the measures developed by us in future investigations for comparative purposes. Therefore, our research makes valuable contributions to research in this niche.

We are able to identify several implications for practice. First, the findings showed the importance of developing staff capacity. At the institutional level, promoting the acquisition of the requisite competencies (new subject content knowledge, technology use and pedagogies), offering assistance by providing self-learning options, and offering support in the form of recommending development programmes, are important. In addition, the responsibility for developing staff capacity cannot be regarded as the sole responsibility of the TVET institutions. Staff should also take responsibility for their own professional development and for staying relevant. They should be passionate, espouse self-determination and possess a sense of ownership if they are to succeed and build on their careers.

The second implication of our findings is that, as a part of supporting culture, TVET institutions must consider promoting staff-exchange programmes with industry to keep staff abreast of technological developments in work processes. Furthermore, the institutions should provide support through recommendations, encouragement, guidance and communities of practice in order to update staff competencies – including subject content knowledge, the use of digital platforms and tools, and pedagogical practice. The findings suggest the need for initiatives between academia, industry and other stakeholders for mutual learning to engage in constant dialogue to respond to the requirements of Industry 4.0 in order to promote curriculum development, staff capacity-building and student apprenticeship or internship training.

The third implication of the findings is that the autonomy and capacity of TVET institutions to hire new staff with Industry 4.0 competencies and technologies, to acquire appropriate digital infrastructure for developing a conducive teaching and learning environment, and to enter into agreements or partnerships with digital service providers such as broadband can lead to the successful implementation of Industry 4.0 competencies in programme offerings. In this regard, previous research highlighted the importance of financing TVET programmes (e.g. Oketch 2016; Gonçalves, 2019; McGrath et al., 2020; World Bank, 2021). In addition, the findings imply that TVET institutions must maintain a close connection with the public (mainly industrial sectors as a whole) to publicise the value of implementing Industry 4.0 technologies in workplaces.

The present study also has implications for policymaking. What, when and how to transform economies and societies along with Industry 4.0 should occupy a major portion of the national agenda of all countries. Our findings on the two moderators suggest some implications for policymaking. First, it is the ultimate responsibility of the state to take appropriate policy decisions to provide all types of TVET institutions with opportunities for inclusive growth. A state's policies and initiatives for creating a multi-stakeholder collaboration system for TVET, for example, may reduce disparities at the institutional level and may boost institutions' capacity to implement Industry 4.0 competencies in their programme offerings.

Second, the extent of preparedness of a country to take advantage of Industry 4.0 could be indicated by national-level economic indicators such as the annual growth rate of real GDP per employed person. TVET institutions are influenced by the nature of economic conditions. Our findings showed that the annual growth rate of real GDP per employed person could operate as a moderating factor and affect the implementation of Industry 4.0 competencies in programme offerings. This suggests that a country's policies and actions on employment generation, technological upgrading and innovation will bring about economic transformation and help to yield higher levels of productivity; with these transformations, changes to institutions' programme offerings are highly likely.

Conclusion

Given the accelerating pace of the changes occurring as a result of Industry 4.0, the existence of research studies on the response of higher education in programme offerings is disproportionately small worldwide. In response to this backdrop, we questioned what the critical success factors are that support the implementation of Industry 4.0 competencies in TVET programme offerings. Our study identified some critical success factors that are associated with incorporating competencies into programme offerings, adopting appropriate teaching and learning practices, and building staff capacity in the context of Industry 4.0. The findings also pointed to the role of two moderators in boosting the implementation of Industry 4.0 competencies in programme offerings.

Limitations and future research

First, our scope was limited to TVET institutions at the tertiary level in STEM fields. It is imperative that the conditions intermingled together influence successful implementations. Nevertheless, we believe that our findings should inspire future researchers to expand meaningfully the depth and breadth of future investigations. Regarding future research, the level of TVET system understudy can be broadened to include the macro- or meso-levels. Furthermore, the findings on moderators imply that a country's policies could enhance the types of programme offered and the way in which these are delivered. Furthermore, the present study was limited to 15 countries in the Indo-Pacific region. However, TVET is of interest to all countries across regions and continents. The method we have adopted and the measures we have developed could be tested across countries to increase the scholarly contribution to the field of TVET.

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JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Gregory, JL & Zulu, F-QB. 2024. Enhancing vocabulary acquisition through Memrise in an English second-language class: Action research at a TVET college. *Journal of Vocational, Adult and Continuing Education and Training*, 7(1):28–48. http://doi.org/10.14426/jovacet.v7i1.387

Enhancing vocabulary acquisition through Memrise in an English second-language class: Action research at a TVET college

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ABSTRACT

As the basis of a language, vocabulary is important because it promotes dialogue and the expression of individual ideas and opinions, has an impact on reading comprehension, and improves academic achievement. The purpose of this action research was to use the Memrise application to improve the vocabulary of English Level 2 second-language students (ESL) in the TVET (technical and vocational education and training) sector. The study of a first-year cohort of ESL students at Level 2 was selected through purposive sampling and the data were collected using pre- and post-testing, questionnaires and reflective journal entries documenting the teacher's self-reflection and observations on Memrise usage. Memrise was used in Author One's classroom during a six-week period. Using Guskey's (2002) model of teacher change, the research revealed improved, varying degrees of academic achievement among students following the implementation of the application. In addition, the study highlighted these students' preference for technology-enhanced learning experiences, such as the Memrise application, over traditional text-based approaches. This research not only challenged the teacher–researcher to embrace technology in order to engage in enhanced teaching practices, but also provided the student cohort with an engaging pathway towards vocabulary acquisition, a process that fostered mutual development.

KEYWORDS

Vocabulary; Memrise; English second language; teaching; action research; technical and vocational education and training (TVET)

Introduction

An enriched understanding of the world and an enhanced future begin with learning the English language. This is because English is a globally used language, both socially and academically. It is also the language of learning and teaching (LoLT) at South African technical and vocational education and training (TVET) colleges. However, the Department of Higher Education and Training (DHET) (2013) established that the majority of the student population in these colleges have indigenous home languages. English is not only the LoLT, but it also serves as a universal language that is used in workplaces across the globe. It is important, therefore, for all students to have a good command of English if they are to improve their quality of life with supplemental job opportunities and strengthened skills. Accordingly, it is crucial that appropriate teaching strategies be employed which apply to both English home-language (HL) and English second-language (ESL) students.

The literature on teaching strategies in TVET asserts that instructors must innovate their teaching methods effectively (Bozkurt, 2019; Stander, Du Plooy & Scheckle, 2022; Nepembe & Simuja, 2023; Magagula & Awodiji, 2024). For this reason, this action-research study adopted the Memrise application as an innovative teaching strategy to enhance vocabulary acquisition among ESL students at Level 2 in the TVET sector. The research focus was decided upon in response to persistently low performance among second-language students in English Level 2 in this sector. The National Certificate: Vocational (or NC(V)) at National Qualifications Framework (NQF) Level 2 is equivalent to Grade 10 in South African secondary schools. Abadzi (2006) states that the inability to read is problematic because it restricts children's participation in formal education. Furthermore, 'it prevents them from successfully learning textbook content, participating in classroom discourse, or responding reliably to tests' (Abadzi, 2006:1). It was observed that the students in the TVET college that was the location for this study did not like to participate in classroom discussions or offer their opinions because of their lack of confidence in articulating themselves in English, which resulted largely from their meagre vocabulary that limited their ability to express their thoughts fluently.

Previous research (Buthelezi, 2018; Stander et at., 2022; Nepembe & Simuja, 2023) has indicated that the majority of TVET students come from poor backgrounds, are not self-motivated, do not work independently, and often do not have the family support to check whether they use language correctly. Predominantly, they speak isiZulu or isiXhosa as their home language, but the LoLT is English. The difficulty is that, on occasion, meaning is lost in the translation between languages. Stander et al. (2022) assert that there is a relationship between poor academic performance (AP) and learning in an additional language. Many students struggle to feel comfortable with English as a subject because they have not built up a store of words over the years and lack the fluency and confidence to communicate effectively using them.

Stander et al. (2002), cited in Buthelezi (2018), state that the TVET sector attracts academically weaker students who regard a TVET college education as their last hope, because many have failed at school or were removed from school because of bad behaviour, pregnancy or drug

abuse, and they then enter the system in an attempt to matriculate. However, there are numerous other challenges with English, specifically among Level 2 second-language students at the TVET college in this study. The lack of vocabulary in English inhibits students from fully participating in class activities and discussions, answering questions correctly, speaking fluently and confidently when socialising, and achieving academically in English and other subjects. Pertinent to this, Stander et al. (2022) found there to be a relationship between English-language proficiency (ELP) and AP. Therefore, 'if one lacks command of English one may be, or feel, excluded and disempowered' (Madileng, 2022:1).

In this article, we report on the action-research study that was conducted at a South African TVET college. Motala and Menon (2020) recommended that teaching and learning in higher education should create a well-educated student equipped with the knowledge, skills and attributes for a rapidly changing era. Based on the changing Digital Age, this action research used the Memrise application to improve the vocabulary of English Level 2 second-language students in the specific TVET college. In South Africa, there is a lack of research on Memrise being used in higher education institutions. Therefore, this study also sheds light on an innovative teaching and learning strategy in the context of the Fourth Industrial Revolution (4IR). The study is guided by two research questions:

RQ1: How can the Memrise application be used to improve the vocabulary of Level 2 English second-language students?

RQ2: How did the implementation of the Memrise application improve the vocabulary of Level 2 English second-language students?

Importance of vocabulary

Vocabulary is the basis of all languages. Elmahdi and Hezam (2020) conducted their study in the Saudi Arabian context on the challenges facing methods of teaching English vocabulary to non-native students. They contend that it is wrong to define vocabulary as the words we teach in a foreign language. Instead, they define vocabulary as the total number of words that are needed to communicate ideas and express a speaker's meaning (Elmahdi & Hezam, 2020:559). Taebenu and Katemba (2021), who conducted a study on vocabulary enhancement through Memrise and Google Classroom, also define vocabulary as 'words that we should know [in order] to communicate effectively, words in expressive vocabulary for speaking and words in receptive vocabulary for listening' (2021:231). Regarding someone who is learning English as a second language or a foreign language, it is imperative to have a good range of vocabularies for social interaction.

In this study, we recognised Taebenu and Katemba's (2021) two kinds of vocabulary: receptive and productive. According to Taebenu and Katemba (2021), receptive vocabulary is that which the students recognise or encounter in reading text but do not use when speaking or writing. In contrast, productive vocabulary is defined as those words that students understand and can

pronounce correctly and use constructively in speaking and writing (Taebenu & Katemba 2021). These types of vocabulary, Taebenu and Katemba (2021) contend, are central to using language and are of critical importance to the typical language of learning. In relation to productive vocabulary, Madileng (2022), in her systematic analysis of the English NC(V) curriculum (DHET, 2013), identified limitations in the curriculum. She established that the English curriculum does not prescribe the set works for students, nor does it include the production of extended text such as discursive essays (2022:91). These limitations deprive students of the ability to develop their vocabulary, which is an essential attribute of, and contributor to, their academic success and beyond. In a study on effective vocabulary instruction, Sedita (2005) underscored the strong relationship between knowledge of vocabulary and reading comprehension.

According to Sedita (2005), if a student does not know the meanings of a sufficient number of the words in a text, comprehension is impossible. This means that students should be exposed to different words and build up a word bank from an early age; and that, when they do so, they are more able to comprehend, read and write – which all have an immense impact on their performance in academia (i.e. their AP). Therefore, if vocabulary is the foundation of all languages and has an impact on AP and the ability to socialise, then the South African government should prioritise vocabulary teaching and learning from a very young age. In the *Mail and Guardian* newspaper, Sommer (2023) laments the state of education in South Africa, stating that it is in decline owing to a number of factors. Some of these are a lack of, or a non-existent, infrastructure, teachers lacking knowledge of current teaching practices, and a shortage of teachers in schools. Schmitt (2000) argues that vocabulary plays an important role in students mastering English-language skills. If students master English, it has an impact on other things, such as articulating their thoughts both verbally and in writing.

There is a holistic value to learning vocabulary in all facets of life, from the early years of development through schooling and beyond. If students do not have a solid foundation of vocabulary, they are disadvantaged in the skills of listening, speaking, reading and writing, which are all essential to effective communication. The issue of low literacy levels is not limited to the TVET colleges, though, but is experienced throughout South Africa. Low literacy levels begin in schools for many reasons, ranging from a lack of resources to teachers lacking knowledge of how to teach vocabulary. This has a ripple effect, and when students arrive at tertiary institutions they struggle because of the many gaps in their vocabulary and their lack of proficiency in English. Howie et al. (2016) state:

> South Africa's participation in [the] three cycles of Progress in International Reading Literacy Study (PIRLS) (2006, 2011 and 2016) shows consistently low reading comprehension levels in the fourth grade. The most recent data indicated that 78% of South African Grade 4 children cannot read for meaning or retrieve basic information from the text to answer simplistic questions, compared to 4% of students internationally (Howie et al., 2016:55).

According to Spaull and Pretorius (2019), similar reading skills that were required for print in the 20th century are required for digital formats in the 21st century.

Technology has changed lives and enabled people to access a world of opportunities and resources. Nuralisah and Kareviati (2020) assert that students' motivation for, and interest in, learning vocabulary can be improved when teachers use learning methods and strategies that the students prefer. Generally, technology in education has brought dull topics to life and made difficult concepts much easier and more fun to learn. Jagtap (2015) explains how the role of the educator has advanced as a result of technological advancements. Teachers have adapted to these changes in their pedagogical teaching, enabling students to become more independent as a result. Although the Memrise application, through research studies (Kent & Sherman, 2013; Fadhilawati, 2016; Nuralisah & Kareviati, 2020), has been shown to lead to positive academic improvements, it is not without its negative aspects, specifically among TVET students in South Africa. For instance, research conducted in Columbia (Nurani, 2023) and Indonesia (Fadhilawati, 2016) using the Memrise application in universities as a teaching tool showed positive outcomes in vocabulary acquisition, but the application remains inaccessible without data or a Wi-Fi connection (Fadhilawati, 2016). We elaborate on Memrise in the methodology section.

Conceptual framework

It is widely acknowledged that it is important for teachers to engage in continuing professional development in order to remain at the cutting edge of their profession. A number of external professional development initiatives are available for South African teachers; these include short courses, workshops and university qualifications. However, there is an acknowledged need for research-backed teacher enquiry as a type of professional development. This entails educators assuming accountability for their own learning, contextualising it in their classrooms, and aligning it with their teaching practice. For this reason, this action research, serving as a transformative professional development model, targeted the enhancement of teaching practice. In line with the two research questions, this study employed Guskey's (2002) model of teacher change as depicted in Figure 1. The model shows that the three major goals of the professional development of teachers are changes in a teacher's classroom practices, changes in learning outcomes for the students, and changes in the beliefs and attitudes of the teacher.

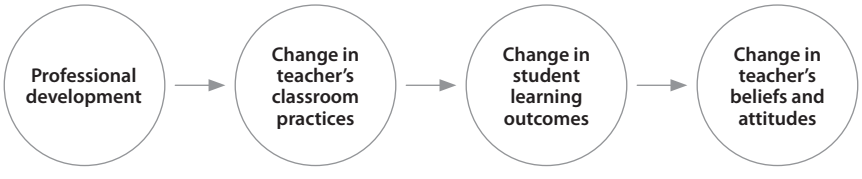

FIGURE 1: Model of teacher change

Source: adopted from Guskey, 2002

Guskey (2002) identifies three major goals of professional development programmes, which are: change in the classroom practices of teachers, change in their attitudes and beliefs, and change in the learning outcomes of students. The first construct of the model recognises that change is challenging for teachers but is potentially progressive. Teachers are sometimes hesitant to change (Guskey, 2002) because of their fear of the unknown and not knowing whether something will work or not. Many teachers therefore remain rigid in their teaching practices, which makes them view change as very risky, uncomfortable and unnecessary, as they associate it with added workloads, which might not even pay off or ultimately advance students' performance. The second construct that is key to the model is the tangibility of proof or evidence of students' progress. Feedback is essential to gauge whether something is successful or not. Therefore, it is after obtaining feedback or evidence, especially positive feedback, that teachers' attitudes and beliefs may shift.

The final construct is for top management to provide continuous follow-up, support and pressure. Supporting teachers through the successes or failures that accompany change is essential and the correct amount of pressure pushes teachers to try something new. This study concurs with Guskey's (2002) model of teacher change in relation to Memrise being implemented in the classroom as part of teaching practice. According to the data generated from the questionnaires, self-reflection and testing conducted, the positive learning outcomes of students, or the improvement in their vocabulary, had an impact on Author One's beliefs and attitudes to technological development and the use of Memrise.

Research context

This action-research study was conducted in a TVET college located in the uMgungundlovu district of KwaZulu-Natal. In South Africa, the education system is directed by two separate government ministries and departments: the Department of Basic Education (DBE), which oversees education in primary and secondary schools, and the DHET, which oversees tertiary and vocational education. Vocational education began in the form of further education and training (FET) colleges, which were renamed TVET colleges. In these colleges, the aim is to integrate theory, practical training and work-based experience. One of the programmes offered at TVET colleges is the National Certificate (Vocational) (NC(V)), which comprises Levels 2, 3 and 4 of the NQF, the equivalent of matriculation, comprising Grades 10, 11 and 12. An NC(V) programme consists of seven subjects, three of which are fundamental: Life Orientation, English First Additional Language (FAL) and Mathematics/Mathematical Literacy – all of which are compulsory and lay the foundation for the other four vocational subjects.

Methodology

The present study adopted a qualitative approach, and an action-research design was used. Given that action research is employed to enhance teaching practice as a component of a transformative process (Koshy, Koshy & Waterman, 2011), this study is positioned within the critical paradigm. Cohen, Manion and Morrison (2018) explain that the critical paradigm recognises the ideological and political contexts of educational research, contexts that strive to

emancipate individuals. This action-research study is therefore emancipatory due to changing conditions which might hamper desired improvement in classroom practices. We, the authors, argue that conducting this action research is a 'transformative professional development' (Kennedy, 2014:689) activity which 'is liberated from the imposed activities of the school management team or Department of Basic Education officials' (Mathura & Zulu, 2021:3).

Author One reflected on her teaching practice and designed an intervention that aimed to change and transform her teaching practice in the TVET context. Christiansen & Bertram (2014:27) posit that the critical paradigm perceives reality as being shaped by social, political, cultural, economic and various other dynamics. In this study, the students' language proficiency is foregrounded by their social and cultural backgrounds. In addition, the students' proficiency in their home language is influenced by their socialisation and upbringing. Author One conducted action research as a transformational tool (Christiansen & Bertram, 2014) with the support and guidance of Author Two in order to acquire knowledge about teaching English and to enhance her own professional development. Action research is explained by Kemmis and Taggart (1992) as including stages that should be implemented: planning, action, observing and reflecting. The research was conducted to enhance the English vocabulary of ESL students. It was also conducted to improve Author One's teaching practices in her English classrooms.

In this action research, Memrise was used as a teaching strategy. The Memrise application, when used in classes, has been shown to be an effective technological strategy for increasing the interest of students in acquiring vocabulary. Fadhilawati (2016:36) defines Memrise as 'an online learning community where we can learn almost anything, especially language, mostly for free. It is the right mix of science, fun, and community'. Fadhilawati (2016) established that, instead of using a dictionary with words and meanings, the Memrise application has brought those words and meanings to life with colour, interaction, memes, progress reports, activities and goal-setting. The scientific community has made significant progress in enhancing our understanding of the benefits of Memrise for vocabulary acquisition (Kent & Sherman, 2013; Fadhilawati, 2016; Nuralisah & Kareviati, 2020). However, although we have substantial information about Memrise and the benefits of increased vocabulary among students as highlighted in research studies such as those of Fadhilawati (2016), less is known about educators' perceptions of the ways in which technology can enhance traditional methods of teaching vocabulary and can be fostered among students.

Figure 2 showcases examples of the various categories of learning activity available when using the Memrise application.

The screenshot illustrates students engaging with the learning category of memory training, where they complete tasks aimed at enhancing memory retention and learning efficiency. The *Memrise* application has a variety of features, including audio, visual and media (Taebenu & Katemba 2021). It was implemented in the scheduled English lessons as part of the TVET timetable and as four stages spanning a duration of six weeks, as detailed in the following sections:

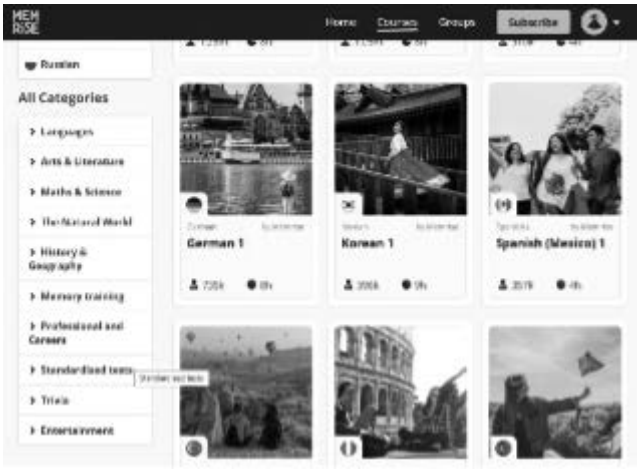

FIGURE 2: Examples of categories of learning activity for Memrise

Source: https://www.memrise.com

Week 1: Planning stage

The planning stage of the action research involves outlining ideas and activities from their inception to the end of the study (Mistar & Zuhairini, 2010). In the first week, Author One started to draw up a plan of action. The activities that were prepared included: designing lesson plans; a short-story comprehension exercise with tasks; and setting pre- and post-tests and a questionnaire. The tests took the form of a comprehension exercise titled 'Make Way for Generation Z', by Rea Khoabane; it was worth 30 marks. The questionnaire contained both open- and closed-ended questions. The Memrise application was downloaded on each computer and the computer laboratory was booked for the relevant dates. In addition, the criteria were set in such a way that the same students were given a comprehension exercise before and after the use of the Memrise application to deduce any significant change in their vocabulary use, either positively or negatively.

Weeks 2–5: Implementation of Memrise

Implementation requires the researcher to act and execute the plan formulated in the previous stage. Author One gave the students the short story; it was read aloud by Author One to all the students present in the class. The students were then divided into groups of six and one student then read the short story aloud a second time; students then highlighted and wrote down all the 'difficult' words on a sheet of paper. They then used dictionaries to find the meanings of all the words written down from the short story. Later, in Week 3 (14–18 August 2023), Author One allocated students time to learn the words and the meanings on their list during class time and encouraged them to continue learning them at

home. Author One had conducted the pre-test in Week 2, based on the short story and the words the students had highlighted.

The implementation of the Memrise application commenced in Week 4 (21–25 August 2023). First, Author One took the students to the computer laboratory and introduced them to the application, showing them how to work with it. Next, the students familiarised themselves with general and specific words related to the post-test short-story comprehension. They then learnt the words and their meaning through various games, quiz activities and repetition tasks. They were encouraged to download the application on their cell phones and continue learning the general and specific words at home. The activities the students were exposed to are explained in more detail in the findings section of this article.

Week 6: Observations

During the observation phase, the researcher monitored the effects of the action research in its context (Nugroho, Nurkamto & Sulistyowati, 2012). In Stage 3, Author One observed the students' vocabulary use to identify whether any improvements had occurred and noted her reflections in her journal. According to Koshy et al. (2011), during observation, an educator must explain the procedure for data collection, the instruments used to gather data, and how they are used. During observation, Author One noted down evidence in her journal to record and determine the realisation of the strategy in relation to solving the research problem. Two varieties of data-collection method were used: first, conducting tests to ascertain the students' improvement in the implementation of Memrise; and, second, the completion and analysis of questionnaires to understand the students' responses to the use of Memrise as a learning tool in English Level 2. Author One then administered the post-test on the short-story comprehension to the students.

Week 6: Reflection continued

The function of reflection is to determine the strengths and weaknesses of the research and whether it has been successful (Nugroho et al., 2012). Author One reflected on the cycle over the period of six weeks.

Based on the purpose of conducting the action research, purposive sampling was used to select the participants. Purposive sampling involves the researcher making deliberate choices about which individuals, groups or objects to include in the study (Christiansen & Bertram, 2014:60). The TVET students were chosen because Author One teaches them English and they possess the characteristics that were needed. The study purposely examined the use of Memrise by second-language students in an English class because it was not known whether any improvement among them would be demonstrated. However, ultimately, it aimed at examining any improvements in educational practices which might benefit lecturers, students and the broader community in the TVET sector.

TABLE 1: Biographical information of participants

Participants	Gender	Age	Years N(CV)	Progression in Grade 9
Group A	11 females	18–22	1	None
Group B	12 females and 1 male	18–22	1	None
Group C	14 females and 3 males	18–22	1	None

Before conducting the study, the authors adhered to ethical protocols. We applied for permission from the DHET and the University of KwaZulu-Natal (UKZN) to conduct the study. Relevant gatekeepers' permission for the study to be undertaken in one TVET college was obtained from the principal. The TVET students consented to participate in the study. The ethical principles that should be present in all research studies are autonomy, non-maleficence and beneficence (Durrheim & Wassenaar, 2002, as cited in Christiansen & Beretram, 2014:66). To uphold and respect the autonomy of the participants, consent forms were distributed to 40 Level 2 English (FAL) second-language students. The participants engaged freely and voluntarily and were able to withdraw from the study at any time. Pseudonyms were used for all the students to preserve their anonymity, and all the information gathered was treated with the utmost confidentiality. No harm was caused to any student during the research process and therefore it aligned with the non-maleficence requirement. The beneficence of this study was to Author One as a participant in the study and to Author One's exposure to new teaching practices, to the students who were exposed to new technology during their English lessons, and to the larger TVET community.

In order to maintain confidentiality, the names of the students were not used. Table 1 shows the participants' profiles for gender, age, years doing the N(CV) programme, and if they had progressed in Grade 9. The sample comprised all of the students who were taught English by the lecturer (Author One), making a total of 40 students: 37 females and three males aged between 18–22 years old, along with Author One as a participant. All the participants were studying English Level 2 at the time and Author One was also a participant in this study as she was actively implementing an innovative teaching strategy in her English classes.

The primary data sources were questionnaires, which contained open- and closed-ended questions, pre- and post-vocabulary testing and observations, and self-reflection in Author One's journal. The quantitative data were generated from pre- and post-testing to ascertain and track any improvement in the vocabulary among Level 2 ESL students through the use of Memrise. The study included questionnaires that were distributed among the group of 40 students at the TVET college. The questionnaire was used to generate participants' biographical data through closed-ended questions and open questions were used to understand the students' experiences of Memrise. This study was unique in that it used pre- and post-testing. Self-reflections were completed by Author One to identify criteria that could determine the effectiveness of implementing Memrise rather than traditional teaching methods for the improvement of Level 2 English vocabulary acquisition.

According to Creswell (2014), the combination of quantitative and qualitative data generation suggests mixed methods, but the authors argue that this action research remained a qualitative approach because the questionnaires were not employed in order to cross-check or confirm the findings of the qualitative data; they were used mainly to reach many participants using open-ended questions seeking qualitative data. The data were also obtained from the existing working documents, manuals and policies that were considered for the review. The approach of pre- and post-testing was intended to determine whether Memrise contributed positively to the academic, individual and social gains of the students; and it made it possible to examine student and lecturer views regarding the overall experience of using digital technology.

This study adopted a deductive approach to data analysis. According to Clarke and Braun (2013:3), the researcher brings to the data 'a series of concepts, ideas or topics they use to code and interpret the data'. To present the data, Guskey's (2002) model of predetermined teacher-change themes was used, and the data-analysis process was guided by this model. According to Clarke and Braun (2013:2), '[t]hematic analysis is a method for systematically identifying, organising, and offering insight into, patterns of meaning (themes) across a dataset.'

Trustworthiness

Guba and Lincoln, 1985 (as cited in Christiansen & Bertram, 2014) explain the trustworthiness of research findings by using the concepts of credibility (Do the findings reflect the reality and lived experiences of the participants?), transferability (To what extent can the research be transferred to another context?), dependability and confirmability. These are the strategies for enhancing trustworthiness. In this study, we adopted triangulation in an attempt to confirm the credibility of the research findings. According to Cohen et al. (2018), triangulation requires the use of different data-generation methods or data types to establish common patterns. Observations were made, otherwise known as 'reflexive self-analysis', through Author One's weekly journal entries by using thick description. These entries provided sufficient detail to enable the reader to judge whether the findings can be transferred to another context. Confirmability was enhanced by an audit trail presenting every step of the data analysis to show transparency and to provide a rationale for the decisions made. Dependability was enhanced by the use of rich data so that, when the research is repeated, the findings will be consistent.

Findings of the study

In this section, we use the constructs of Guskey's (2002) model of teacher change to present the findings of this study: professional development, change in teachers' classroom practices, change in student learning outcomes and change in teachers' beliefs and attitudes. An absence of knowledge of vocabulary among students and traditional vocabulary teaching methods were both evident during the pre-testing.

Theme 1: Professional development

Professional development is the first theme of Guskey's (2002) model, and it shows that the outcomes of professional development are change in teachers' classroom practices, change in student learning outcomes, and change in teachers' attitudes and beliefs. In this study, professional development was enriched by implementing a new technology, Memrise, aimed at enhancing comprehension in teaching and learning practices in the classroom. Teachers' attitudes and beliefs were improved due to the noticeable progress made by ESL students. This innovative approach was novel for both the students and Author One, and it fostered growth through the action-research process. This aligns with the overarching goal of action research, which is to empower teachers to become agents of their own transformative change.

Theme 2: Change in teachers' classroom practices

Guskey's (2002) second theme is change in teachers' classroom practices. This change may occur when teachers try to incorporate something new into their teaching practices or add technology to enhance their lessons. A change in classroom practices would possibly mean the future inclusion of these practices as part of the enacted curriculum. Author One initially employed traditional methods of teaching English comprehension, as outlined in 'Make Way for Generation Z' (Khoabane & Du Plessis, 2023), and conducted a pre-test. Subsequently, the impact of this approach was compared with the post-test results following the implementation of Memrise. The performance of the students is detailed in Table 2. Figure 3 shows a screenshot of a journal reflection on Author One's activities during the planning for the implementation of Memrise.

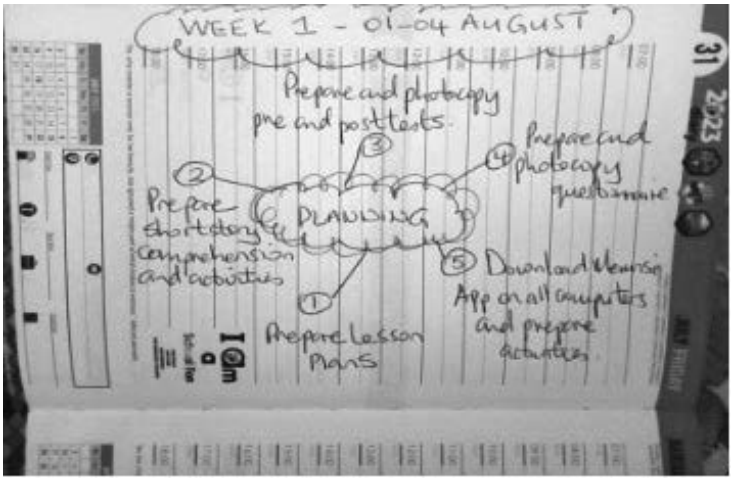

FIGURE 3: Author One's journal reflection on activities during the planning phase

As the initial step of implementing Memrise, Author One introduced the application to students and engaged them in academic-English learning through memory games with specific tasks they had to complete. Screenshots illustrating Memrise activities are depicted in Figures 4, 5 and 6.

FIGURE 4: Academic-English activity completed using Memrise

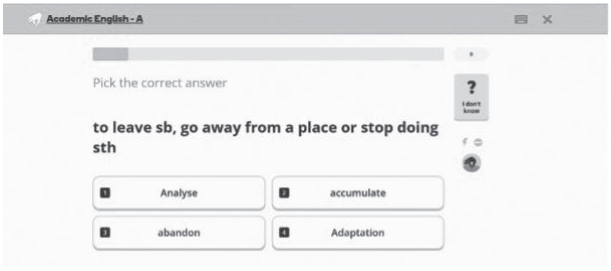

FIGURE 5: Academic-English activity completed using Memrise

Figures 4 and 5 above illustrate the academic-English learning process, where students are presented with word definitions followed by quiz questions prompting them to apply their newly acquired knowledge.

Figure 6 shows one category of learning English using the Memrise application. There are around 380 different categories that students need to encounter in order to grasp English grammar and language more fully. The screenshots illustrate students engaging with the section titled English Grammar – Pronouns, where they completed quiz questions aimed at enhancing memory retention and learning efficiency.

FIGURE 6: Learning about pronouns followed by a quiz using Memrise

Theme 3: Change in student learning outcomes

The third theme was change in student learning outcomes. According to Guskey (2002), these are the learning outcomes of students – which can be anything from a class test, student attendance to formal assessment – where the validity of teaching can be measured. Data from the questionnaires revealed that 90% of the students expressed dissatisfaction with comprehension activities when Author One used traditional teaching methods without technology, primarily citing a dislike of reading. This sentiment was exacerbated by a tendency to lose interest quickly, which could be attributed to the perceived lengthiness of comprehension passages. The lack of engagement appeared to contribute to the poor performance of some students in the pre-test.

The following extract illustrates the students' perceptions of their performance in the pre-test:

> Student 2: I'm not sure what … the important ideas [are].
>
> Student 24: I don't like reading.
>
> Student 34: I lose interest fast.
>
> Student 37: I miss … some stuff in the story.
>
> Student 40: I don't know how [to] tie up the main ideas.

The findings from the questionnaires revealed that the students liked Memrise due to its technological aspect, enjoyable nature, vibrant visuals and other factors. However, the observation notes suggest that a few students did not enjoy using the Memrise application during English lessons, particularly those students who obtained marks below 50%. They

seem to have experienced challenges in learning with technology and content. The student responses in the questionnaire indicate their preferences regarding the four aspects of English: orals, creative work, comprehension and language. The data from the questionnaires suggest that all the students enjoyed orals the most. This was also evident in the observation notes on the Memrise lessons, namely that more students were actively involved in the discussion. The findings from the comparison between the pre-tests and the post-tests revealed a predominantly positive improvement in vocabulary learning, with more favourable outcomes than negative ones. Table 2 illustrates the comparison of the pre- and post-test results.

TABLE 2: Comparison of pre- and post-test results

STUDENTS	PRE-TEST	POST-TEST
1	54	58
2	50	56
3	44	70
4	72	76
5	58	70
6	60	74
7	92	86
8	74	78
9	66	68
10	36	62
11	62	52
12	28	52
13	80	80
14	64	74
15	86	80
16	84	90
17	58	66
18	64	76
19	82	88
20	50	80
21	50	64
22	42	56
23	95	96
24	30	45
25	44	48
26	68	62
27	80	74
28	74	72

STUDENTS	PRE-TEST	POST-TEST
29	78	93
30	54	54
31	78	72
32	46	42
33	42	48
34	82	80
35	68	54
36	68	68
37	34	64
38	82	84
39	68	88
40	42	82
Average	**62.23**	**69.55**

Table 2 indicates that the average percentage of the post-test for this cohort increased from 62.2% to 69.5%, implying an overall improvement in performance following the implementation of Memrise. While the average percentage demonstrates an increase, it is noteworthy that the performance of 26 students improved. However, there were more severe reductions in scores between pre-test and post-test. There are students such as Students 24 and 25 who achieved marks below 50%. Surprisingly, Student 32 scored 46% in the pre-test and 42% in the post-test and Student 34 scored 82% in the pre-test and 80% in the post-test. The decline in students' performance in the post-test occurred with both high and low achievers and this raises a concern about the intervention strategy.

Theme 4: Change in teachers' beliefs and attitudes

A change in teachers' attitudes and beliefs is the fourth theme. It indicates that, once teachers are provided with proof or see an improvement in student outcomes for themselves, their attitudes and beliefs change due to the change in, or introduction of, new teaching practices or technology in the classroom. The observations revealed that the students enjoy learning through technology; they also socialised much more and interacted with Author One, the teacher, to a much greater extent because of the relaxed environment. They did not enjoy having to find words from a dictionary and many students gave one person in their group the dictionary to find the words and then they all wrote these down.

This action research has inspired us to continuously try new things and reflect on what works and what does not work, but, ultimately, to try things out because the classroom is not just a space for the teacher, but also for the students. At the beginning of this study, Author One was very hesitant about introducing technology during English lessons due to time constraints and personal hesitation that arose from a belief that technology is time-

consuming to learn and distracts students from the content of syllabi that needs to be covered. However, since obtaining the positive results derived from the pre- and post-test, questionnaires, observations and self-reflection, Author One's attitude towards, and beliefs about, technology have changed. In this study, the authors realised that technology is there to make teachers' lives easier, to enhance and add variety to lessons, and to adjust and stay abreast of teaching in the 21st century; it is not there to take over teachers' jobs, but to help to improve or refine them.

Discussion of findings and recommendations

The adoption of innovative teaching strategies aimed to facilitate students' acquisition of vocabulary, which, according to the findings, proved to be largely beneficial for both the educators and the students involved in the study. A comparison between the pre- and post-tests suggests an appreciable increase in the academic results of a number of the students. The findings indicate that most of the students preferred the use of a technological application because it was enjoyable and gave rise to immediate progress. It was also something new and colourful and there was a ranking system that motivated them to use the application more and perform well in the tests. After one cycle of action, the result of the research showed that learning and reviewing vocabulary through Memrise could improve the students' achievement in vocabulary acquisition from a mean score of 62.2 (pre-test) to that of 69.5 (post-test). Moreover, the students responded positively to the strategy applied, as reflected in the results of the questionnaire they responded to.

The findings concur with similar research conducted (Fadhilawati, 2016) by the Faculty of Agriculture and Animal Husbandry at the Islamic University of Balitar. The implications of these findings suggest that the implementation of Memrise led to an overall improvement in vocabulary learning among the students. However, the presence of students whose performance did not improve, or even declined, highlights the need for further investigation into individual learning needs and the potential challenges of implementing educational technologies such as Memrise. In addition, it underscores the importance of ongoing monitoring and adaptation of teaching strategies to ensure that all students benefit from the use of technologies.

The implementation of the Memrise application over traditional teaching practices was overwhelming at first. It was difficult to create vocabulary lists and class groups and to decide on ways to monitor the students' work. In addition, during the lessons, it was not easy to tell whether the students understood the vocabulary lists or not. As time progressed, though, the authors became familiar with the application and could also assist those students who were not computer-literate. In line with those of Nepembe and Simuja (2023), the findings of this study indicate the need for teacher training that is centred on designing lesson plans which integrate technology, pedagogy and content knowledge. Altun and Khurshid Ahmad (2021) highlight the fact that embracing technology is one of the important ways of progressing the teaching–learning process in schools and universities, especially for English-language

teaching. The Memrise application provided a multitude of various activities for students to explore and learn from, which was interesting for many of them; and its strategy was used to improve the vocabulary of English Level 2 students. The use of technology during lessons also enabled Author One to adapt her pedagogical teaching practices and foster a more independent working environment among her students.

Limitations of the study

Applying Memrise as a teaching–learning mechanism had several limitations. One limitation of the study was the unstable, or sometimes non-existent, Wi-Fi connection. This rendered accessing the Memrise application impossible, because an online application of necessity requires the use of Wi-Fi. An additional constraint was that it was a once-off research intervention where students used technology that was novel to them, with some students struggling to master it. There were also time constraints in trying to complete the curriculum while at the same time attempting to expose the students to the Memrise application or use it to enhance their vocabulary. A technical difficulty we faced was the use of the general category of Memrise, which asks for the insertion of two languages – one the users understand (questions based in this language) and the target language to be learnt (the new language being learnt). The application does not have isiZulu as an option for the known language, which is a problem since the majority of the students in the TVET sector that Author One teaches are isiZulu speakers. Another problematic aspect was that we were forced to use either US (United States) English or UK (United Kingdom) English, as there was no option for South African English. Nevertheless, we used general UK English because the pronunciation of words is closely linked to the pronunciations common in South Africa. There were also close ties between South Africa, Britain and the British colonies during the 19th and 20th centuries, which helped with pronunciation. Furthermore, there was a lack of computers with the Memrise application installed on them, a lack of availability of computer laboratories, and also little contact time for students to use Memrise. Despite these limitations and obstacles, the students still managed to meet their goals, in the process learning the identified new vocabulary and applying it to comprehension skills.

This was a once-off research intervention where students used technology that was novel to them, so the positive outcomes could also be attributed to some extent to the non-traditional teaching methods. One might wonder, though, whether students would remain as enthusiastic if this technology were to be used regularly for vocabulary acquisition.

These limitations suggest a need for intervention from TVET stakeholders to provide additional resources and enable another action-research cycle. In a future action-research cycle, students should be allocated data to access the Memrise application on their cell phones, which would enable them to continue their vocabulary enhancement at home and stay motivated outside of classroom time. In addition, installing the application in a general computer laboratory would enable students to continue learning during their free time. It

would also be beneficial if the application could interpret words from isiZulu to English and offer the option of South African English.

Conclusion

The purpose of the study was to investigate whether using the Memrise application could help to improve the vocabulary of students in English Level 2 classes in the TVET sector. Memrise has been found to be a valuable tool for enhancing students' vocabulary, equipping them with the increased language, literacy, comprehension and fluency skills necessary for proficiency in expressing themselves orally and verbally in English. The study highlighted numerous advantages of using Memrise: academic improvement, boosting student confidence, more noticeable participation in classroom activities, and a keener interest in learning English, especially when using the application. The problems arising from inaccessible Wi-Fi and computer laboratories, time constraints, this being a once-off study, and limited language and country representation on the application, had a minimal effect on the outcomes – which were largely positive. Overall, Memrise advanced the English vocabulary of students in addition to contributing to Author One's professional development, specifically changes in her classroom practices. The study also indicated that technology is something which all educational stakeholders should consider embracing in an ever-changing Digital Age. Future research could explore the effectiveness of incorporating Memrise into classroom activities more intrinsically and regularly in order to enhance English-grammar instruction and English-language fluency among second-language students.

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JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Mouwers-Singh, C & Arendse, A. 2024. Older adult learners as digital citi zens: Their needs and challenges while participating in an online master's programme. *Journal of Vocational, Adult and Continuing Education and Training*, 7(1):49–68.
http://doi.org/10.14426/jovacet.v7i1.369

Older adult learners as digital citizens: Their needs and challenges while participating in an online master's programme

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ABSTRACT

This article explores the learning journeys of older adult learners (OALs) enrolled in an online education master's programme. Today, many OALs are enrolling in various online programmes. A study by the first author explored the ways in which these OALs identify with being digital citizens, and also investigated their needs and challenges. The capabilities approach was used as the theoretical framework and provided a lens through which the participants' digital experiences could be explored most appropriately. The objectives of the study were: (a) to identify the needs and challenges of OALs participating in an online master's programme as regards digital literacy, technical support and learning resources; and (b) to explore their online learning experiences and challenges, including digital literacies and the way OALs consider themselves as digital citizens. The qualitative nature of this study included a narrative enquiry. Using open-ended, semi-structured interviews, the eight participants with an average age of 49 shared detailed perspectives about their online learning experiences, digital literacies, and the way they view themselves as digital citizens. The findings reveal that OALs need specific levels of learning assistance, intergenerational learning, collaborative learning, mentorship and support when using digital technologies.

KEYWORDS

Digital citizens; digital literacy; Fourth Industrial Revolution; older adult learners; capabilities approach; narrative enquiry

Introduction

The world's populace is becoming older, and ageing populations are a universal phenomenon worldwide. Concurrently with these demographic changes, the considerable breakthroughs and developments in digital technologies and devices also influence this Digital Age, especially in the context of the Fourth Industrial Revolution (4IR). According to the World Economic Forum (2016), the 4IR is upon us. It represents an era in which technological advances enable human beings to merge the physical, biological and digital worlds regardless of age. This convergence of technologies has caused fundamental changes in the way we work, live, and interact with one another, offering many new challenges but also giving rise to the possibility of risks. A key characteristic of the 4IR is the pace, range and complexity of these changes. And with the world focusing on sustainable development and growth, the solutions to adapting to these changes and challenges will ensure the equitable inclusion of all people in future economies (World Economic Forum, 2016). Digital skills have been acknowledged as a critical competency in the workplace, and for active participation in society and lifelong development at an international level. Various academics, researchers, educators and experts claim that individuals who understand digital tools and can use digital means effectively are more empowered to exploit opportunities and achieve success in education, and with regard to employment prospects, professional growth and many other facets of their lives (Jimoyiannis, 2015).

In this context, this article explores the learning journeys of older adult learners (OALs) enrolled in an online education master's programme. The key objectives include: (a) identifying the needs and challenges of OALs participating in such a programme as regards digital literacy, technical support and learning resources; and (b) exploring the online learning experiences and challenges, including digital literacies and the ways in which OALs consider themselves as digital citizens.

Literature review

This literature review foregrounds certain scholarly debates and important developments that have a bearing on this research undertaking. Since the focus of the research is not on traditional students but rather on non-traditional students, studies pertaining to adult learners and OALs have been selected and reviewed.

Concepts of digital literacy and digital citizenship

'Digital citizenship' refers to several levels of responsibility for technology and can be defined as the behavioural norms pertaining to the use of technology. The following general areas of behaviour make up digital citizenship: etiquette, communication, education, access, commerce, responsibility, safety, and security (Ribble, Bailey & Ross, 2004). Digital citizenship is a dynamic, flexible and multifaceted concept linked to, and interlinked with, the everyday lives of individuals and their online and offline activities (Choi, Glassman &

Cristol, 2017). Digital citizenship also promotes equality in vast areas of life regardless of age, race, gender, etc.; it refers to the ability of individuals to participate in online society and involves acquiring skills to exist and navigate in an increasingly complex and digitally mediated world (Sadiku, Tembely & Musa, 2018). The concept of digital citizenship is an important consideration for society. It can be defined as the norms of behaviour that apply when using technology in the most general context and in the context of exercising appropriate behaviour and acquiring knowledge (Ocak, 2019).

'Digital literacy', on the other hand, consists in a variety of knowledge, complex skills, attitudes to information and communication technologies (ICTs) and an understanding of them in order to achieve personal development and employment goals, and also of the various other activities needed to function within a contemporary digital environment. This is because people who can understand and use digital means effectively are more likely to be empowered, to take advantage of educational opportunities, and to achieve success socially, economically and personally (Jimoyiannis, 2015). But digital literacy goes far beyond simply an instrumental use and function; it is also a cultural, political and ethical phenomenon. In addition, it is about social skills and competencies, habits and values that help individuals to cope better with the accelerated dynamism of, and changes, in everyday life (Neves & Henriques, 2020). Experts worldwide regard it as one of the key competencies needed for lifelong learning and active citizen participation in society and development. According to Jimoyiannis (2015), digital literacy therefore presents a sociocultural dimension that must be analysed as an evolutionary process viewed from a holistic and a lifelong human-development perspective. Furthermore, it involves more than simply the capability to use or operate digital software or devices; it also includes a diversity of complex skills, such as cognitive and motor skills and sociological and emotional skills, which are critical to operating and functioning successfully in a digital environment (Eshet, 2004). Eshet (2004) mentions further that digital literacy can be defined as the skill needed to survive in a digital era, since it comprises those specific skills and strategies used and needed in digital environments. According to Shopova (2014), improving digital literacy and skills in ICTs is a prerequisite for achieving improved results and for performing successfully in learning.

How do older adult learners identify with being digital citizens?

Older adults use digital technology less fully; this is because they are confronted with a variety of challenges which may deter them from such participation (Reneland-Forsman, 2018). Such adults tend to lag behind their younger counterparts in using ICT even though embracing it can enhance their well-being and the quality of their lives. But adults are active agents who try to understand and make sense of the digitalising world and they can therefore identify the advantages and limitations of digitalisation (Pirhonen, Lolich, Tuominen & Jolanki, 2020). Designing instructional strategies with which to promote meaningful learning among OALs has always been difficult, though, as their relationship with technological skills and their adoption is not straightforward (Ahmad et al, 2022).

Data from *World population prospects: The 2015 revision* (United Nations, 2015) indicate that the global number of adults between the ages of 25 and 59 years and of those 60 years and over is rising faster than the growing number of children; what is more is that, in 2015, there were already 29 per cent more people aged 25 to 59 years than there were 15 years previously in 2000. These projections forecast that, by the year 2050, it will be a 62 per cent growth compared with 2000.

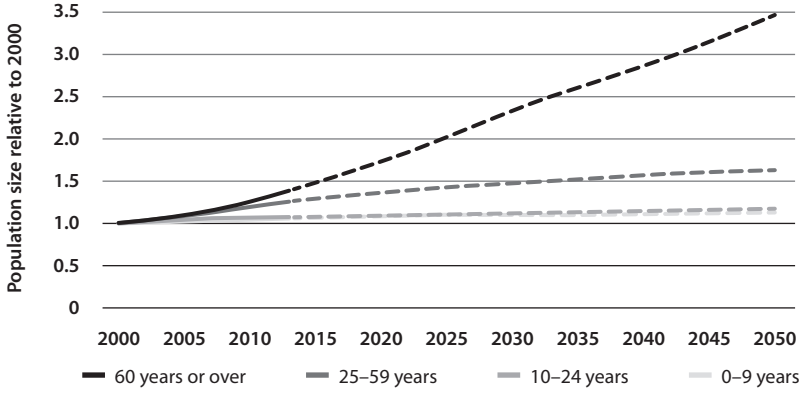

FIGURE 1: Increase in world population relative to 2000, by broad age group, 2000–2050 (United Nations, 2015)

Adult learners have unique needs in education that require attention from higher education institutions. This said, although many policies and theories are created to respond to the growing educational difficulties and challenges confronting adult learners in higher education, it is recognised that more needs to be known about the adult learner in the light of increasing knowledge and skills demands as well as about the unique knowledge and skills needs of adult learners (Owusu-Agyeman, Fourie-Malherbe & Frick, 2018).

According to Kara, Erdoğdu, Kokoç and Cagiltay (2019), the challenges faced by adult learners in online distance education tend to be strongly related to one another, and therefore one challenge might become the source of another. Some other factors that may contribute further to the challenges faced by online master's students include a lack of communication, not receiving clear instructions or having expectations clarified, technical difficulties, isolation, a lack of social interaction, and adapting to new learning styles (National University, 2024). Within an online learning environment, peer interactions and strong interpersonal relationships can help students to develop a sense of belonging when they undertake remote studies (Ramsey, Betz & Sekaquaptewa, 2013; Smith, Lewis, Hawthorne & Hodges, 2013). The coronavirus pandemic (COVID-19) brought about an intense and abrupt digital transformation, leaving individuals and institutions no choice but to take unusual and extraordinary digital leaps and make significant adjustments to their modi operandi (Livari, Sharma & Ventä-Olkkonen, 2020). These almost overnight changes in ICTs gave rise to

rapid and profound changes in society, in the way people communicate, in the way they access information and in the way they work. Consequently, ICTs have come to be perceived as a necessity in 21st-century society (Jimoyiannis, 2015). Yet technology itself possesses qualities that can help to improve human potential (Haenssgen & Ariana, 2018). The transition from blended to fully online learning met the social distancing requirements and economic shutdowns imposed by COVID-19 (Fernandez & Shaw, 2020), but that same transition was not without significant difficulties and costs (Aristeidou & Cross, 2021). Although students experienced anxiety, social concerns and Internet connection challenges during COVID-19, they nevertheless perceived the online learning platform as being useful, if not essential (Elhadary, Elhaty, Mohamed & Alawna, 2020).

Owing to the rapid development of digital technologies, people often find themselves in unequal positions in the area of skills. Nevertheless, generally, there is an expectation of the future benefits that can result from digital technologies (Pihlainen, Korjonen-Kuusipuro & Kärnä, 2021). Working adults have also been experiencing changes at work and in their work practices; and because of the technologies they are adopting and using at work, some occupations are also changing faster than others (Brolpito, 2018).

Implications for adult learners

Online education for adult learners strengthens their social, personal and professional development and assists with competency development, which can be functional in both the digital world and daily activities (Neves & Henriques, 2020). Engagement with digital interfaces is therefore critical to achieving social inclusion and constructing meaningful educational practices (Reneland-Forsman, 2018). In order for learners not to be left behind, it would be useful to consider more holistic approaches that take into account various challenges and which open up opportunities for all learners to cultivate the necessary, relevant skills (Chakroun & Keevy, 2018). Adults therefore need to position themselves in digital environments so that they do not feel isolated. They should be open to participating fully and become more involved in the digital environment (Muñoz-Rodríguez, Hernández-Serrano & Tabernero, 2020). For this reason, most adults who have passed through their formal education phase still have to develop digitally in order to improve their digital literacy, because improving their digital literacy levels is fundamental to their advancement. Undoubtedly, many questions and concerns remain unanswered in attempting to understand and clarify adult learners' need for, and acquisition of, digital literacy and the suitable strategies and ways that should be embraced to provide further support to, and encourage, adult learners to learn about ICT (Jimoyiannis, 2015).

Theoretical framework: Capabilities approach

This study has adopted the capabilities approach as its theoretical framework. This approach takes the research forward, since it recognises the diversity of people and their ability to convert resources and goods into real opportunities and achievements. It aligns

with the study, as it is a holistic framework that takes into account current developments in education and lifelong learning, thereby responding to issues of quality relating to the goals and fulfilments of an individual that make learning and living worthwhile (Jirgensons, 2015). Moreover, the capabilities approach has been used for multiple purposes and has been applied, developed and dramatically expanded over the past 25 years in a range of fields, including education (Robeyns, 2017). It proposes a viewpoint which allows for the rethinking of lifelong learning far beyond human capital theory, and which suggests that learning should be assessed and evaluated according to the capability to achieve and redefine the concepts of human well-being and social development (Chiappero-Martinetti & Ventakapuram, 2014).

Education and the role that it plays are both many-faceted and complex. They are challenged by the paradigm shift away from viewing development in primarily economic terms towards regarding it as placing the human being at the centre and fully enhancing freedom and development to help people of all ages (Hoffman, 2006). Adult education and adult participation should therefore always be assessed in close association with participants' real-life experiences; they cannot be assumed to be separate from the lives of participants if unique and engaging learning environments are to be designed (Cortinovis, 2018).

The capabilities approach therefore asks the following questions: What is it that people can do and be (their capabilities)? And what are they actually and genuinely achieving as beings and in their doings (their functionings)? In addition, it asks whether institutions, practices and policies place an emphasis and focus on people's capabilities in doing what they value and in manifesting the kind of person they want to be (Robeyns, 2017). Universities and landscapes in which online learning is offered in higher education therefore need to work closely with students if they are to understand them and be able to identify any constraints and the ways in which their approaches can assist and support them in exercising their freedom 'to be and to do'. They need to do so in order that both curricula and programmes can be developed which focus on outcomes for the student and continually acknowledge their freedoms to choose and negotiate their interests (Tait, 2013).

Key concepts relating to the capabilities approach include capabilities, functionings, agency, conversion factors, empowerment, real freedoms, and equity in education (Sen, 1999). Capabilities are about the range of things that a person can do and be, based on the resources and freedoms available to them, whereas functionings are the actual achievements and states of being that a person manages to attain (Sen, 1999). Agency is the ability to act upon one's values and goals in order to influence one's situation, which is a crucial aspect of human development, whereas conversion factors are about the conditions that influence an individual's capability to convert resources into functionings (Jirgensons, 2015). Empowerment is the process through which individuals gain the ability to make strategic choices in areas that they value. Real freedoms are the actual opportunities available to individuals to pursue what they value without their being restricted by external constraints

(Chiappero-Martinetti & Ventakapuram, 2014). Finally, equity in education entails ensuring fair access to education and providing support that considers individual differences and needs, with the aim of ensuring that all individuals are offered the opportunity to succeed (Sen, 1999).

Table 1 is a summarised version of the key concepts of the capabilities approach. It includes some of the examples from the data gathered, showing how they link to the concepts and subconcepts of the approach. The analyses and findings are presented and discussed in greater detail (concepts, subconcepts) in the analysis, results and findings sections that follow, which provide a clear and concise overview of the results and their significance.

Table 1: Summarised version of the concepts of the capabilities approach linked to data (Mouwers-Singh, 2022)

CONCEPT	SUBCONCEPT	DEFINITION	SOME EXAMPLES FROM THE DATA (SEE PARTICIPANT RESPONSES UNDER 'ANALYSIS OF FINDINGS' BELOW)
Capabilities	Capabilities to achieve	Range of things a person can do and be, based on the resources and freedoms available to them	Brenda and Washington highlight the need for specific learning assistance and support, indicating gaps in the capabilities available to them to use digital technologies fully. This suggests a need to enhance the capabilities that support learning.
Functionings	Achieved beings and doings	Actual achievements and states of being a person manages to obtain	Thora discusses the stress of learning digital platforms simultaneously with course content, illustrating a gap between potential capabilities and actual functionings in managing digital technologies.
Agency	Exercise of agency	Ability to act upon one's values and goals to influence one's situation; a crucial aspect of human development	Doreen's narrative about the benefits of a study-buddy system indicates how the exercise of agency in forming supportive educational networks can enhance learning outcomes.
Conversion factors	Personal and environmental factors	Conditions that influence an individual's capability to convert resources into functionings	Norma's panic when new digital tools are introduced, and her need for orientation, highlights the way personal and environmental factors affect the conversion of educational resources into practical digital skills.

CONCEPT	SUBCONCEPT	DEFINITION	SOME EXAMPLES FROM THE DATA (SEE PARTICIPANT RESPONSES UNDER 'ANALYSIS OF FINDINGS' BELOW)
Empowerment	Educational empowerment	Process through which individuals gain the ability to make strategic choices in areas they value	Washington's struggle with online learning and his reliance on family for support suggests a lack of empowerment in the digital learning process, indicating a need for more structured educational support.
Real freedoms	Opportunities to act	Actual opportunities available to individuals to pursue what they value without being restricted by external constraints	Brenda's lack of a 'go-to person' for understandable explanations points to a restriction in her real freedoms to engage effectively, with and benefit from, the online learning environment.
Equity in education	Educational equity	Ensuring fair access to education and offering support that considers individual differences and needs, aiming to provide all individuals with the opportunity to succeed	Varied levels of digital skills among participants such as Reginald and Washington highlight inequities that need to be resolved through tailored support and resource allocation.

Further linking the theory to the study, Saito (2003), cited by Cortinovis (2018), asserts that failing to pay customised attention to individual challenges and needs is certain to exacerbate further inequalities that could lead to lifelong disadvantages.

Methodology

A qualitative research design was used for this study. According to Frankel and Devers (2000), the logic guiding qualitative research designs is frequently inductive, adaptable, dynamic, emergent, non-linear and non-sequential, and this methodology consists of expressing events and the meanings and experiences of individuals and groups in order to respond to well-stated, significant research questions. The qualitative research methodology used for this study was a case study within a narrative-approach enquiry. A narrative enquiry was seen fit for adoption, since narratives help researchers to arrive at a clearer understanding of the behaviours and experiences of individuals and, accordingly, to come closer to representing the context and integrity of their lives (Anderson & Kirkpatrick, 2016).

Convenience sampling, which is a non-probability sampling technique, was used. And here the individuals closest to the researcher were chosen to act as respondents due to their accessibility. According to Marshall (1996), there is an element of convenience sampling in several qualitative studies; it is also the most commonly used sampling

method. The respondents are often chosen due to their being at the right place and time, and the sample is chosen based on the convenience to the researcher (Acharya, Prakash, Saxena & Nigam, 2013).

Eight participants with an average age of 49 who were participating in a particular online master's programme shared detailed perspectives about their online learning experiences, challenges (including digital literacies), and the way they perceive themselves as digital citizens. A set of core, open-ended interview questions was developed for the interviews, and they formed part of a general interview-guide strategy that provided some structure to the researcher by ensuring that the same general areas of information were collected from all the participants. The open-ended questions were developed to produce narratives that provided adaptability for follow-up questions to be asked. According to Cohen, Manion and Morrison (2018), the responses to open-ended questions can often contain 'gems' of information that may not have been caught otherwise.

While conducting the interviews, the interviewer took notes; however, the interviews were also audio-recorded and transcribed using Microsoft Teams, a cloud-based collaboration tool. All the participants' sensitive information, including their identities and confidential information, was removed and secured.

Guided by the data in the United Nations 2015 reports showing the growth in the number of adults 25 years of age and over, the researchers sampled adult learners in higher education aged 25 years and older with no maximum cut-off age; seven out of the eight participants were older than 41 years of age. This sample, however, does not represent the wider population but presents only a representative sample of students doing an online masters in education.

In a narrative form of enquiry such as that used in this study, qualitative data analysis was also then used. The process of data analysis was guided by the seven steps of qualitative data analysis proposed by Cohen, Manion and Morrison (2018), which were slightly adapted by the researcher according to predetermined themes.

Table 2: Adapted seven steps of qualitative data analysis by Cohen, Manion and Morrison (2018), according to predetermined themes

STEP 1	Establish units of analysis for ascribing codes to the data.
STEP 2	Create a domain analysis by grouping together items into themes.
STEP 3	Establish relationships and links.
STEP 4	Make speculative inferences and theorise some explanations.
STEP 5	Write a summary of the main features, key issues, concepts, constructs and ideas.
STEP 6	Scan data for any discrepant cases.
STEP 7	Generate theory, findings and conclusions.

Analysis of findings

Digital technologies are generating new opportunities for skills development and are improving the quality of services to a wide range of sustainable development areas, including education; however, they can also pose challenges and disruptions if individuals and institutions fail to adapt to them quickly (Chakroun & Keevy, 2018).

Older adult learners as digital citizens

Our findings reveal that OALs require specific levels of learning assistance, intergenerational learning, collaborative learning, mentorship and support when using digital technologies. This is echoed in the participant responses below:

> **Brenda:** On this course, I didn't really have a go-to person who could explain … something in a more down-to-earth manner [so] … I could understand … [that] which I believe is critical in a programme like this.

> **Washington:** My family, daughter and others are helping me in my online struggle and to do things smoothly. It isn't and wasn't easy … being online.

Here, Brenda and Washington highlight the need for specific learning assistance and support, indicating gaps in the 'capabilities' available to them to achieve and fully use digital technologies. Brenda's lack of a 'go-to person' for understandable explanations points to a restriction in her 'real freedoms' to engage effectively with, and benefit from, the online learning environment. This suggests a need to enhance the capabilities that support learning. Washington and Brenda's statements highlight the importance of support in enhancing capabilities, particularly in the context of online learning. They also emphasise the importance of having supportive resources in place (a go-to person or family) to facilitate understanding and to foster a sense of capability, which is a key aspect of the capabilities approach. In Brenda's case, by providing accessible resources and support, we can empower individuals such as her to exercise their real freedom (opportunity to act without restriction) and to reach their full potential.

It is a finding that, while participating in an online master's programme, OALs needed enhanced levels of encouragement to improve their digital literacies, to become digital citizens and to participate in learning new technologies continually and successfully. This is evident in the participant responses below:

> **Doreen:** My learning story included a study buddy and a study group that helped me to cross bridges and to learn certain terminologies and even statistics.

> **Thora:** … having a mentor perhaps as a support platform, which would be recommended. For me, it would have been a light bulb.

Doreen's narrative about the benefits of a study-buddy system relates to 'agency', which is the ability to act upon one's values and goals to influence one's situation – a crucial aspect of human development. This indicates how the exercise of agency in forming supportive educational networks can enhance learning outcomes. It also relates to 'capabilities', 'functionings' and 'conversion factors', which highlights the importance of social support and peer learning in enhancing capabilities and achieving desired outcomes. Doreen is exercising agency and taking proactive steps to achieve her goals and expand her capabilities.

Thora's response also relates to the concept 'agency'. Thora's desire for a mentor as a support platform indicates that she values support in achieving her goals, which is a key aspect of agency. Thora's metaphor of a 'light-bulb' moment highlights the potential impact of having a mentor during her learning journey. A vital component of the capabilities approach is agency, because people need to be able to choose from among the capabilities that they have reason to value (Randal et al., 2020).

The participants emphasised that their learning journey was hampered when they were required to learn new digital skills alongside the content of the learning programme. In this regard, the participant responses below are pertinent:

> **Thora:** I first had to learn the digital platform and acquire the skill and then move on to the content. I had to learn it separately. I was easily stressed when this happened – I [felt] like [saying:] 'Don't put me in a hotbox like that.' Rather, let us learn the digital app and acquire the new skills and then move on to the content, but not together – otherwise, it can easily distract a person.
>
> **Doreen:** For me, I first have to acquire digital skills, then move on to learning the content.
>
> **Norma:** When a new digital platform or application was introduced, I panicked every time.

Thora speaks of the stress of learning digital platforms simultaneously with course content, illustrating a gap between potential 'capabilities' and actual 'functionings' in managing digital technologies. Thora's preference for a sequential approach to learning digital skills and content reflects the importance of building capabilities in a gradual and sustainable way to ensure that effective conversion factors align with the capabilities approach's emphasis on enabling individuals to achieve their full potential.

Doreen's response also relates to the concepts 'capabilities' and 'functionings'. In Doreen's case, acquiring digital skills is a capability she needs to develop, which will then enable her to achieve the function of learning the content, thus highlighting the sequential nature of capabilities and functionings, where developing one capability (digital skills) is a necessary step toward achieving another functioning (learning content).

Norma's response, on the other hand, relates to 'capabilities', 'functionings' and 'conversion factors'. The introduction of new digital platforms or applications triggered feelings of panic (emotional conversion factors), hindered her capabilities (e.g. to use the platform effectively), and limited her functionings (to engage fully with the learning process). Norma's response emphasises the importance of considering emotional conversion factors in the learning process and recognises that emotional panic can have an impact on an individual's ability to develop capabilities and achieve their goals (achieved beings and doings).

Furthermore, it was found that most of the adult learners in this study did not use technology fully, which led to challenges and even prevented them from engaging with, and actively participating in, the programme. This is echoed in the participant responses below:

> **Reginald:** I had to try to juggle dealing with and troubleshooting technical and digital aspects, and this sometimes could slow or stop learning.

> **Washington:** For me, it was a struggle. Other students perhaps could go on, but I felt left behind in my learning journey. There was a task we had to do, and I got stuck, because of the digital things, and it affected me in this programme. My learning was hindered, as my computer skills were not up to scratch. [For] … those who were sufficient[ly] [skilled, it was … a major plus …, but for me it was a major hindrance.

Washington's response relates to the concepts of 'empowerment', 'capabilities' and 'functionings'. His struggle with online learning and his reliance on family for support suggest a lack of empowerment in the digital learning process and indicate a need for more structured educational support. His experience highlights how his limited digital skills ('capabilities') hindered his ability to complete tasks ('functionings'). His limited digital skills and resulting struggles with tasks made him feel disempowered, left behind and less capable than his peers, which highlights the importance of empowering individuals through the development of digital skills, access to resources and support, and fostering a sense of control over their learning journey and in achieving their goals.

Reginald's response relates to the concept 'conversion factors' as well as 'equity in education'. In Reginald's case, the technical and digital issues he encountered acted as conversion factors that hindered his ability to fully utilise the resources available to him, which slowed and even stopped his learning. Reginald's experience also highlights a potential equity issue, as technical and digital problems hindered his ability to learn, which may not have been the case for others. There are varied levels of digital skills among participants such as Reginald and Washington, and this also highlights the inequities ('equity in education') that must be mitigated through tailored support, structure, resource allocation, and educational equity.

Older adult learners' needs and challenges while participating in an online programme

Another of our findings is that, although OALs do experience new learnings in online learning programmes, they nevertheless still experience many diverse challenges, specifically in the use of digital technologies. This is expressed in the participant responses below:

> **Thora:** Yes, I experienced a lot challenges. I struggled with certain things on my computer. If only … I had an information technology person with me. Examples: Hardware and software challenges. Data usage was also a huge financial challenge for me, and it affected me.

> **Doreen:** Yes, I … [lacked] technical skills at times, and this was challenging. As a result, I sometimes felt isolated, especially by others … [who] were maybe more advanced than me.

Thora's response relates to the concept 'conversion factors', specifically highlighting two of them that affected her ability to achieve her goals (personal conversion factors and environmental conversion factors). Personal conversion factors include her struggle with certain computer skills, indicating a lack of personal capabilities to use technology effectively. Environmental conversion factors characterise the unavailability of IT support and the high costs of data, which created an unfavourable environment that hindered her ability to convert resources. These conversion factors limited Thora's agency and freedom to achieve her goals, highlighting the importance of responding to, and resolving, these factors in order to enhance individual capabilities and well-being.

Doreen's response, in contrast, relates to the concept 'capabilities'. Her limited technical capabilities prevented her from participating fully, even leading to feelings of isolation. This highlights the importance of possessing the necessary capabilities (in this case, technical skills) to participate fully and engage in society, and also indicates how a lack of these capabilities can lead to feelings of exclusion and isolation ('emotional conversion factors').

OALs participating in this online master's programme were first-time online learners and it was they who faced various challenges in adjusting to the new online learning environment. This is echoed in the participant responses below:

> **Washington:** If you are not ready for online, and you did not prepare, you will be faced with onboarding challenges.

> **Thora:** A lack of preparation and online readiness … [leads to] onboarding challenges.

Washington and Thora's statements above about readiness and preparation relate to the concept 'agency'. They emphasise the importance of individual agency in overcoming

challenges and achieving success within the online environment. By overcoming these challenges and providing supportive conversion factors, it will be possible to empower Washington and Thora to develop their capabilities, build their confidence, and exercise their agency in the online learning environment. Agency can be affected by context – which includes personal, environmental and various social factors – and this limitation on the individual's agency is encapsulated in the capabilities approach as the conversion factor (Randal et al, 2020). This also aligns with the concept 'conversion factors', referring to the external conditions and circumstances that either facilitate or hinder an individual's ability to achieve their goals. By overcoming these challenges, we can provide conversion factors that empower individuals to succeed in online learning environments.

Some of the OALs participating in this online master's programme highlighted the reality that the COVID-19 pandemic forced them to become more digitally inclined because, during this time, the need to be more active in digital environments became more apparent. This is evident in the participant responses below:

> **Doreen:** After so many years of experience and studying face to face, COVID happened and forced us to do things online. I was not really exposed to digital environments prior to COVID and starting this programme.
>
> **Nicole:** We learned a lot about doing things online, especially during COVID.
>
> **Brenda:** COVID also had a significant impact on our embracing technology and being digital citizens. COVID also had a large role to play and fast-tracked us … [in] being digital citizens.

Doreen's response relates to the concept 'conversion factors', specifically highlighting environmental conversion factors (COVID-19) and personal conversion factors (a lack of prior exposure to digital environments). This statement illustrates how these factors can have a substantial impact on an individual's ability to develop and exercise their capabilities.

Nicole's response relates to the concept 'capabilities', suggesting that the experience of navigating the pandemic has enhanced her capabilities, such as adaptability, resilience and learning, which are essential to achieving well-being and freedom in the face of adversity.

Brenda's response, in contrast, relates to the concept 'functionings', suggesting that the COVID-19 pandemic has enabled her to achieve these functionings, which are essential to full participation and engagement.

A few of the OALs participating in this online master's programme highlighted a need for online readiness programmes, which they believed would help them to prepare for and make the transition from face-to-face to online learning more easily. This is revealed in the participant responses below:

> **Norma:** We traditionally come from a place where teaching is taking place face-to-face. So, orientation is important, as this is where you get your heartbeat. That support is important.
>
> **Chad:** Orientation is very important, especially for older adult learners and for people less familiar with technology [–] and if there is a lack of preparation, this could be problematic and will cause challenges, even exclusion.

Both Norma's and Chad's responses relate to the concepts 'capabilities' and 'conversion factors' in the capabilities approach. Norma emphasises the importance of dealing with capabilities and conversion factors that influence an individual's ability to adapt to new learning environments, which is a key aspect of the capabilities approach.

Chad's response aligns with the focus of the capabilities approach on individual capabilities, conversion factors, and the importance of taking these factors into account in order to promote inclusion and well-being. He emphasises the need for targeted support and orientation as ways of enhancing their capabilities and promoting inclusive learning environments. This is supported by Wright (2015), who claims that the first-time online learner faces many difficulties, such as a lack of preparedness and not possessing the innate ability to adjust to new digital tools and platforms.

Two of the OALs participating in this online master's programme highlighted the fact that they need a certain level of learning support throughout their learning journey. This is echoed in the participants' responses below:

> **Doreen:** If support platforms were available to me, it would have really helped me a lot. I felt my younger counterparts from the education industry had an advantage over me. So, the support structures I am referring to are different support structures for technical support and even educational support. I felt I had to work harder than my younger counterparts, especially due to my age.
>
> **Washington:** Definitely, the support platforms are very important, especially if you want to take the maximum number of adult learners into account. Especially for older adult learners, much support is needed for them to develop. And help is very crucial for me, and unfortunately that is lacking.

Both Doreen and Washington's responses highlight the importance of 'equity in education' and 'educational equity'. In Doreen's case, there is a lack of support and resources for individuals from different age groups, highlighting the need for greater equity in education. Washington also highlights the lack of support platforms for OALs as a critical equity issue in education. He draws attention to the need for targeted interventions and innovations to fulfil the unique needs of people. By prioritising support platforms, we can create a more

inclusive and supportive learning environment that also values the contributions and experiences of OALs.

In addition, it was found that adult learners need to learn together with their peers in a collaborative way, which should include meaningful and interesting online discussion forums. This is made clear in the participant responses below:

> **Reginald:** The discussion forums and support platforms on this programme were a safe space and … good platform to help learners transition, as the topics were guided by lecturers and facilitators.
>
> **Norma:** Discussion forums are recommended. Even if you … [use] WhatsApp, I find you then develop your relationship more. These platforms one should grab with both hands … [for here] you can speak and interact with peers, even those across the border …[; if you do not, you] will feel alone, and you may even feel like dropping out, but your peers on these platforms will carry you and pick you up and tell you to keep going [as] we are nearly there.

Reginald's response relates to the concepts 'capabilities' and 'conversion factors' in the capabilities approach, highlighting the importance of creating inclusive and supportive learning environments that take into account the diverse needs and capabilities of learners. His use of the words 'safe space' shows that he feels that the discussion forums and platforms should provide a safe and inclusive environment in which learners are able to transition and develop their capabilities. Then the word 'transition' highlights the importance of these platforms and forums in helping learners to enter and embrace new learning environments and to deal with personal conversion factors (e.g. prior experience, skills) and environmental conversion factors (e.g. access to support structures).

Norma emphasises the need for inclusive and supportive learning environments that foster connections and capabilities, leading to increased motivation and persistence among learners.

This view is supported by Croft, Dalton and Grant (2010), who claim that adult learners need the necessary interaction and support, and that a lack of these could affect the richness of the learning experience or lead to feelings of isolation. Challenges therefore need to be recognised, and holistic methods are important in bringing about the opportunities to develop the necessary abilities and skills so that nobody is left behind when they have to undergo digital transformation and participate meaningfully in digital societies (Chakroun & Keevy, 2018).

Conclusion

In order to thrive in the Digital Age, older adults must acquire new skills and adapt to emerging technologies. The 4IR brought about a demand for online higher education programmes such as online master's programmes, and higher education institutions must respond to this by developing inclusive and supportive models for lifelong learning. Online institutions must cater to a range of diverse learners and acknowledge the unique challenges and needs of OALs. By understanding these needs and challenges, they will be able to tailor digital settings accordingly and empower OALs, such as those participating in online master's programmes, to become confident digital citizens. Moreover, learning should be emancipatory, fostering holistic development and social sentience. In such circumstances, creative and supportive digital design for programmes such as an online master's programme is able to contribute more effectively to the improvement of digital literacy and proficiency, in turn enabling OALS to transition more seamlessly from face-to-face to online learning programmes. Higher education has a crucial role to play in responding to the needs and challenges faced by OALs by promoting participation, engagement and full inclusion in both education and society.

Recommendations

The following recommendations can help institutions to respond effectively to the unique needs and challenges faced by older adults in online master's programmes, ultimately enhancing their experience and outcomes:

- *Orientation and onboarding workshops:* The impact of effective orientation and onboarding workshops for older adults should be explored, and, related to this, how such workshops affect their confidence and their persistence in online learning programmes.
- *Online discussion forums:* The role of online discussion forums should be analysed and/or designed to foster a sense of inclusivity among OALs who participate in online learning programmes.
- *Mentorship programmes:* The impact of mentorships on OALs' self-efficacy, motivation, academic achievement and success should be investigated.
- *Support platforms:* Various types of support platform (e.g. technical, academic, emotional) should be investigated and analysed so that their impact on the success of adult learners in online master's programmes can be gauged.

In conclusion, online institutions must consider carefully how they will assist and support diverse students as they exercise their freedom 'to be and to do', and study programmes must be developed that recognise students' freedom to choose what they want to be and do (Tait, 2013).

Acknowledgements

The authors wish to acknowledge the contributions of the participants in this study and to express their gratitude to them for their willingness to make such contributions. The authors also wish to express their appreciation to Tichaona Musikavhanhu for his guidance and mentorship.

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JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Prinsloo, N. 2024. How implementable is e-RPL in the public technical and vocational education and training sector after COVID-19? Learnings from the Western Cape. *Journal of Vocational, Adult and Continuing Education and Training*, 7(1):69–87.
http://doi.org/10.14426/jovacet.v7i1.390

How implementable is e-RPL in the public TVET sector after COVID-19? Learnings from the Western Cape

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ABSTRACT

'e-RPL' is referred to as the unique practice of using electronic, digital and mobile web technology to collect and record evidence of prior learning acquired formally, non-formally or informally, or as a combination of these (Cameron & Miller, 2014). This article reports on a small-scale study of artisan recognition of prior learning (ARPL) implemented at public technical and vocational education and training (TVET) institutions in the Western Cape province, South Africa. Current practice is reviewed and opportunities for, and barriers to, implementing e-RPL are explained. The author attempts to investigate whether it has been possible to apply e-RPL and e-Portfolios effectively in ARPL at public TVET colleges in the TVET environment since the COVID-19 pandemic. It was found that, although ARPL is gaining traction at selected public colleges, funding and resource constraints remain a significant impediment to expanding it. The form of e-RPL evident at the institutions of higher education studied was limited to the administration of ARPL. Although pilot projects have used mobile technology, they have been limited in their extent and effectiveness. The author concludes that e-RPL holds promise as a means of expanding RPL access and provision during times when physical contact is curtailed. However, the potential of e-RPL tends to be tempered by the socio-economic realities affecting potential candidates.

KEYWORDS

Recognition of prior learning (RPL); artisan; e-RPL; artisan recognition of prior learning (ARPL); e-Portfolio

Introduction

The South African Qualifications Authority (SAQA) defines recognition of prior learning (RPL) as

> the principles and processes through which the prior knowledge and skills of a person are made visible, mediated and assessed for the purposes of alternative access and admission, recognition and certification, or further learning and development (SAQA, 2019:6).

Artisan RPL (ARPL) was introduced through a series of pilot programmes at accredited trade test centres in 2017 to replace the section 28 Trade Test of the Manpower Training Act 56 of 1981. This enabled workers who had not received formal training to have their experience assessed against the criteria required by a specific trade. Successful completion of an RPL assessment would allow the candidate to do a trade test and ultimately become a fully fledged artisan. ARPL was conducted solely face-to-face.

However, in 2020, the COVID-19 pandemic forced education and training institutions in the post-school sector to rethink their methods of teaching, learning and assessment (OECD, 2021). Face-to-face lessons were replaced with a combination of Zoom, Google Meet and WhatsApp platforms. Assessments also transitioned from the traditional sit-down examinations to online assessments. Whereas these online assessments could be applied when testing theory, practical tests requiring observations were not easily accommodated (OECD, 2021).

COVID-19 also had an impact on the ARPL processes, with several centres having to close during the lockdown phase of the pandemic. Now, in the post-COVID-19 environment, there have been calls to move the RPL assessments online, particularly for those candidates who live in areas far from recognised RPL centres.

Costs are an important barrier to accessing RPL opportunities; they could range from R1 800 for an RPL evaluation to around R13 000 for the six-week gap training and trade test preparation. If not funded or supported by business, workers would not be able to afford these costs. At the same time, access to online opportunities, especially for the poor, was curtailed and so the existing race, class and gender divide was exacerbated by the digital divide. With many ARPL candidates being poor and living in rural and peri-urban areas, access to resources, including the Internet and Wi-Fi, are affected negatively. A 2022 report by the World Economic Forum on data costs in Africa found that South Africans pay up to R85 per gigabyte of data, a cost equivalent to nearly four hours' work for people earning the minimum wage (Harrisberg & Mensah, 2022). This resulted in reduced access to resources for electronic RPL or e-RPL.

In South Africa, a key philosophical and legislative or policy underpinning of RPL is to provide access and to enable redress for the racial injustices of apartheid in order to further learning and

personal advancement. Supported and driven by the union movement (Cooper, 1998), RPL was considered to be a vehicle through which workers would have their skills recognised and certificated, which would, in turn, result in commensurate increases in remuneration. This is captured in policies such as the SAQA RPL policy (2019), the Department of Higher Education and Training (DHET) RPL Coordination Policy (2016) and the Quality Council for Trades and Occupations (QCTO) RPL Policy (2014). Progressive steps have also been taken to broaden access to RPL opportunities, particularly in the artisan space, including attempts to increase the number of decentralised trade test centres that offer ARPL.

Internationally, there has been increasing emphasis on developing e-Portfolios in RPL for artisans by means of which candidates develop and upload their portfolios of evidence onto an online platform. However, the relevant literature, particularly that from Australia, Europe and New Zealand, points to some of the challenges and opportunities of this approach to RPL (Cameron, 2012; Chan, 2022; Stojanovska-Georgievska et al., 2023). Chan (2022) investigated the increasing use of technology to assist in the process of upskilling workers in a changing work environment in New Zealand. Chan's study, which focuses on the vocational educational system, notes the increasing role of e-Portfolios in these changing contexts and in the promotion of lifelong learning. Stojanovska-Georgievska et al. (2023), focusing on the European Union, investigated the development of digitisation, especially the use of the e-RPL tool for creating a web-based application that would replace the document-based procedure for RPL. The authors argue that there is a need to have the predetermined criteria for qualifications in place before the minimum requirements for mutual acceptance, recognition and validation of qualifications, based on the existing occupational standards which need to be defined first in order for e-RPL to be effectively implemented. They also note the advantages of using various web-based platforms to streamline the RPL process.

Cameron (2012) notes that the use of e-Portfolios in RPL processes in the workplace and professional-practice contexts attracted little attention in the literature due to its emergent nature. Her study explored the growing use of e-Portfolio-based RPL (e-RPL) and professional recognition (e-PR) processes in Australia and the implications of these for recognising workplace learning and experience.

Although the study was limited to the Australian context, Cameron (2012) found that an array of e-RPL and e-PR were being used across multiple fields, disciplines and contexts. She also found that the occurrence of e-PR was more dominant than that of e-RPL and this resulted in the development of a framework that provided the conceptual scaffolding for recognition systems in the workplace.

Cameron (2012) outlined the implications of the correct matching of practices and tasks to appropriate types of e-Portfolio-based RPL and PR along a continuum of formal and informal learning, and with varying degrees of learner control. This highlighted the complexity of RPL assessment systems in the workplace and training institutions.

More recently, a Kenyan study by Ligale (2023) has provided an African perspective on the potential benefits of the use of e-RPL to allow for wider access to potential candidates and by modifying the e-learning platforms in Kenya to achieve this. In considering e-learning, Ligale (2023) argues that e-learning support is mainly facilitated by content design, the quality of e-learning systems, learner experiences and feedback, social support, assessment and evaluation, and institutional factors.

Based on the international literature reviewed above, can e-RPL and e-Portfolios increase viable access to RPL opportunities at public vocational institutions? This article therefore seeks to answer two questions:

1. What, if any, are the current practices of RPL in the public TVET sector?
2. What are the potential barriers to and opportunities when implementing e-RPL at public TVET colleges?

Theoretical framework

This study uses two theoretical lenses to frame the study: Activity Theory is used to provide a theoretical basis for the ARPL context, and a Critical Theory of Technology (CTT) lens is employed to evaluate the use of e-RPL in the TVET sector.

Activity Theory considers the ways in which human activities are regarded as systemic and socially situated phenomena that include work systems, community, history and culture (Engeström, 2001). Developed further by Engeström, the well-known 'Activity Triangle' captures the key players in this process, as illustrated in Figure 1.

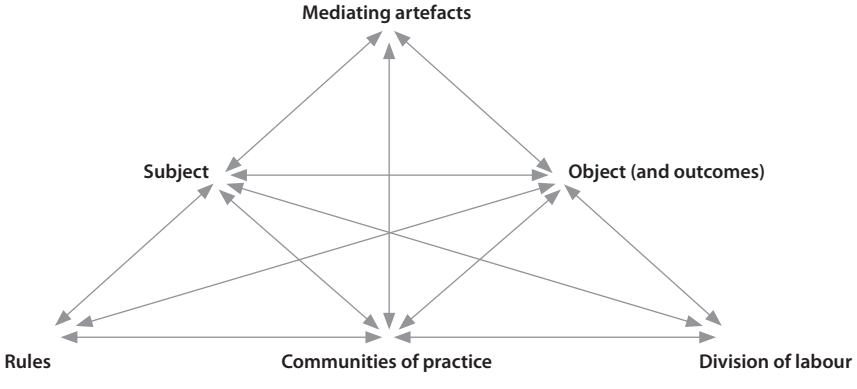

FIGURE 1: The Activity Triangle

(Source: Engeström, 2001:135)

Figure 1 shows a network of relationships between a subject (an individual or an organisation) and its object. It indicates that, for a subject to achieve its goals, more than a direct relationship is needed. To achieve a goal, mediating tools, rules, communities of practice and the division of labour are required. The arrows show how each part of the activity could influence another part in the activity system.

Activity Theory or Cultural–Historical Activity Theory (CHAT) is particularly useful in capturing the roles of the different actors and contexts involved in RPL. Naudé (2016) notes that RPL candidates struggle to link their knowledge gained through workplace experience to the requirements of the qualification. The role of the RPL assessor in this case is critical in the process of making the tacit knowledge and skills visible.

Naudé (2016) highlights activity systems: the academic and those in the workplace. The academic institution as an activity system uses the components of the activity system to generate new knowledge and disseminate disciplinary knowledge with strong rules and boundaries. These disciplines are strongly coded in a community of practice, which does not allow the less informed to get behind these boundaries. The more solid the boundary, the more narrowly defined are the knowledge and skills.

The workplace could be described in a similar manner but as a different context. The tools, rules, communities of practice and division of labour have similarities (policies, procedures, manuals, etc), but also clear differences (i.e. the absence of journals, academic traditions and disciplinary boundaries, and different communities of practice) when compared with the academic institution. The ARPL process pays special attention to the competencies that are needed by the workplace or industry.

Naudé (2016), when focusing on rethinking RPL, notes the importance of mediating tools. He argues that

> [m]ediating tools play an important role in determining whether [an] RPL advisor could unlock the knowledge that candidates have obtained in the workplace. The concept of mediating tools provides a starting point for transferring workplace knowledge into academic knowledge (2016:10).

This is particularly important when considering the role of the ARPL toolkit (mediating tool) and the role of the RPL assessor. The way the assessor engages with the RPL candidate is important in order to allow for a broader assessment of competence, especially when considering e-RPL.

The Critical Theory of Technology (CTT) is used in research to examine and critique the social, political and economic dimensions of technology. This theoretical lens goes beyond the technical aspects of technology to explore its broader impacts on society, emphasising the interplay between technology and power structures. The CTT argues that technologies are not separate from society

but are adapted to their social and political environment. Since technologies are implicated in the sociopolitical order they serve and contribute to shaping, they cannot be characterised as either neutral or as embodying a singular 'essence'. According to Feenberg (2008), two philosophical streams underpin CTT: substantivism and constructivism. Substantivism emerges from a philosophy of technology and argues that technology is autonomous and inherently biased towards domination. Constructivism, in contrast, emerges from contemporary social science. Social studies of technology pursue empirically grounded investigations of technological design and development. Feenberg (1991) states that a CTT seeks to reconcile the schism between the substantivist and the constructivist theories of technology.

This theoretical framework adds a useful lens through which this study can be evaluated, in that it allows for a balance between debates of what constitutes knowledge, skills and competence, on the one hand, and the use of technology to validate or reinforce patterns of dominance, on the other. However, in the post-COVID-19 context, a shift to online assessment and the promise that this holds, particularly in the context of e-RPL, needs to be tempered by the stark realities of the digital divide, the demographics of the ARPL candidate, and also the extent of access to necessary resources. Technology can also serve as a barrier to teaching and learning due to the lack of access to online platforms – which goes against the underpinning RPL aims of access and redress.

The use of these two theoretical perspectives will provide useful lenses through which to analyse both the ARPL process and the use of e-RPL. Both CTT and Activity Theory or CHAT allow for a critical analysis of the interplay between technology, society, learning and experience. Activity Theory highlights the various activity systems that form the basis of socially situated processes, including community and workplace. It draws from the basis of situated learning as espoused by Vygotsky (Cole et al., 1978). CTT considers the way technology affects the social, economic and political dimensions of society. The theory also investigates the interplay of technology and the maintenance of social and knowledge hegemony. The CTT theoretical perspective highlights the important role of technology in Activity Theory systems, in this way providing insights into the tensions and contradictions of technological solutions for professional occupational practice when compared with traditional practices of face-to-face human observations of competence.

e-RPL in TVET – a policy context

In recent years, policies in South Africa have raised the profile of RPL in the national discourse. For instance, the White Paper on Post-School Education and Training (WPPSET) (DHET, 2013c) highlighted the importance of RPL for enhancing the mobility and employability of candidates. The WPPSET states that RPL is an important approach to 'redressing past injustices and recognising competence gained through practical workplace learning and experience' (DHET, 2013c:93). The varying conceptions of RPL and competence, the policy suggests, have been detrimental to streamlining and embedding RPL in the education and training system.

Skills development policies have, however, been developed against the backdrop of a decline in the manufacturing capacity of South Africa, which has seen a reduction in large-scale apprentice training by state-owned enterprises (Bhorat et al., 2020). There have also been debates about the goals of the National Qualifications Framework (NQF) when considered against the National Plan for Post-School Education and Training (NPPSET) and, more particularly, the backdrop of the Fourth Industrial Revolution (4IR) (Loots & Butcher, 2021). Commentators on ARPL and subsequent policies such as the WPPSET (DHET, 2013c) have therefore urged that an increase in the number of qualified artisans be achieved through artisan RPL so as to meet the development targets of the National Development Plan (NDP) (Presidency, 2012). This was also captured in the National Skills Development Plan (2011) and the NPPSET (2023), where targets were laid down that include the training of 5,1 million students across higher education, TVET and adult education. This includes the training of 30 000 artisans per year by 2030, of which ARPL is viewed as an integral component.

The current RPL policies also allow for the use of enabling technology to facilitate access and redress, but they are silent on how these will be implemented. For example, some RPL policies do not specifically refer to e-RPL, but they do note the broadening access and the standardisation of processes (SAQA, 2019). New policies continue to represent the changing education and training context and, by extension, RPL. The recently developed RPL implementation framework for post-school education and training (2024) that is open for public comment has highlighted the importance of technology at an assessment and administrative level to streamline the RPL process. Therefore, the use of technology to facilitate the RPL processes is considered to be an essential means to increase access to RPL opportunities.

However, the technicist approach to ARPL focuses primarily on assessing certain occupational competencies while other critical competencies are not assessed. The result is a more substantivist approach to the use of technology and equipment linked to a particular trade. The use of technology will also be affected by the age of the candidate and their access to equipment that is used in the trade (Feenberg, 2008).

The implementation of e-RPL is gaining increasing traction in South Africa, particularly in higher education institutions. This includes the use of e-Portfolios in the RPL process. e-Portfolios are understood to be electronic portfolios that use digital technologies. This allows the portfolio developer or RPL candidate to collect and organise portfolio artefacts in various media types (i.e. audio, video, graphics, text). An electronic portfolio is also known as a web folio, an e-Portfolio or a digital portfolio. (Softic et al., 2013; Chan, 2022; Stojanovska-Georgievska et al., 2023).

e-Portfolios are, however, not confined to RPL. In the workplace, for example, e-Portfolios are used to collect and record evidence of prior learning based on the current competencies that are required by an organisation or an employer. These purposes could be related to human resource management requirements such as job-related competencies, knowledge and skills or for skills audits such as skills gap analyses and performance appraisals (Cameron, 2012).

At higher education institutions (HEIs), the development and use of e-Portfolios have become more prevalent in recent times as a means of both assessment and a record of personal development, and also for use in RPL for access and advanced standing. However, although e-RPL and e-Portfolios are referred to separately, they are not mutually exclusive and are in fact complementary in the RPL context (Cameron, 2012; Ligale, 2023).

Research methodology

The study focuses exclusively on ARPL in the engineering trades of Motor Mechanic, Diesel Mechanic and Welding. When compared with RPL applied in HEIs, ARPL in TVET colleges is applied in a more technicist and more narrowly defined manner. The data for this article are drawn from two sources: a 2017 pilot project report of ARPL implementation at technical and vocational institutions; and a 2021 study of ARPL implementation in TVET colleges and the workplace. Both data sources were obtained in the Western Cape province of South Africa and processed by the institute at which the present author works. The data from this small-scale study was primarily derived from interviews the author conducted with key stakeholders, including TVET college and workplace managers and RPL practitioners, in addition to observations. In the 2017 pilot study, a total of ten individual, semi-structured interviews were conducted and the same number of observations of the ARPL processes were made. The study interviewees included managers, ARPL practitioners and candidates. The 2021 study included a total of 32 interviews, which were conducted at six public TVET colleges and three workplaces. These studies highlighted key barriers to broadening the findings and recommendations drawn from the report and the study. The findings of this study focused on the possible applications of e-RPL and e-Portfolios. The interview data were transcribed and analysed using Atlas Ti and coded themes were then derived, one of which was the potential use of e-RPL.

A limitation of this research is that it was a small-scale study that focused on RPL implementation in the public TVET context and that it may not be capable of generalisation to the TVET sector or other sectors.

Findings: Current RPL practice in TVET – the ARPL toolkit

As mentioned previously, the RPL processes in TVET colleges were initially implemented according to the Manpower Training Act (MTA) of 1981. In 2016, this was streamlined into what was known as RPL toolkits, which were promulgated by a series of Trade Test Regulations as new toolkits for trades were developed (DHET, 2017). The ARPL process is presented in Figure 2. The paragraphs below the figure capture the ten key stages in the ARPL process in addition to the e-RPL status and opportunities.

The ten stages of ARPL (DHET, 2017) illustrated in Figure 2 present opportunities for e-RPL, and these are captured below. The current level of technology use is also discussed.

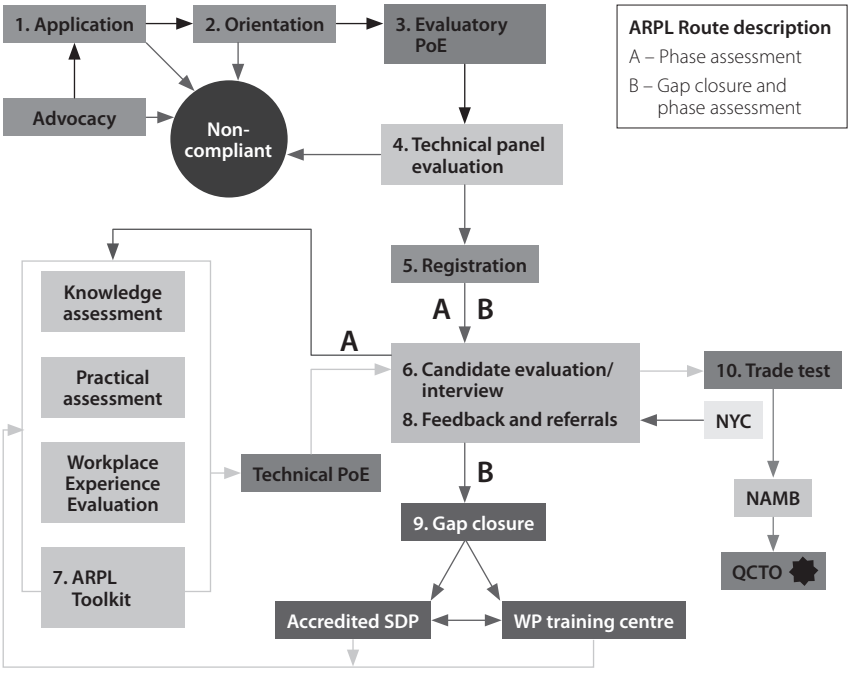

FIGURE 2: The ten stages of ARPL

(Source: DHET, 2017)

Stage 1 – application

At this stage, candidates are encouraged to apply. The minimum entrance criteria are the minimum verifiable entrance criteria for an assessment as per the DHET Trade Test Regulations (2013a), which include being 19 years of age or older. Candidates may be either employed or unemployed, with a minimum of three years' verifiable work experience in the diesel, motor mechanic or welding trades. Although currently used at most ARPL centres, the online application process is still in its infancy at some public centres.

Stage 2 – orientation

At this stage, potential candidates are introduced to the ARPL process and what it entails. They are counselled as to their expectations and what is required to complete the process successfully. Orientation usually comprises a plenary session followed by one-on-one counselling by an ARPL assessor.

Orientation is currently done mostly via a face-to-face process or a telephonic interview with an ARPL assessor. e-RPL possibilities in this regard include using platforms such as Google Meet and WhatsApp that would allow remote interview opportunities.

Stage 3 – evaluatory portfolio of evidence (PoE)

This stage comprises the development of a portfolio that includes a record of employment, experience and qualifications. One of the challenges here is assisting or guiding the candidate to find the relevant information.

At present, the PoE development is an intensive process requiring regular contact sessions between the RPL practitioner and the candidate. Whereas there is a move to shift to online platforms, most portfolios are currently article-based. However, a move to e-Portfolio development will alleviate additional costs, such as printing, for candidates.

In some sectors, such as the professional body for sports coaches, the South African Sports Coaching Association (SASCA), the use of e-RPL for designations is widely used and has produced very good and credible results. However, e-RPL in the artisan environment could benefit from researching these case studies in other contexts where e-RPL practices have been piloted and then implemented on a larger scale.

Stage 4 – technical panel evaluation

The panel comprises subject-matter experts (SMEs) who will evaluate the portfolio prepared by the candidate. This evaluation will determine whether the student progresses to the next phase.

Evaluations are mostly performed by SMEs at the college or workplace in consultation with the Sector Education and Training Authority (SETA). They can also be done using a common platform if the SME is not in the same location as the candidate. This will also deal with logistical constraints when there is a shortage of expertise.

(Stages 1–4 have stop-outs built in where students are counselled as to what processes to follow. Successful candidates move on to Stage 5.)

Stage 5 – registration

Successful candidates are registered whereas those who are not successful are advised on what to do. Registration is currently done online at the colleges and workplaces, although it will be important to consider enhancements, including the use of common platforms.

Stage 6 – candidate evaluation

Candidates are then interviewed and evaluated for trade test readiness based on their PoE. At this stage, they are either considered to be ready for the ARPL assessment or they will require training to fill in skills or knowledge gaps. The interviews are mostly conducted face-to-face but there are moves afoot to have this done online using video platforms such as WhatsApp,

Google Meets or Zoom, or even telephonically. By conducting these interviews online or telephonically, travel and accommodation costs will be reduced for candidates.

Stage 7 – ARPL assessment

The candidate is assessed via the ARPL toolkit. This includes a knowledge assignment, a practical assignment and a workplace evaluation. The assessment process is conducted through face-to-face sessions during which the candidate and the assessor are physically present. There are, however, opportunities to use readily accessible platforms to conduct the assessment remotely. This requires an ARPL assistant to be present with the candidate and an RPL assessor who can operate remotely.

Stage 8 – candidate evaluation

Based on the results of the ARPL evaluation that includes the interview and ARPL toolkit assessment, the candidate may either be considered fit to proceed to the trade test or may be required first to undergo additional training. Currently, candidates are informed and counselling takes place either face-to-face or telephonically and, where possible, via email. Where gap training is required, counselling is conducted between the RPL assessor and the candidate. Nevertheless, using appropriate platforms that allow online meetings may facilitate the process of counselling and support – especially where the candidate resides far from the training centre. The ARPL process ends at this stage. Being RPL for access, successful completion enables the candidate to do the trade test, which is explained below.

(It is important to note that Stages 9 and 10 are not part of the RPL process but an assessment required of all apprentices. Successful completion would mean that an apprentice or labourer would receive their trade test certificate and be recognised as an artisan.)

Stage 9 – the trade test

Candidates who have completed their gap training and their evaluation or those who were considered competent and did not require gap training can submit themselves for the trade test. Currently, the trade test requires physical, face-to-face evaluation of the candidate by the trade test assessor. Using online platforms, however, may enable remote observation of the assessment by the assessor. An assistant will need to be present with the candidate.

Stage 10 – certification

Successful candidates are awarded their trade test certificate.

The process of certification has significant delays due to different platforms being used in addition to reporting requirements. However, using a common online system and processes will streamline and speed up this process.

As can be gleaned from the process above, each of these stages, except for Stages 9 and 10, has the potential to implement and use e-RPL processes. Some processes are already being used, while others have the potential to be seamlessly transferred onto an online platform. It is, however, important to critically evaluate the potential opportunities of e-RPL against the socio-economic realities of the digital divide. These include, inter alia, access to resources, Wi-Fi, technical support and funding.

In the context of this study, there is a difference between ARPL for the trade test and e-RPL. The ARPL process is specifically focused on assessing practical competence against specific occupational standards. As has been highlighted above, e-RPL, in contrast, focuses on using electronic, digital and mobile web technology to collect and record evidence of prior learning acquired either formally, non-formally or informally, or a combination of these. e-RPL can, however, be used to replace traditional face-to-face processes, although this nascent approach has yet to be implemented at scale in the South African TVET sector.

Findings: e-RPL in TVET – current form and extent

In the South African context, the use of e-Portfolios for RPL is still in its infancy but is growing (Davids et al., 2019). The use of e-Portfolios is increasingly evident in HEIs, whereas at TVET colleges RPL candidate portfolios are still mostly paper-based. Furthermore, research conducted during the COVID-19 pandemic and its impact on TVET and other learning institutions (Papier, 2021) showed that a move to online platforms may affect the fairness of the assessment owing to the uneven access of candidates across the country to adequate connectivity and the high costs of data.

Based on the 2017 ARPL report findings and also the findings in the 2021 study highlighted in Table 1, the interviewee responses were grouped under six broad challenges. These are described below.

First, the respondents complained that the paperwork and administration were intensive and were especially challenging when administrative support was not available. Ten respondents in the 2021 study stated that particularly RPL in the trades required a great deal of administration to gather the necessary documentation for the PoE. For example, one practitioner stated that the ARPL process was very bureaucratic and that practitioners tend to go overboard regarding RPL compliance issues.

It was also noted that there was a long turnaround time between the test being done and certification, which was damaging to the industry and demotivating for the candidate. Apparently, the delays are caused during the processes which are dependent upon the trade test centre involved, the National Artisan Moderation Body (NAMB), and the QCTO which awards the certificate. The suggestion was that these administrative processes should be performed online, including the development of candidates' e-Portfolios of Evidence.

Second, current ARPL assessment practice is a time-consuming, resource-consuming and resource-intensive process. Sixty per cent of the respondents in the 2021 study believed that the self-assessment part of the ARPL could be completed at home on a computer or a smartphone and emailed back.

One college respondent noted that the self-assessment component of the ARPL processes required the candidate to be physically present. This required them to take a day off from work to go and complete the assessment. He asked: 'Why can't he (the RPL candidate) do it at home on his computer or on his smartphone and mail it to me and I can check it?' Doing so would reduce the time lost at work for candidates while also reducing the costs of assessment.

Third, as with assessment, the quality assurance and accreditation processes are intensive. It was also acknowledged that, along with the increasing use of technology in the automotive and welding industries, there was a need for public TVET colleges and their workplace counterparts to adapt the curriculum to meet the new competency benchmarks.

In this context, the use of digital platforms would require RPL practitioners to develop new strategies to train, support and assess candidates and would require their institutions and/or training academies to support such initiatives.

Fourth, as noted previously, costs were an inhibiting factor, and the view was expressed that these could be reduced through online/e-RPL means.

A college RPL practitioner argued that ways need to be found to make it easier for candidates to complete the ARPL process. Echoing the examples given by other respondents, he stated that candidates were forced to leave his panel shop to go and complete the ARPL process. While he acknowledged that the candidates must be exposed to the requirements for the test, it nevertheless means that they are away from their work for a considerable time, which means a loss of income, yet they must pay for the test.

Components of the ARPL process, such as the preparation of the e-Portfolio, could be completed at home on a computer or a smartphone and sent back to the RPL practitioner. This modus operandi would reduce the time lost at work for candidates while also reducing the costs of assessment.

Fifth, the view was expressed that having a standardised ARPL in place would allow for the shift towards a more online environment.

A respondent noted that all the trade test centres would need to be 'linked to a server, a central server and the trade test tasks generated via the computer' as a means of quality assuring the process and streamlining the ARPL process in particular.

Furthermore, some concerns were expressed about moving RPL assessment entirely to a digital platform, since it was said that this may have an impact on the way in which assessment is implemented. Concern was also expressed about the fairness of the assessment owing to the unevenness of Internet access and the cost of data for candidates from diverse socio-economic groups. In addition, RPL candidates with limited levels of digital literacy would need to be supported on such platforms. It was mentioned, moreover, that, for artisans, evidence of competence resides mainly in their demonstration of practice.

Finally, linked to the discussion on administration was the matter of certification. In this context, it was noted by several stakeholders that there was a need for a common platform for reporting to various assessment bodies and regulatory authorities. The timeous issuing of the trade certificate was viewed as critical by respondents, as was the recognition of the trade certificate by industry. Thirteen per cent of the respondents in the 2021 study stated that RPL needed to be more widely advertised in the community and especially in industry. One respondent stated that it was important to work with the community entities and formations, but that this did not always work in practice. He suggested the use of digital platforms to reduce the administration of RPL and for advocacy of RPL.

Table 1 offers an overview of the ARPL barriers stated in the 2017 and 2021 research on ARPL and opportunities for the use of e-RPL presented above.

TABLE 1: ARPL barriers and opportunities for e-RPL

ISSUE	BARRIERS TO ARPL PROCESS	OPPORTUNITIES FOR E-RPL
Administration	Paperwork or institutional capacity	ARPL is currently used – an online reporting process
Assessment	Gaps or assessing practice	Standardised ARPL process Gap-training opportunities
Accreditation of trade test centres, workplace sites & practitioners	QA of sites Upgrading for e-RPL, support and training for RPL practitioners	Public–private partnerships Online RPL training – communities of practice
Costs	Data or travel and accommodation or ARPL being resource-intensive	Reduction in certain costs for candidates
Common or standardisation	Different forms and reporting processes	Using a common platform will make administration easier
Certification	Time delay	Reduced administrative time to certification – e-passport

Discussion – implications of e-RPL for TVET

In the article to this point, the concept of e-RPL and e-Portfolios and the way artisan RPL or ARPL is used in TVET colleges, have been considered. Consideration has also been given to the extent of its implementation in TVET colleges.

Feenberg (1991) argues that the CTT highlights the need to bring the substantivist use of technology closer to its developmental aims. In the context of e-RPL, it means the use of technology that is accessible and supportive of students, particularly in the rural and poor communities where there is limited connectivity and data costs are high. Widely used platforms such as Google, Teams, Zoom and WhatsApp and mobile phones could be harnessed instead to facilitate access.

Although e-RPL can enable a larger group of candidates to access RPL services, particularly from the rural communities, support is still needed (Davids et al., 2019; Ligale, 2023). This includes assisting and counselling candidates in preparing their PoE. This ties in with the constructivist developmental view expounded by the CTT (Feenberg, 2019).

The online e-RPL process adds another andragogical layer to the RPL practised by the practitioner. Cooper et al. (2016) have argued that RPL is a specialised pedagogy requiring practitioners to apply a broad range of teaching and assessment methodologies to ensure that the often tacit or hidden knowledge and skills of the candidate become explicit. Several authors, including Softic et al. (2013), Cameron, Travers & Whihak (2014), Davids et al. (2019) and Ligale (2023), allude to the role of the RPL practitioner in applying a similar process when using technology in RPL. Softic et al., for example, note that

> [t]eachers also need a tool, support (technical and pedagogical) and students who will want to use it. Teachers also must be aware and prepared that implementation of new tools and new methods of teaching require significant amount of time and effort in the beginning (2013:2).

Certain forms of RPL lend themselves to the use of online technology. For example, the PoE in the form of e-Portfolios and online interviews is being used regularly at institutions. Practical RPL assessment requires candidates to be observed by the RPL practitioner or assessor via video link while the RPL assistant is available at the remote centre to assist the candidate.

Resourcing continues to be a perennial challenge, one of balancing the importance of creating access to and reducing the cost of RPL. In the e-RPL context, this means having access to the appropriate equipment and resources at the college or institution where the candidate can be assisted.

The literature increasingly recognises the specialised role of RPL practitioners in the assessment process (Ralphs, 2012; SAQA, 2019). Consequently, several policy documents

have considered the training and development of these practitioners – for instance, the SAQA National Policy on RPL (2019) proposed that it would be necessary for Quality Councils to provide for 'supporting the training and monitoring of RPL practitioners including RPL advisors, facilitators, assessors, moderators, and administrators' (2019:12). According to the SAQA (2019) National Policy document, the RPL practitioner is

> a person that functions in one or more aspects of RPL provision, including policy development, advising, portfolio course design and facilitation, assessment, moderation, administration, monitoring and evaluation, research and development (2019:5).

The continuing development of RPL practitioners was also recognised in the DHET National RPL Policy (2015) document that argued for the professionalisation of RPL practitioners through a professional body and for a register for all RPL practitioners in terms of which they would receive support to grow their technical knowledge and skills in order to implement and improve RPL practices (2015:13).

Conclusion

This article sought to answer two questions: (1) What, if any, are the current practices of RPL in the public TVET sector? and (2) What are the potential barriers to and opportunities when implementing e-RPL at public TVET colleges? It has been found through interviews, observations and a review of the literature that the current practice of RPL is more standardised with the implementation of common RPL toolkits. The application of these toolkits is technicist and focuses on the application of core competencies based on the trade rather than on the critical competencies needed for the 4IR. It has also been found that e-RPL has mostly been focused on the administration of ARPL but not on the process.

Activity Theory highlights the role of practitioners and is the mediating tool relevant to this study. The theory stresses the need for the RPL practitioner to be flexible in their approach to assessing the competence gained in the workplace and in their application of the mediating tool. The dangers of a solid disciplinary boundary is evinced in the narrowness of the assessment. The mediating tool therefore needs to be flexible, allowing the RPL assessor to consider broader notions of competence. This creates the tension between technology as a primarily human process in an activity system process and in raising contradictions and tensions in the interface between technology and human beings.

CTT cautions that technology, while possibly broadening access to opportunities, is neither apolitical nor value-free. It is important that the digital divide in the context of e-RPL be dealt with by providing the bridges suggested in the recommendations to ensure access to, and redress for, ARPL candidates. It is also important that technology should facilitate and accommodate varying learning and assessment styles.

Finally, the post-COVID-19 period challenges mentioned at the start of this article mirror the experience of those involved in RPL and at the public TVET colleges and in private workplaces. In this context, e-RPL holds promise as a means of expanding RPL access and provision at times when physical contact is curtailed. However, this promise of e-RPL needs to be tempered by the realities affecting many potential candidates, including unequal and costly access to digital resources.

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JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Mantashe, LX. 2024. Do universities have the articulation of college programmes in mind when reviewing their academic curricula? *Journal of Vocational, Adult and Continuing Education and Training*, 7(1):88–111.
http://doi.org/10.14426/jovacet.v7i1.392

Do universities have the articulation of college programmes in mind when reviewing their academic curricula?

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ABSTRACT

In order to articulate academic programmes from college to university effectively, the curricula of the two institutional structures must be aligned. Studies show that this is not always the case, despite the existence of national and sectoral policies that are intended to promote alignment. In grappling with this reality, this study explored the level of interface of academic programmes between TVET (technical and vocational education and training) colleges and a comprehensive university in South Africa. It also investigated whether, and the extent to which, university policies and actors considered college programmes during their curriculum-review processes. Document analysis and semi-structured interviews were used to gather qualitative data. It was found that, instead of considering college curricula, curriculum review was driven by professional bodies, market demands and relevance. Moreover, institutional actors did not have the required agency to engage with the current misalignment of college–university academic programmes or curricula. The implication is that, while necessary, university policies for promoting academic curricula for articulation and programme interface are not adequate for resolving the problem of the misalignment between college and university curricula. To facilitate the interests of agents in articulation, the articulation officers at institutions of higher learning must ensure that articulation policies are in place in departments and that curriculum designers and related stakeholders are imbued with articulation principles during the review and realignment of curricula.

KEYWORDS

Articulation; curriculum reform; curriculum mapping; programme interface

Introduction

Articulation is a concept that is in the early stages of development in South Africa (Branson et al., 2015), a country emerging from a past of apartheid injustices (Bolton & Samuels, 2016). Before 1994, the higher education curriculum, including ways in which knowledge was produced and disseminated, reflected the political and economic goals of colonial South Africa. Higher education institutions were compartmentalised: some for blacks and others for whites. This led to the 'proliferation and differentiation of the institutional types' and created a 'rigid binary divide' (Ng'ethe, Subotzky & Afeti, 2008:116).

In the case of technical colleges, the curricula were designed to suit market needs (Terblanche & Bitzer, 2018; Madileng, 2022). Their curricula articulated with those of either universities or, more likely, technikons (or universities of technology) owing to the nature of the latter (Lortan, 2019). Colleges and technikons provided technical education and training and traditional universities offered theoretical knowledge and pursued research. This structural reality insulated college qualifications from those of universities, and even universities were insulated from one another based on race or ethnicity and the colonial function of qualifications. Inevitably, this undermined articulation between programmes. This is why the different approaches and sites in which learning occurred were not perceived as being equal and were segmented without articulation being borne in mind (Bolton, Matsau & Blom, 2020).

In order to overcome the pre-1994 higher education structure and culture, a legislative and policy environment was brought into being from 1995 to promote the integration of the different institutional types, including colleges and universities, and to build one differentiated and articulated education and training system (Bolton et al., 2020). One such key mechanism was the South African Qualifications Authority (SAQA) Act, which was passed into law in 1995, with SAQA being tasked with developing a national qualifications framework (NQF) (RSA, 1995). The first draft policy on articulation was completed only in 2014, with the first policy being gazetted in 2017. The purpose of the articulation policies was to resolve the underlying philosophical gap and structural barriers to access and movement within and between institutional types. The Policy and Criteria for the Registration of Qualifications and Part Qualifications on the NQF were devised to

> establish and maintain coherence between the three Sub-Frameworks (S-Fs) in order to clarify, strengthen articulation between qualifications within each S-F and between the S-Fs, and support the coherence of purpose between education, training and development nationally (SAQA, 2013:5–6).

S-Fs include the General and Further Education and Training Qualifications Sub-Framework (GFETQSF), the Higher Education Qualifications Sub-Framework (HEQSF) and the Occupational Qualifications Sub-Framework (OQSF).

Despite these and other related policies and the political and institutional will to advance articulation, the creation of articulation routes or pathways continues to lag behind (Needham & Papier, 2018). Students who have completed a college education continue to find it difficult to gain entry to, and recognition in, universities (Terblanche & Bitzer, 2018; Bolton, Govender & Matima, 2019; Bolton et al., 2020). Failures to implement articulation at the systemic, conceptual and structural levels of education and training still occur (DHET, 2013; RSA, 2017). Among other obstacles, curricular misalignment seems to constitute a significant reason for the lack of articulation (Papier et al, 2016; NPPSET, 2017; Bolton et al., 2020), making it important to investigate the current state of TVET–university curriculum alignment.

This study reports on the findings of an investigation into whether one comprehensive university considered the curricula of colleges during the review of its curriculum. Before the presentation of the study findings, there is a brief discussion of the theoretical framework, which serves as the lens through which this study was conducted. This is followed by a review of the literature on the complexities involved in curriculum development and programme interface. This is followed, in turn, by a discussion of the competing interests between college, university, occupational and government stakeholders and a clarification of the ways in which these competing interests affect both the curricula and the interfaces between programmes.

Theoretical framework

Archer's constructs of structure (Archer, 1995), culture (Archer, 1996) and agency (Archer, 2000) constitute the framework for this paper. 'Structure' refers to relations (Archer, 2003) that are social in nature (Porpora, 2011) and 'culture' refers to the ideas, beliefs and theories contained in society's 'propositional register' (Archer, 1996:105), with propositional register being the ability to construct abstract thoughts in our minds and to do so independently of personal experiences. 'Agency' refers to the reflexive, creative, innovative and purposeful actions of people and the choices they make in their daily lives in order to shape and reshape social reality (Archer, 1996, 1995). Moreover, according to Porpora (2011:27), culture 'is what we collectively produce, and agency is what we do with it individually'. The university curriculum as currently structured constitutes the structure which impinges on whether and how academics review academic programmes, including the ideas and interests they advocate. Both the agency and the ideas of academics are crucial to determining whether curriculum reform involves consideration of TVET (technical and vocational education and training) college programmes and, if so, the extent to which such reform does.

Archer also theorises the constructs above as being different from, independent of and influential on each other (see Archer, 1995; 1996; 2000). She constructs the method of analytical dualism to separate the constructs temporarily 'in order to examine the *interplay* between them and therefore to explain changes in each and/or on all of them – over *time*' (Archer, 1995:66, *emphasis added*). From the interplay of constructs a social outcome occurs, but one of the constructs may have a more dominant influence on the outcome than the others.

This study sought to understand how agents influence the curriculum and academic programmes through the curriculum-review process. Agents are role players by virtue of the positions they occupy in the institutional departments and are bound by structural constraints both in and outside a university. The study also sought to describe those constraints and interrogate the ways in which agents navigated them. Archer (2000) foresees that academics can use their roles either to advance change in the curriculum structure or to maintain structures in line with their interests and the ideas they have about articulation and university relations with TVET colleges. As the literature indicates below, roles themselves have to be played within the confines of institutional logic, which tends to hinder any ideas that agents might hold.

Literature review

Curriculum for articulation

Articulation is fundamentally about curricula (Bawa, 2013), not universities or education and training institutions per se (Qonde, 2014). This implies that when qualifications are developed, multidimensional articulation routes should be mapped out and, considering the primary purposes of qualifications, they 'should also be designed with planned articulation routes at the outset' (NNPSET, 2017:22). In addition, institutions should have simplified rules that govern articulation (RSA, 2017). Articulation pathways should be created in such a way that there is no need for there to be credit-transfer agreements between different institutional types (Bolton & Samuels, 2016).

All curriculum design processes – for any institutional type and regardless of the purpose for which or the level at which a qualification exists or the subframework(s) in which a qualification resorts – should make provision for the creation of multiple pathways for students. However, the reality of the relations between TVETs and universities is that they are dynamic and complex, significantly affecting the process of curriculum development – on the basis of which articulation can either be fostered or hindered. These complexities and dynamics are discussed briefly below.

University–college curriculum (mis)alignment

In South Africa, the curricula of TVET colleges and universities are not yet properly aligned (Malale & Gomba, 2016; Graham et al., 2017; Needham, 2018). This is due, among other factors, largely to structural, conceptual and systemic factors (RSA, 2017). For instance, curriculum misalignment has the consequence of preventing students with a National Certificate Vocational (NC(V)) from gaining access to the programmes of other higher education institutions that offer disciplines and courses in the same field as their counterparts who have gained a National Senior Certificate (NSC) (Branson et al., 2015; Malale & Gomba, 2016). In a study by Bolton et al. (2020), some respondents said the problem is not misalignment per se; rather, it is the lack of willingness on the part of universities to accept applicants who have an NC(V).

Where colleges and universities have agreements in place, Gibbon et al. (2012) nevertheless claim that the way in which curricula are composed serves to obstruct articulation. These authors argue for linkages to be developed that enable the current system to be advanced towards greater curricular alignment, particularly between TVET colleges and universities. Furthermore, to ensure seamlessness of movement between different structured curricula or programmes, there must be, among other actions, a 'review of [the] NC(V) curriculum' and a 'restructuring of subject combinations at college for the certificate to enable strong articulation with university' (Gibbon et al., 2012:135). Moreover, Lortan (2019) adds that the right moment at which to consider building articulation routes should be during the conceptualisation of the new diplomas. However, this opportunity was not fully exploited, as the particular findings of this study show.

Bolton et al. (2020) recently found that students who have gained either a National Accredited Technical Education Diploma (NATED) or an NC(V) struggle to have their qualifications recognised by universities due to the breadth and depth of the college curriculum. This may point to a lack of interface between the different sub-frameworks. Gibbon et al. (2012) believe that the synergy of S-Fs must be deliberately and consciously worked on and achieved to the point where, if a possible interface between them is identified, a concerted effort must be made to put it into effect. For the system to be truly interconnected, there must be visible evidence of the alignment and facilitation of the different learning routes (Papier et al., 2016).

To this end, at the same time as qualifications are developed, the articulation routes should be mapped out, linked to the primary purposes of qualifications; and qualifications should also be designed from the outset with planned articulation routes being in place (NPPSET, 2017).

However, the above cannot be achieved without agency. For example, to reform a curriculum is to influence structural change in which agents have various vested interests either as groups or as individuals (Archer, 2000). These agents' interests could include either retaining or changing inhibiting structures and retaining or modifying any problematic perceptions they may have about college qualifications. This possibility of agential interests undermining articulation is hardly engaged with in the literature; structure is often given more precedence, which has led to the plethora of policies promoting articulation. This article contends that, in addition to building structural enablements, the exercise of agency is further required during curriculum mapping in the curriculum-review processes in order to explore all possible articulation pathways and to put them into effect. In this regard, Bolton et al. (2019) are correct in calling for a culture that encourages articulation between colleges and universities, a culture requiring agential awareness of the national imperative for advancing greater articulation.

College curricula as they currently stand are generally and heavily geared towards occupations and skills or competence (Terblanche, 2017; Needham, 2018; Needham & Papier, 2018; Terblanche & Bitzer, 2018; Madileng, 2022). However, the argument that Terblanche and Bitzer (2018) advance for leadership to promote curriculum change at the TVET level in order to keep programmes relevant to the industry or employers they serve should be

approached with caution. In the first place, from the point of view of policy, TVET colleges do not have the autonomy to change their curricula: the power to do so resides in the government in the form of the Minister of Higher Education and Training (Terblanche & Bitzer, 2018). In the second place, with restructuring or revising the curricula, the risk exists of demand-led college qualifications undermining programme interfaces. This is where curriculum designers in both colleges and universities, including interest groups, need to interact during the revision or realignment of curricula if they are to balance their respective interests. The way around this is to agree on specific articulation arrangements according to which different stakeholders – via credit-transfer policies and recognition of prior learning (RPL) – may construct a curriculum in ways that reconnect the college, occupational and university programmes, as has been suggested in the research project of Bolton et al. (2020).

There are examples of where the structures of the curricula between college and university have allowed for built-in articulation routes as a result of the historical relationship between the two institutions. For example, engineering qualifications at the Durban University of Technology (DUT) exemplify such strides towards facilitating articulation. Here, students can move from a National Diploma in Engineering at college to engineering qualifications at university, which entails transferring the credits for all their first-year or first-semester modules if the students have completed their N4 and N5 at college (Lortan, 2019).

According to this arrangement, the alignment of the curriculum designs of both university and college is also of such a nature that a student who is excluded is permitted to repeat any modules they failed at college and, if they pass satisfactorily, they are permitted to return to university, having gained credits for the modules they passed the second time round (Lorhan, 2019). This example practically and vividly suggests the need for collaboration between stakeholders to build a coherent system of education. However, such collaboration must also take into account the competing interests embedded in the make-up of different knowledge structures.

Collaboration and competing interests

Summarising the recommendations made in the SAQA–DUT study, Bolton and Lortan (2019) make two key recommendations in relation to the promotion of articulation: (1) There is a need for cooperation in the development of a curriculum so as to create conditions that make for successful articulation. Needham (2018) adds that collaboration should be included in the design of a curriculum, in line with the second recommendation, which is that: (2) 'The development of the NCV and NATED qualifications needed to incorporate articulation-by-design from the start' (Bolton & Lortan, 2019:17).

Collaboration should involve stakeholders such as the government, business, colleges, universities and quality-assurance bodies required to engage in the curriculum development process. In the process of collaboration, the problem of the negative perception of the TVET curriculum needs to be overcome from the outset. This problem of trust is not unique to South Africa: it exists even beyond its borders. For example, in the United States, it is alleged

that the college curriculum lacks quality (CCRC, 2015). In South Africa, their equivalent, the TVET colleges, similarly do not enjoy a good reputation among the universities. There is the perception that colleges offer education of a lower quality; therefore, the requirements for NC(V) candidates are higher than those for learners coming from Grade 12 (and having gained an NSC). As a result, an authentic, objective process of curriculum mapping, discussed in the next section, could be a significant solution to the problems associated with curriculum misalignment and it could also help to overcome the stigma attached to college education.

It should be borne in mind, though, that stakeholders have different interests which present a dynamic situation involving the nature, form and extent of their cooperation in the development of curricula and the implementation of adaptations – including the success or failure of collaborations and agreements. Notwithstanding the many successful and emerging articulation initiatives (Bolton & Lortan; 2019; Bolton et al., 2020), though, the work of Papier et al. (2016) and Needham & Papier (2018) stresses the value of collaboration, on the one hand, and the systemic, structural, conceptual and practical challenges brought about by the competing interests affecting the development of articulation routes in the system, on the other.

In support of their claims, Needham and Papier (2018) reflected on the implementation of an articulation project which involved the government, the insurance industry, colleges and one university in the Western Cape. The project was intended to facilitate the transition of students from college to university. An insurance industry-specific qualification, supported by a government-funded Sector Education and Training Authority (SETA), was offered to 100 candidates at five colleges. If successful, the qualification would facilitate student articulation to the commerce faculty at the university that participated in the project, and it was intended to enable students to study towards a diploma and a postgraduate qualification at that university.

Two findings from their study are important. First, out of the 100 candidates who commenced their studies at college towards a qualification as a financial planner, only 12 students passed their university diploma, and, of those, only six passed the postgraduate qualification. This very low success rate of students who intended articulating from college to university has also been experienced in France, where only fewer than ten per cent of those who articulated to university were able to complete their university degrees (Ananiadou, Field, & Chakroun, 2019).

Second, and most importantly, in the Western Cape study, out of the 120 credits received from the insurance SETA programme, only 12 credits were transferrable from the first year of college to the Bachelor of Commerce at the university in question (Needham & Papier, 2018).

The earlier study by Papier et al. (2016), which also related to an insurance SETA and involved study towards a qualification in Wealth Management, made similar findings after the mapping of two programmes. Both studies (Papier et al, 2016; Needham & Papier, 2018) concluded that the different purposes of the qualification stood in the way of effective articulation, in that no adequate fundamental academic curriculum for the two disciplines

existed at college to facilitate articulation into university and increase the chances of success once the candidates were admitted to university.

It was also found that it was not easy to set up a bridging programme to build the foundational disciplinary knowledge that was missing from the industry-imposed curricula at colleges, because no funding had been provided for it. Confirming this fact, Ananiadou et al. (2019) found that the foundational knowledge and skills critical to success at university are not embedded in the college curricula.

From the foregoing, it can be said that, whereas Terblanche (2017) is correct in asserting that curriculum change should target both industry needs and movement within higher education, there is a real possibility of one stakeholder affecting the ultimate content and structure of a programme. In the collaboration suggested by Needham (2018), if a market-oriented paradigm prevails, the required interface may be compromised. Needham & Papier (2018) point out that the difficulty of having two equivalent or complementary qualifications in place (one from college, another from university) resides in the contradictory paradigms about where knowledge is produced, the nature of the different sites of knowledge (work and university), and the quality and value of the knowledge in the workplace. For example, they point out that unitised qualifications are specific, prescriptive and competency-based and do not offer the disciplinary knowledge often offered by universities (see also Madileng, 2022).

Importantly, colleges and universities not only have peculiar interests, but also institutional logics that are different from the intrinsic logics in the NQF's unitised and modularised programmes, and these are reflected in the curricula they offer. Institutional logics have to do with the way institutions are structured and work and why they are structured and work the way they do, including what value they attach to, and how they value, learning from other institutions (Raffe, 2007). Effectively, they are driven by their own self-interest (Raffe, 2007). Intrinsic logic, on the other hand, has to do with what other bodies outside a university do and what their intentions are. The NQF, for example, calls for a single, integrated, although differentiated, system of education and training, and articulation is its key instrument to facilitate the unity and integration of the system. This means that institutional and intrinsic logics are not consistent and even clash with each other (Raffe, 2007; 2011). Raffe found that most of the barriers to a unified system in Scotland were institutional. This implies that policy mechanisms with their intrinsic logics must contend and harmonise with institutional logics (Raffe, 2003). The results in the present study indicate that the institutional context has remained somewhat unchanged.

For example, in addition to concerns about relevance to industry, universities tend to be preoccupied with such factors as institutional regulations (following rigid admission rules), the protection of academic disciplines from influences from outside, and funding considerations related to enrolments and graduations. So, when implementing externally induced policies meant for building a united system of education and training, they are bound to prioritise the foregoing constraints. Similarly, business, trapped in its commercial

logic, uses funding as a way of leveraging the propagation of unitised and modularised learning, thus compromising effective articulation between college and university. In such a case, the universities, concerned with their own priorities, cannot keep up with the proliferation of unitised learning at college, which Raffe (2013) regards as fragmenting learning and controversial.

Another crucial problem, as pointed out earlier, is that a college curriculum which is developed by the national government impinges on the creative agency of colleges (Terblanche & Bitzer, 2018). In contrast, it is the universities that have the leeway to create the curricula for the different disciplines they offer qualifications for. In revising curricula with articulation in mind and implementing boundary-crossing practices, it is therefore necessary to have in place painstaking curriculum mapping while at the same time considering the different paradigms that may exist between disciplinary and vocational knowledge.

Curriculum mapping

The finding by Needham and Papier (2018) that there were only 12 credits that could be gained and transferred from the occupation-bound qualification resulted in the recommendation of creative solutions such as the creation of bridging courses to facilitate articulation. Bolton et al. (2020) found that bridging courses enable articulation. These findings also confirmed the benefit of curriculum mapping between so-called 'sending' institutions (i.e. colleges) and 'receiving' institutions (i.e. universities).

Curriculum mapping is regarded as a fundamental inspirational force for the creation and sustainability of any continuous relationship between institutional types or any credit-transfer agreement or arrangement (Paez et al., 2011). It is about establishing an interface between two components of a qualification, such as units, subjects or modules (Jackson et al., 2011). Here, content- or subject-matter experts investigate every component of the sending and receiving qualification of a curriculum, the NQF level and the assessment practices before they make a professional judgement about the level of equivalence between the two programmes (Blom, 2013). Curriculum mapping also helps to identify inconsistencies in a curriculum (Makura & Nkonki, 2017).

When gaps are identified, the credit accumulation and transfer (CAT) principle could be considered, meaning 'access and success' through 'supplementarity' (SAQA, 2014: clauses 15a, 15d). In terms of this principle, what this means is that TVET students could be admitted to a university course on condition that they complete supplementary work before gaining a credit transfer (Lortan, 2019) – especially in cases where there is an over-alignment after the transfer of some credits from a sending institution. In this way, any possible duplication of learning is avoided (Paez et al., 2011).

Curriculum mapping is not without its difficulties, though. Some of the difficulties relate to the amount of time, energy and resources needed to map credit transfers on a case-by-case basis,

including the difficulties associated with the topics covered and the extent of their coverage (Paez et al., 2011). Mapping is also difficult when the ways in which courses are designed, described and assessed in each sector are different (Jackson et al., 2011). This is the case between the college and university programmes included in the study by Needham and Papier (2018).

It is indisputably a difficult task to establish the extent of equivalence between two courses (Kennepohl, 2016). If agents do not share an interest in building articulation routes, the complexities discussed above could amplify the impact and adversely affect whether curriculum analysis occurs at all with articulation to a university programme in mind. In addition, the process of mapping may cause reversion to the matching principle of articulation, a principle that may not always enhance effective articulation. These difficulties justify the necessity for agency in those institutional actors who are involved in curriculum reform or realignment for the purposes of articulation.

Methodology

In responding to the purpose of the study, two key questions were explored:

1. How do academics review curricula in their respective academic departments, considering the structural constraints between the college and university curriculum?
2. How do their review processes help build alignment of college and university curricula?

To answer these questions, this study employed a qualitative, single-case study methodology with embedded units. This allowed the case itself to be examined and also the data to be analysed within the case analysis and between the case analyses, inclusive of a cross-case analysis (Yin, 2003). The comprehensive university type (in the form of particular departments) was the unit of analysis, and the embedded sub-units included five departments that were offering national diploma programmes in the Faculty of Business Management Sciences (FMS). The university resulted from the merger of two technikons and a traditional university campus. At all times, the structural and cultural contexts were taken into account when making methodological decisions (Yin, 2003).

To collect data, the researcher interviewed a purposively chosen sample of seven participants from five national diploma programmes offered by the FMS. These participants were asked what prompted them to review the curricula of the programmes they offered, and whether, how and the extent to which they considered college curricula during the review process. Their responses shed light on their agential interests, including the structural context in which they exercised their agency and the ideas they shared about college curricula.

The participants comprised two deans in the FMS who were based at different campuses plus heads of department and lecturers who had been involved in admissions. Both deans had been working in the institution for more than ten years. Then there were two heads of

department (HoDs) – one managed Management and Human Resource Management (HRM) and the other managed Tourism Management (TM) and Hospitality Management (HM). At the time of the data collection, the HoD for the Accounting programme was new and unfamiliar with the context; as a result, one senior lecturer who had been in the department for more than ten years was interviewed. The remaining participants were lecturers who were responsible for admissions in Management and HM, respectively. The HM lecturer was a former HoD of the HM department before it was consolidated with TM under one HoD.

The programmes above were selected because they represent some of the diploma programmes that were offered at technikon campuses and had the potential to enhance articulation goals during curriculum review. The Accounting programme had a national higher certificate at NQF Level 5 in addition to a diploma; this diploma articulated to a Bachelor of Commerce degree in Accounting that was located on the traditional university campus. Apart from these, the university also offered engineering diplomas and degrees in law, social sciences, medicine, and the humanities. Owing to time and resource constraints, these programmes were not included in the units of analysis.

The data were collected through semi-structured interviews and from two university documents: University Articulation Guidelines ((UAGs), and the general prospectus of the university (the prospectus) and the faculty prospectus of the FMS. The prospectus contained the admission requirements for National Senior Certificate (NSC), National Certificate Vocational (NC(V)), and National Accredited Technical Education (NATED/N-programme) N3, N4, N5 and N6 candidates, Credit Accumulation Transfer (CAT) rules and Recognition of Prior Learning (RPL) policy provisions. Pseudonyms are used to refer to the participants in this study and the university's name has been omitted.

Inductive content analysis was used to analyse the results, and the categories considered emerged from the data analysis rather than from preconceived categories (Hsieh & Shannon, 2005).

Results

The report draws largely on the contributions of three participants – Nomonde, Sindiswa and Josh – and on extremely limited data from Gary. Although they dealt with admissions and were members of their departments, other participant responses were too lean; in any case, their responses are better expressed in the verbatim statements from the three listed above. Furthermore, the findings are drawn from UAGs, the 2024 university prospectus, and the prospectus of the faculty concerned.

Curriculum review

The study sought to determine whether curriculum reform or realignment considered articulation in ways that facilitated a programme interface between college and university.

The UAGs indicated clearly the need to consider college curricula in the review of university curricula:

> In order for a systemic articulation to be more effectively implemented, it is important that curriculum analysis is undertaken to consider the curriculum of NCV programmes offered at TVET and other colleges against the cognate programmes at the university. This exercise should include other qualifications quality assured by SETA/QCTO (Quality Council for Trades and Occupations), and offered at TVET and other colleges.

According to the UAGs, curriculum analysis would be conducted to determine *areas of difference* (theoretical and/or conceptual) and ways of reconciling any existing differences. In the same context, there was no direct talk of considering NATED programmes at the N4, N5 and N6 levels. The UAGs provided no more guidance than the above. The university's general prospectus for 2024 makes the 'general requirement for admission to study for a degree qualification' a diploma, which is a 'standard requirement', while it says that those possessing a 'TVET qualification … may apply' for admission. The prospectus makes no mention of concepts such as articulation, credit transfer, work-integrated learning or curriculum reform. The concept of curriculum appeared in the faculty prospectus, which provided for a faculty curriculum committee whose purpose was 'to provide strategic oversight on all faculty curriculum matters …'.

The faculty prospectus made no reference to the UAGs, and the curriculum committee was not guided any further than that it must perform the function of 'reviewing existing programmes and recommend replacement of irrelevant programmes/modules/courses' to ensure 'relevance' and response to 'identified needs' of the institution. The curriculum considerations of college curricula appear only by implication in the following statement in the general prospectus:

> It is left to Faculties to take a decision on the equivalence of Degree and Diploma courses undertaken at other institutions, with the proviso that Faculties will submit recommendations to Senate about the status of such courses.

Whereas four of the six departments included in the study had reviewed their curriculum more than once during the past five years, the review was not performed to facilitate college–university articulation. It was driven instead by external factors.

The HRM and Management Department, for example, was driven by market needs, advice from professional bodies and benchmarking from other universities. The universities, according to interviewee Nomonde, had moved from the National Diploma to a specific diploma of their own, leaving them (i.e. the university under study) a bit behind:

> We are looking at the problem we are going to have in future: of graduates that are going to be redundant and unemployable. So that is why we keep changing according to the needs of the market, and according to the advisory board.

To this end, the programmes under her leadership were removing some of the courses and replacing them with relevant substitutes:

> We have recurriculated our course from the National Diploma to the Diploma. That is why I was saying we have introduced courses like HR Information Systems. We are in the process of recurriculating [the] Management Diploma so that we can remove the Admin. courses, such as Administrative Management 1, 2 and 3, to introduce or to be replaced by Project Management 1, 2, 3, which is the thing the market needs.

In the redesign of the programmes above, including Tourism, there was no deliberate consideration of building articulation routes or an interface for college programmes. At departmental meetings, all of the participants reported that there was passive involvement in matters pertaining to articulation between universities and the college or academic departments. Asked about their influence on TVET in the revision or realignment of curricula, Nomonde said: 'We do not have the powers to influence them [colleges] to recurriculate when we are recurriculating, to see what we see.'

She suggested that TVET–university articulation may not occur in the near future:

> If they [TVETs] don't do what we are doing, probably this might affect them – after some time – if they don't move faster, with our pace, probably in five years' time we will not be able to absorb their students. They've got to change with [the] times.

Programme misalignment

There were misalignments between college and university programmes. While the UAGs made room for curriculum analysis and there was a broad university policy in the prospectus serving as a framework for credit transfer, no detailed policy on credit transfers existed in any of the departments under research to deal with the misalignments. Instead, different departments had different articulation practices in place.

While other departments had not performed curriculum mapping, HRM had done so and had found that college content overlapped between the first- and second-year levels for some of the four modules where credit transfer was usually enabled. This overlapping content represented over-alignment,[1] and also an underdeveloped credit potential,[2] if not an overload of the college content. NCV Level 4 in Tourism, according to interviewee Josh,

1 'Over-alignment' refers to having first-year content spilling over the first trimester or so without the potential of gaining a credit for it, even for modularised courses.

2 An 'underdeveloped credit potential' means that there is a credit that could be possible only if more content were to be added to meet the conditions for transferability.

was under-aligned[3] in relation to the content of the first-year curriculum at university. Josh, carrying an academic transcript of a student from a certain TVET, suggested this under-alignment and articulation dynamic in the following words: 'If you check these subjects they are doing there and compare them with the ones that are done here [at the university], there is no alignment.'

He elaborated on this statement as follows:

> The challenge as I see [it] is that the kid is doing N4, N5, N6, and the subjects are four. The challenge we had was that this kid will do N4, 5, and 6, and we have here plenty subjects, and she would have only focused on four. … We agreed that we must admit them at Level 2 [year two] and help them do the courses that are not there. Remember, then, the four subjects are not in line … [Are they not in line in terms of the wording or content?][4] The challenge is there.

Owing to the lack of rigorous, deliberate curriculum analysis, it was a struggle deciding how to deal with N6 students, including the work-integrated learning (WIL) aspect:

> We were debating last year about … asking ourselves as the business faculty, saying 'ladies and gentlemen, at which level do we put such a student' [with N6+ WIL]. She has a [TVET] diploma, where do we put her? Where do we put her?

Interviewee Sindiswa highlighted the reality that the college programmes and qualifications were too narrow and too highly specialised from start to finish whereas the university offered qualifications that are much broader at the diploma level:

> For example, when you talk about Office Management and Technology from our side, we have Legal Practice, Communications, Information Admin., Business Admin. But for them, when they talk of Office Practice, it's only Office Practice. Everything they do is contained in the office work … not having a broader perspective of the entire programme that we offer in the university.

She added:

> In most cases, they specialise in terms of modules. They offer courses in terms of modules. We offer courses in terms of full-year subjects, not six-month subjects as they are having. So, that is where we are unable to just accredit them in all the things they are doing.

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3 'Under-alignment' involves either the absence of certain university subjects and modules in the curriculum or inadequate coverage of topics as college subjects and modules.

4 This question was addressed to the participant to indicate the flow of the conversation and to help the reader follow the quoted response.

However, there was no plan in place to overcome these structural misalignments. In the case of HRM, students were doing four modules at the level of N6 at college; the university was teaching five modules in the first year (see Table 1). Accounting as a subject was not offered at the colleges of the students the department had become familiar with. As a result, the students had to study Accounting in the first year while they were taking other second-year subjects.

In the case of Management, there were five subjects in the first year of university, whereas TVET candidates could, according to Gary, be credited for only two or three of the first-year subjects (see Table 1).

So far as the N6+WIL was concerned, Tourism seemed to have a substantial misalignment, far greater than that found in Management and HRM. The misalignment took the form of under-alignment, as explained above and illustrated in Table 1, with as many as eight university modules not having been taught at college.

TABLE 1: Misalignment of TVET and university programmes

ACADEMIC PROGRAMME	NUMBER OF MODULES AT COLLEGE	NUMBER OF CREDITABLE MODULES	MODULES NOT TAUGHT AT COLLEGE
HRM	4	4	1
Management	4	3	2
Tourism	4	4	8
Hospitality	4	No case to refer to	No case to refer to
Accounting	Differs per TVET	Sometimes all first- and second-year; sometimes some, not all.	Differs from college to college

Articulation between departments or faculties

As far as intra-institutional articulation practices are concerned, document analysis revealed that, regarding interdepartmental and interfaculty articulation, the university had created three routes from the NQF Level 5 certification, National Higher Certificate: Accountancy, to a degree or a postgraduate programme.

Alternatively, students could articulate from the Faculty of Management Sciences (FMS) to a Post-Graduate Certificate in Education (PGCE) in the Faculty of Education. The PGCE allowed candidates who may have started at college and progressed through to the NHC: Accountancy to change direction from FMS to a teaching occupation and then to articulate vertically from there to an honours degree in Education (an NQF level 8 qualification) right up, after a master's in Education, to a doctoral degree at NQF level 10. Even the diploma

programmes of other faculties (such as Engineering) were able to articulate in this manner, provided that an applicant held a diploma with two major teaching subjects.

This practice at the level of credit transfer was evidently applying the principles stated in the UAGs. The UAGs provided a student holding a TVET qualification with an opportunity to articulate to a university's diploma programme or a cognate qualification. However, the practices above have not permeated college programme articulation at the diploma level of the departments. Even some internal arrangements were scattered and largely uncoordinated: the participants reported that sometimes students struggled to enter a cognate qualification because they did not meet one element of the criteria, as was the case between some of the FMS programmes and the PGCE.

Discussion

The following themes emerged from the results above: programme misalignment and the need for curriculum mapping. These two themes are discussed in this section.

Programme misalignment

The first glimpse of failure to conduct deliberate curriculum analysis appears in the evident misalignment of the college programme with the university's one, and this is despite the UAGs suggesting that colleges be kept in mind when conducting curriculum analysis. The misalignments identified imply a waste of both time and money as being against the objectives of the articulation policy (see RSA, 2017).

Whether the wastage can be avoided or not requires an understanding that the misalignment stems from the different purposes for which academic and vocational programmes are established, as implied by interviewee Sindiswa. The different purposes of programmes affect the way a curriculum is designed and developed and also the decisions about which topics are to be included in or excluded from the curriculum – including the ways in which they are taught, and the students are assessed (Madileng, 2022).

Regarding the purposes of modules, there also seems to be a problem with the colleges' modules and/or their allocation to semesters versus the university's year-long courses, as Sindiswa pointed out, and also complexities related to the division of learning into units for occupational qualifications, as was found by Papier et al. (2016) and Needham and Papier (2018), and confirmed more recently by Bolton et al. (2020). These structural constraints seem to play a dominant role in contributing to the nature and extent of the misalignment.

The structural reality is that colleges necessarily prepare students for the workplace and for occupational purposes (Needham & Papier, 2018). Therefore, in the design of curricula or qualifications, foundational academic content is not included because the focus is on attaining certain levels of competence only (Madileng, 2022). This explains the complaint by

Sindiswa that colleges offer narrow and highly specialised programmes, which is contrary to the approach of universities, that is, to impart conceptual content knowledge. From the above it is evident that, although not inevitable, misalignment is more likely to continue to occur in future.

Perhaps the dynamic problem under consideration can be attributed to both the interests of the institutions and the external interests involved in each. The breakdown in alignment arises when interests kick in – when, for example, an insurance SETA prescribes a curriculum and demands that it be taught in such a manner, on the one hand, and when universities are not even familiar with the unit- and module-based nature of vocational and occupational learning, on the other. In a nutshell, there are, logically speaking, competing interests among college, university, government and business.

When Nomonde said that they adjust their curricula based on the advice of professional bodies and market-related needs, she was unwittingly revealing the constraining power that these external factors have over both colleges and universities in the area of curriculum design. She also revealed the power universities have to insulate themselves from the curricular difficulties that colleges encounter, such as those found by Needham and Papier (2018) in their study described above.

This then raises the question: How can convergence be achieved at the curriculum-design level to reduce misalignment? While a part of this convergence lies in change at the level of ideas (Archer's cultural system) about these knowledge structures (vocational versus academic qualifications), another part of the answer lies in curriculum mapping that could minimise the misalignment. The mapping of curricula is agential in nature and actors must be required to navigate the different structural mechanisms at play.

Programme interface: Agency in curriculum mapping

The results show that the institutional actors who participated in the study were engaged in the quasi-, ad hoc and undeliberate mapping of college–university curricula. Those participants who engaged in curriculum mapping (i.e. Josh and Nomonde) were doing so for the purposes merely of deciding on the criteria for gaining admission to a university programme and the number and nature of the credits needed to transfer from college to university; it was not their remit to decide about what to do with misalignments per se.

This distinction is important because it explains why, when misalignments were discovered, credits were not granted, and also why no supplementary curricula were put together to avert such misalignments. Nor was any further effort put into curriculum review as a response to this structural reality. At the time of the interviews, there was no policy mechanism in place for faculty curriculum committees; this was adopted later, but with very little guidance, as was reported above.

At the level of structure, there was only an institution-wide policy on articulation and credit transfer, not one in individual academic departments which were confronted with curricular complexities. At the role level, it appears there was no interest in creating pathways to greater articulation and credit transfer. The very articulation pathways found in many departments were historical because the comprehensive university also offers technikon-type programmes (Lortan, 2019), not because any agential work was done to build more pathways after the merger of the two types of institution.

In fact, the approach towards the articulation problems that arose in departments was passive, even towards intra-institutional articulation questions. Perhaps, then, the problem of the failure to keep college curricula in mind during curriculum design at universities lies beyond the realm of curriculum mapping. In the doctoral study from which these results were extracted, it was reported that the institutional actors interviewed did not have a deep or dynamic knowledge of the intricacies of articulation (Mantashe, 2022).

Some of the participants (such as interviewee Gary) appeared not even to have read the general institutional policy and credit-transfer guidelines in the prospectus; and, given the knowledge they demonstrated about articulation, it does not seem possible that they would intentionally have engaged in relevant and robust systematic curriculum mapping for articulation on a complex scale.

Two contentions are worth offering regarding the importance of agential knowledge: first, curriculum mapping requires of the curriculum designers that they be in possession of at least appropriate knowledge of the objectives as set out in the NQF and of the institution's articulation policy, of subject or module expertise, and of a transdisciplinary disposition and agency. Knowledge of these elements can consciously impress upon institutional actors the need to promote the ideas and practices of articulation. This does not suggest that knowledge is enough. The institutional concerns about the reputation of college curricula and the fact that there are disparities between NSC and NC(V) and NATED qualifications, their own needs as articulated in the faculty curriculum committee, and funding concerns, play a crucial role in the review of the curriculum.

Second, following on the preceding argument, namely that knowledge is a prerequisite to exercising agency in particular ways during the curriculum development or review processes, the absence of a deep knowledge of articulation hampers the possible emergence of the required interest in the idea of articulation that could otherwise exist and affect articulation during curriculum mapping.

It should be stated that this article is not arguing that knowledge of articulation leads to an automatic interest in promoting articulation practices during curriculum analysis or programme review; it does, however, pave the way for that possibility. Moreover, if an agent develops an interest in promoting articulation, the author argues that creativity in

the use of curriculum mapping, along with other articulation tools such as learning outcomes and learning descriptors, could be the outcome.

Given the tedious and complex nature and process of curriculum mapping as articulated by Paez et al. (2011) and implied in the work of Makura and Nkonki (2017), there is a need for institutional actors who are well attuned to the project of building interfaces between college and university programmes as espoused by articulation-related policies. In the case of the present study, there was little enthusiasm for, and commitment to, driving articulation – it found that even potential articulation conversations with the colleges nearby the institution under study collapsed (Mantashe, 2022).

Closing structural gaps; creating pathways

As pointed out in the findings section, the articulation guidelines of the university created structural enablements that could have been used to facilitate the much-needed interface between college and university qualifications. Keeping in mind the different knowledge structures and purposes of the two institutions, there has to be a more deliberate mapping of the curricula of the two. It is by identifying inconsistencies between curricula that the CAT policy, which suggests the principle of 'access and success' through 'supplementarity' (SAQA, 2014: clauses 15a, 15d), could effectively be considered. According to this principle, TVET students could be admitted on condition that they do supplementary work before they are awarded credits. The findings show that this was not done for the reasons already advanced above.

Yet this principle was successfully applied in the Engineering faculty at the DUT: in accordance with the principle of supplementarity, a short course was introduced to create a bridge for the college student with the requisite credits to benefit from a credit transfer (Lortan, 2019). This confirms the significance of the intentionality of institutional actors.

Finally, mapping, which some participants relied on when taking articulation decisions, may be seen as either a contradiction of other articulation instruments such as learning outcomes (LOs), learning descriptors (LDs) and programme exit outcomes or a process that is at least inconsistent with them. Indeed, all the evidence points to university actors trying to match the two qualifications rather than trying to explore where the two stand in the LDs, which equivalences can be found in LOs, and the extent of the gaps and inconsistencies in the substance of the two different programmes, those of the college and university.

Despite the possibility of reversion to the matching principle, it is contended that curriculum mapping cannot be discarded completely. Instead, by creative means, it could be carefully enjoined in the use of LOs, LDs and programme exit outcomes as instruments of articulation. However, this requires a substantial amount of human agency and advocacy on the part of institutional corporate agents and individual actors in their respective academic departments. As the CCRC (Community Council Research Center) (2015) counsels: institutions should

commit themselves to, and make changes in, their practices related to curriculum alignment and collaboration with one another.

How does Archer help us understand the findings?

Whereas knowledge structures, and therefore curricular structures, are different and constrain institutional actors, this difference does not sufficiently explain why recurriculation in the university concerned did not take college curricula into account. After all, policy makes provision for overcoming the differences. First, it is Archer's theoretical work which illuminates the reality that curriculum review involves multiple powerful interest groups – government, employers, professional bodies, academics – with vested interests and with different bargaining powers to influence the structure of the curricula of college and university. Importantly, the unitisation of learning and modularisation, which contribute to curriculum misalignment, reflect the complexity and multidimensionality of college–university structures and the tensions between the interests of the powerful groups involved in shaping the South African education and training environment.

Archer's work also shows us that the structural constraints beyond the control of each university and academic seem to limit what institutional actors think is important during recurriculation. Second, external structural factors appear to influence the kinds of idea that institutional actors hold about the qualifications they offer. And these ideas (relevance to industry, reputation of college curriculum, funding, etc) preoccupy actors even in the presence of policy mechanisms that exist within and outside of universities.

This explains the limitations of the intrinsic logic of modules and unitised learning and the power of institutional logic in the context of implementation at universities (Raffe, Croxford & Howieson, 1994). The predictive power of Archer's work consequently lies in the fact that, if different stakeholder interests are not harmonised, along with intrinsic and institutional logics, as Raffe (2011) suggests, especially also at the level of ideas where tensions persist about how to proceed, it is hard to see how curriculum alignment could be fully achieved.

Conclusion

From the foregoing discussion about the misalignment of college–university academic programmes and its implications for curriculum development and the exclusion of college students from universities, it has been shown that curriculation review and realignment could be conducted without any reference to college programmes for equivalent subjects or disciplines. The result of this approach could be that the structural aspects of programmes whose curricula have been adapted could drift further apart and be contrary to the notion of programme interface. However, this drifting apart could occur without the actors' deliberate intention of avoiding college–university articulation. This outcome could occur because curriculum reviewers may be preoccupied with their programmes being relevant to the market and satisfying the requirements of professional and occupational bodies.

The study also reveals how vital it is that actors take an interest in college–university curriculum-articulation questions, just as articulation policies are vitally needed in departments to govern and guide articulation processes. Two implications arise here: first, while they are necessary, the university policies promoting curriculum articulation and programme interface may not be adequate to resolve the problem of the misalignment of the college and university curricula. Academic departments should have in place policies on both articulation and curriculum development, and reviews should be explicit about college curricula. Second, and consistent with the preceding assertion, to facilitate agential interest in articulation, articulation officers at institutions must not only ensure that there are articulation policies in their departments, but also that articulation principles are infused into the processes of curriculum revision and curriculum mapping.

Furthermore, inter-institutional and stakeholder involvement should foreground collaborative work regarding articulation, while concerted efforts must be made to balance stakeholder interests (college, government, university, occupational entities, professional bodies). In addition, vocational and academic knowledge structures must be thoroughly investigated and aligned, and the indifference of agents and their unwitting complicity during curriculum revision and realignment must be nipped in the bud.

Limitations of the study

This study did not extend to other academic programmes offered in the university, particularly those technikon-type diplomas in the Engineering faculty, due to time constraints. As a result, it is not possible to extend its findings to other disciplines in the same university. The interpretation of the findings must be understood, therefore, in the context of the FMS disciplines in the technikon-type of programmes (diplomas).

Future research

This study has prompted a need for a wider investigation into the institutional structures and processes universities put in place to create the conditions for considering colleges in the review of curricula. Moreover, it may be useful to examine whether and how creative forms of agency are cultivated by institutions to facilitate the operationalisation of (and within) the constraints of articulation policies during curriculum-review processes and the development of effective multiple pathways in comprehensive universities and universities of technology.

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JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Norodien-Fataar, N. 2024. Expanding student access to higher education: Examining the strategic processes for enhancing access to higher education from technical and vocational education and training colleges to universities of technology.
Journal of Vocational, Adult and Continuing Education and Training, 7(1):112–129. http://doi.org/10.14426/jovacet.v7i1.393

Expanding student access to higher education: Examining the strategic processes for enhancing access to higher education from TVET colleges to universities of technology

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ABSTRACT

In this article, the vexed issue of expanding access to higher education in South Africa is explored by investigating the pathways between technical and vocational education and training (TVET) colleges and universities of technology (UoTs). Central to this examination is the Unfurling Post-School Education and Training (UPSET) project, which seeks to formalise these pathways and establish a more inclusive and adaptable higher education system. Drawing on Hall's (1996) theory of articulation and the concept of relational autonomy, the article highlights the transformative potential of strategic collaborations between TVET colleges and UoTs. Using a qualitative case study conducted at a university of technology in the Western Cape province, South Africa, the article describes the complexities of developing jointly offered higher certificates (HCs) in the post-school sector. It emphasises the strategic role of the UPSET project in revitalising existing practices and cultivating deliberate processes and practices to expand access to vocational education. The article contends that UoTs are ideally positioned to facilitate jointly offered HCs based on their integration of theoretical and practical knowledge and their robust industry affiliations. Furthermore, the article highlights various epistemological approaches to developing HCs in UoTs. It argues for a more integrated higher education system that values both vocational and academic pathways and contributes to social justice and economic empowerment in South Africa.

KEYWORDS

Higher education access; articulation pathways; student mobility; technical and vocational education and training (TVET); universities of technology (UoTs); cross-sector partnerships

Introduction

This article focuses on the complex issue of student access to higher education, specifically exploring the alternative pathways for learners to follow in the technical and vocational education and training (TVET) sector. These alternative pathways, also known as 'articulation pathways' (Ndozyiya & Matsiliza, 2023), are a series of interconnected educational programmes and institutions that enable students to progress from one level of education to the next while acknowledging their prior learning and experiences. The research conducted centres on the Unfurling Post-School Education and Training (UPSET) project, an initiative aimed at formalising these articulation pathways between TVET colleges and universities of technology (UoTs). Such a project is significant, as it opens the door to a more inclusive and flexible higher education system in South Africa.

The present article argues that establishing articulation pathways between TVET colleges and the UoTs contributes to the public good of South African society at large. In this context, 'public good' refers to those behaviours, activities and material benefits that are 'non-rivalrous' and 'non-excludable', meaning that they benefit all members of society (Marginson, 2011:415–417). Marginson (2011) posits that access to knowledge and the facilitation of access to knowledge are considered 'non-excludable' public-good benefits that should be extended to all citizens. In South Africa, ensuring access for students from communities historically excluded from the benefits of university education is a crucial step towards achieving equity.

In the global context, the post-school sector has, for the past three decades, been grappling with the challenge of enhancing access for previously marginalised students. A joint report by the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Labour Organization (ILO) and the World Bank underscores the pivotal role of the TVET sector in accommodating learners from disadvantaged backgrounds, who often possess foundational skills that are relatively weaker than those of their counterparts in general education (Levin et al., 2023). The joint report indicates that the TVET sector currently absorbs disadvantaged students looking for second-tier opportunities. It emphasises that TVET college students are primarily from disadvantaged socio-economic backgrounds compared with their peers in general education (Levin et al., 2023:31). The report provides evidence in the form of results from the Programme for International Student Assessment (PISA) which indicate that, in most of the 35 lower- and middle-income countries (LMIC) participating in the assessment, the level of academic performance of secondary students in vocational programmes compared with their secondary school peers in subjects such as Mathematics is far lower (Levin et al., 2023:32). Despite their current challenges, TVET institutions hold the possibility of equipping young individuals with practical skills and knowledge that are directly applicable to the workforce.

Hazelkorn (2023) predicts a global surge in higher education participation, especially in the Global South. However, she warns that higher education pathways through TVET

participation are dwindling and calls for an urgent re-imagining of the tertiary education model, one which encompasses an ecosystem approach. This ecosystem approach, which integrates various educational, training and innovation actors into a mutually beneficial framework, is one such re-imagining that fosters a more inclusive and dynamic higher education system.

Expanding access to TVET colleges in South Africa can significantly enhance young people's readiness for the job market, in the process increasing their prospects of securing employment and contributing to the economy. However, there is a pressing need for more research on the way in which the qualifications structured by the National Qualifications Framework (NQF) and the learning pathways between TVET colleges and UoTs may be articulated more effectively.

Policy context for the provision of education in the post-school field

The NQF was developed in South Africa to ensure more nuanced access and pathways within the educational ecosystem. It does so by setting national standards for academic and vocational achievements in South Africa. Furthermore, the South African Qualifications Authority (SAQA) is an important role player in the post-school sector. According to the NQF Act 67 of 2008, SAQA must perform specific functions that advance the NQF objectives. SAQA oversees the development and implementation of the NQF, a comprehensive system designed to integrate and align qualifications and quality assurance in education and training (SAQA, nd). The NQF classifies, coordinates and ensures the quality of national qualifications. It is divided into three subframeworks: the General and Further Education and Training Qualifications Sub-framework (GFETQSF) for general and further education up to Grade 12; the Higher Education Qualifications Sub-framework (HEQSF) for higher education, including undergraduate and postgraduate programmes; and the Occupational Qualifications Sub-framework (OQSF) for workplace-based training and qualifications tied to specific job functions.

Articulation within and across the three NQFs is pivotal to expanding student access to higher education by increasing their mobility within the tertiary education ecosystem. However, a gap remains between vocationally oriented programmes and academic programmes (Needham, 2018; Papier & Needham, 2022). Although policy instruments such as the Ministerial Committee Report on Articulation Policy (2013), the National Plan for Post-School Education and Training (NPPSET) (2019–2030) and the recent Council on Higher Education's (CHE) Policy on Articulation into and within Higher Education (March 2023) have been introduced to integrate and diversify the post-school system between these sectors, there is a demand for strong articulation strategies. The NPPSET is a comprehensive road map for realising the goals outlined in the White Paper for Post-School Education and Training. The plan lists several outcomes, one of which is increased articulation for students between and within the NQF sub-frameworks and institutions and also the review of the N4, N5 and N6 and their replacement by higher certificates (HCs) and advanced certificates (ACs) at NQF Levels 5 and 6 (NP PSET:48).

N'gethe, Dzvimbo and Kembo (2007) emphasise that student mobility within the tertiary education ecosystem is a crucial component of articulation in the post-school sector. Moreover, Needham and Papier's (2018) research draws attention to the intermittent articulation initiatives between TVET colleges and universities, thus emphasising the pressing need for more systematic approaches. Similarly, Themane, Mabasa and Mahlo (2022:187) characterise the relationship between vocationally oriented programmes and academic programmes as being 'disparate and binary'. Essop (2020) highlights the critical point that the funding framework incentivises all universities to prioritise research and postgraduate programmes. Consequently, some universities, particularly those reliant solely on government funding, have not adequately focused on their teaching mission and vision. Nevertheless, despite these difficulties, there is a growing recognition of the need for articulation between TVET colleges and universities.

The foundational policy documents of the Department of Higher Education and Training (DHET) – the White Paper on Higher Education of 1997 and the subsequent White Paper for Post-School Education and Training of 2013 – envisaged an integrated education system and stressed the critical role of TVET colleges in fostering vocational education and skills development. The emphasis on TVET colleges is particularly noteworthy because they are centrally positioned to prepare students for employment and entrepreneurship. In fact, the policy framework acknowledges the dynamic interplay between education and the broader economy: the imperative for partnerships with industry and Sector Education and Training Authorities (SETAs) speaks to the need for a collaborative approach to education that seeks to bridge the gap between academic preparation and the realities of the labour market.

Although the policy framework for TVET colleges is well intentioned, one of the significant problems with it is the gap between the policy objectives and their implementation. For instance, the envisaged collaboration between TVET colleges and industry is often hindered by a mismatch of the skills taught and those required by employers (Needham, 2018). Moreover, relying on SETAs for workplace-based training is not without its own complexities, including bureaucratic hurdles and varying levels of effectiveness across different sectors (Needham, 2018).

Similarly, Makura and Nkonki (2017) identify a lack of clear policy and awareness of articulation routes as significant obstacles and therefore posit that most students and educators need to be better informed about the existing articulation pathways. Policy implementation is required to deal with one of the significant challenges in the post-school field. These policies aim to create institutions that impart vocational education, enhance employability and meet industry demands. However, the success of these policies hinges on effective implementation, which requires overcoming challenges such as industry alignment and resource allocation and ensuring that the education in TVET institutions is of the required quality. According to Themane et al. (2023), in the face of these challenges and of implementing them, some universities still need to commit themselves to taking the policies and guidelines on board. This apparent lack of interest in implementation on their part creates a significant barrier to articulation. Themane et al. (2023) therefore recommend that the DHET develop indicators

and establish targets to help the universities evaluate their progress towards articulation, as currently these do not exist.

While policy frameworks are essential to understanding expanded access, it is also necessary to understand the specifics of the articulation between TVET colleges and UoTs. In this regard, developing specific articulation through HCs as a collaborative process between TVET colleges and UoTs is vital to understanding the expanded access between the two sectors. The UPSET project, facilitated by SAQA and the Durban University of Technology (DUT), emerged as a mechanism through which to facilitate this collaboration.

Brief background to the UPSET project

The UPSET project, a unique strategic initiative, was developed under the auspices of the DHET, with the DUT leading the way and supported by SAQA. This project is a significant step towards fortifying South Africa's post-school education and training (PSET) sector. Its primary objective is the coordinated implementation of the Articulation Policy in and across the PSET sector. In this respect, the UPSET project is distinctive in its design to create a more integrated educational system, one that enables transitions and connections between various levels of post-school education by establishing provincial and regional articulation hubs. The project is in its early stages, with new institutions being incorporated annually.

The UPSET project, as indicated, emerged from collaboration between the DUT and SAQA. Together, they conducted a five-year study from April 2015 to March 2020, which included seven in-depth case studies of individual experiences and institutional contexts of articulation initiatives. The study was titled 'Developing an understanding of the enablers of student transitioning between technical and vocational, education and training (TVET) colleges and HEIs (higher education institutions) and beyond'. In 2017, the National Articulation Baseline Survey (NABS) reported on the country's current articulation initiatives and the developing and emerging articulation networks. The NABS offered a broader perspective on the then current articulation initiatives across South Africa. One of the survey's key findings was that expanded access from TVET institutions to UoTs improves the quality of education and increases the diversity of educational provision (SAQA, 2017).

The SAQA (2017) finding is significant because it draws attention to the role of TVET institutions in broadening educational opportunities and contributing to a more diverse and skilled workforce. The survey showed that all the TVET colleges reported being involved in articulation activities and that more than two-thirds of public higher education institutions were also participating in these articulation pursuits (SAQA, 2017:4).

The NABS highlighted three instances of articulation initiatives: the first included several TVET colleges and a UoT; the second involved a traditional rural university, TVET colleges and a SETA; and the third featured a comprehensive university and numerous agreements with colleges for transitions between HCs and national diplomas (SAQA, 2017:6–7). These

articulation initiatives indicated the complexity of the articulation routes from TVET colleges to UoTs. Based on the survey, the UPSET project proposed the development of jointly held HCs between TVET colleges and universities.

The UPSET project aims to establish articulation implementation champions (AICs) and offices at UoTs in South Africa whose primary purpose would be to develop an articulation implementation plan (AIP). The AICs would be tasked with crafting an AIP through collaborative efforts with existing and prospective articulation partners. The AICs would also establish a community of practice among the UoTs, and each region would have a hub leader to coordinate the jointly offered HC.

Central to UPSET's strategy is promoting access to higher education by introducing HCs – a joint venture between UoTs and TVET colleges. This approach facilitates articulation, offering a structured pathway for students transitioning through the PSET sector. The UPSET project intends to conduct a detailed cohort analysis to evaluate the academic performance of students who articulate into university settings as opposed to those who gain direct entry from high school to university.

A significant challenge they identified in the study was the lack of comprehensive data tracking the performance of students who articulate between TVET colleges and UoTs. This gap in the data limits the ability to compare the outcomes of students who articulate from high school to UoTs with those transitioning from TVET colleges. It indicates the need for robust tracking systems to enable a better understanding of student trajectories and outcomes.

The collaboration between the DUT, SAQA and the DHET through the UPSET project highlights the possibility of creating cross-sector partnerships in the higher education landscape. The present article is based on a qualitative case study conducted at a UoT in the Western Cape province of South Africa. It draws on policy documents, official reports, and dialogues and workshops with academics at the UoT and TVET colleges in the context of the UPSET project.

Theory of articulation

This article uses the theory of articulation as posited by Hall (1996). In the context of educational policies and practices, 'articulation' refers to the process by which different educational systems, such as universities and technical colleges, collaborate to create an educational pathway between them for students. Hall (1996) discusses the concept of articulation in relation to cultural and social practices in society. He suggests that the concept of articulation is useful for understanding the way different social forces within the education sector come together to influence educational policies. Hall (1996:141) explains:

> An articulation is thus the form of the connection that can make a unity of two different elements under certain conditions. It is a linkage which is not necessary,

> determined, absolute and essential for all time. You have to ask, under what circumstances can a connection be forged or made? So[,] the so-called 'unity' of a discourse is really the articulation of different, distinct elements which can be rearticulated in different ways because they have no necessary 'belongingness'. The 'unity' which matters is a linkage between that articulated discourse and the social forces with which it can, under certain historical conditions, but need not necessarily, be connected.

In the context of this article, the concept of articulation will enable an understanding of the way UoTs and TVET colleges, which are regarded as different subsystems within the post-school system, may collaborate to implement articulation policies. According to Hall (1996:143), a theory of articulation is both a way of understanding how, under certain conditions, ideological elements come to cohere in a discourse and a way of asking how they do or do not become articulated.

Slack (1996:115) emphasises the process of articulation:

> Articulation is, then, not just a thing (not just a connection) but a process of creating connections, much in the same way that hegemony is not domination but the process of creating and maintaining consensus or of coordinating interests.

She points out the importance of the context in which articulation takes place and explains:

> [T]he context is not something out there, within which practices occur or which influences the development of practices. Rather, identities, practices, and effects generally constitute the very context within which they are practices, identities, or effects (1996:126).

Slack (1996) suggests that practices, identities and effects are intimately intertwined with their contexts, engaging in a reciprocal relationship with the prevailing social, cultural and historical conditions. This interdependence implies that educational processes and mechanisms – exemplified by the NQF and policies such as credit accumulation transfer and the recognition of prior learning – are embedded in these contexts rather than merely being shaped by the socio-economic and political landscape.

Furthermore, Slack (1996) suggests that articulation occurs at different levels in society: the epistemological, the political and the strategic. As she explains:

> Epistemologically, articulation is a way of thinking about the structures of what we know as a play of correspondences, non-correspondences and contradictions, as fragments in the constitution of what we take to be unities. Politically, articulation is a way of foregrounding the structure and play of power that entail in relations of dominance and subordination. Strategically, articulation provides

> a mechanism for shaping intervention within a particular social formation, conjuncture or context (1996:113).

She points out that, from an epistemological perspective, articulation is a method of understanding how our knowledge is structured and the way different types of knowledge fit or do not fit together or may even contradict one another. She questions the traditional idea of unity, indicating that what we consider unified or whole often comprises various, often unrelated parts.

As suggested by SAQA (2017:34), Slack's analysis corresponds to the definitions of articulation in SAQA–DUT (2017) and the Ministry of Higher Education and Training (MHET) (2017), which refer to 'vertical', 'horizontal' and 'diagonal' articulation that can occur either within or between the NQF sub-frameworks.

Slack's (1996) explanations help us to understand the multiple layers of the meaning of articulation. Similarly, the Organisation for Economic Co-operation and Development (OECD) describes articulation as follows:

> Articulation is not a mechanical matter of formal recognition of qualifications or of prior learning experiences, necessary as these may be. It is also a *learning concept*, *implying complementarity*, continuous enhancement or development of competencies, achievement and progression along a pathway that is personally meaningful and has social recognition and status (OECD, 1998:51).

The OECD highlights articulation as a 'learning concept' that aligns with development qualifications and mobility between higher education institutions.

Whereas external demands such as political and economic pressures influence articulation practices, Maton's (2005) concepts of autonomy help us to understand why some universities might be more successful in establishing robust articulation pathways. Maton (2005) suggests that higher education institutions have a high degree of autonomy and distinguishes between positional and relational autonomy to explain the degree of autonomy in the higher education field. Using Maton's (2005) concept of autonomy helps to explain how TVET colleges and UoTs are positioned in the post-school field. The concept of autonomy also illuminates the challenges and opportunities that articulation between the different university sectors face. According to Maton (2005), positional autonomy describes the way academics focus on their roles as independent academic experts to shape their research and scholarly identities. In contrast, relational autonomy involves the connections with areas beyond academia, such as the economy and job market, and the ways in which these connections influence academics' ability to define their academic responsibilities.

The concept of relational autonomy also helps us to understand how TVET colleges and UoTs are positioned within the educational ecosystem. Both sectors have engagements

and interdependent relations with economic interests to meet broader economic needs and advance their educational mandates. Employing theoretical frameworks such as Hall's (1996) theory of articulation and the concept of relational autonomy, the present research highlights the transformative ability inherent in forging dynamic and effective linkages between TVET colleges and UoTs. Hall's (1996) theory offers insights into the way these institutions can form temporary unities to influence educational policies and practices, thereby promoting student mobility and access. The theory of articulation focuses on the way that disparate social forces in the education sector can join together under specific circumstances. It highlights the flexible, contingent nature of educational pathways that adapt to evolving socio-economic conditions. This theoretical approach supports the argument that articulation is not merely a policy imperative but a strategic process that is crucial to enhancing student mobility and broadening access to education, therefore serving the public good.

Research design and methodology

This research adopted a qualitative interpretive methodology emphasising the need to understand social phenomena through the meanings individuals ascribe to them (Babbie & Mouton, 2001). The qualitative paradigm was chosen because it facilitates in-depth participant engagement, illuminating the learning pathways between TVET colleges and UoTs.

A case study design was employed (Yin, 2018) to enable an understanding of TVET college and UoT articulation initiatives. Yin (2018) posits that case studies are particularly potent when they rely on multiple sources of evidence and when delineating a phenomenon and its nebulous context (Yin, 2018:15). The UoT in the Western Cape was chosen for the case study because the researcher is the regional hub coordinator for the UPSET project. The researcher employed a descriptive approach to provide a detailed account of the specific articulation between TVET colleges and UoTs.

Data were gleaned from various sources, including workshop discussions, webinars, meetings, policy documents, official reports, and dialogues with faculty members at UoTs and TVET colleges, during a period of 28 months from October 2021 to February 2024. These diverse sources were instrumental in broadening the understanding of articulation and mobility in the post-school sector.

The author was a participant observer and engaged with lecturers at the UoTs and TVET colleges to explore widening access and participation through the UPSET project. Participant observation is a qualitative research method commonly used in the social sciences; it involves researchers immersing themselves in the community or social setting they wish to study, often participating in the participants' daily activities to better understand their behaviours, cultures, practices and interactions. Patton (2015:33) suggests that participant observers 'gather a great deal of information through informal, naturally occurring conversations'. The observations were made during online webinars, meetings between staff at TVET colleges and the UoT, and specific meetings organised in the UoT; these observations included the

interactions between lecturers at the UoT and conversations between the lecturers of the TVET colleges and UoT lecturers.

The author observed and collected data from workshop discussions, meeting minutes, webinars, policy documents and official reports. I then undertook a systematic data analysis and subjected the data to coding and thematic categorisation. The data revealed three themes: (a) strategic processes to cultivate the development of HCs; (b) variability and disjunctions between the TVET colleges and the UoTs; and (c) diverse approaches to curricula in the UoT. These three themes signify the complex factors in the post-school sector as it strives to express the various components of the higher education system.

Strategic processes to cultivate connections in the post-school sector

This section focuses on the strategic processes integral to the UPSET project. A series of meetings, official engagements and legal agreements with various stakeholders in the higher education sector was crucial to establishing connections in the PSET sector.

A core component of the UPSET project was the legal agreement between the collaborating universities. The legal department identified that the UoTs concluding the agreement with the DUT would assume subcontractor status. Consequently, a Memorandum of Agreement (MOA) was adopted instead of a Memorandum of Understanding. The MOA was essential to fostering collaboration between the institutions and formalising the UPSET project.

Information and perspectives were exchanged through annual hub meetings and workshops with AICs, and AIPs were discussed. At these get-togethers, AICs presented their AIPs, engaged in constructive dialogue, and collectively expressed challenges with a view to overcoming them. They provided mutual advice, shared networks and connections appropriate to the development of HCs in specific fields, and recommended academics who could offer specialised expertise.

The meetings were attended by representatives of the hub and time was dedicated to the group's sharing their AIPs and reflecting on what had worked or not worked during the previous year; the representatives also proffered suggestions for the way forward. A significant part of the meetings entailed discussions about systemic matters such as the National Student Financial Aid Scheme (NSFAS) and SETA funding and those involving first-time entering students (FTEN). Lecturers were concerned about NSFAS funding, in particular whether NSFAS would fund two concurrent qualifications. The policy standards applicable to NSFAS eligibility criteria and the conditions for financial aid revealed that 'the N+ Rule for university students will continue to be based on the number of years in higher education rather than the number of years funded' (NSFAS, 2024:46). This means that funding is possible for HCs and the subsequent qualification to a maximum of N + 1; future HCs would therefore enable students to register with a UoT using NSFAS funding.

It is crucial to raise and resolve these issues when advocating HCs, as they were also the primary concerns raised by academics. The hub meetings included other role players, such as the Quality Council for Trades and Occupations (QCTO) sector, government and academics who had been invited to share their perspectives and discuss policy-related matters.

The regional endorsement at the launch of the UPSET project in the Western Cape demonstrated a pronounced interest on the part of most universities in establishing articulation pathways. At the project's commencement, senior leaders from higher education institutions and TVET colleges signalled their readiness to contribute to its objectives and to implement the articulation policies. The regional support for the UPSET project demonstrated collective recognition of the importance of establishing robust articulation pathways, one that reflected a commitment from senior leaders across the higher education landscape.

At the first regional hub meeting on 14 June 2023 with lecturers of the UoT and TVET colleges, lecturers at the UoT presented their ideas for proposed HCs in Science and Engineering, and the DUT shared its HC in Science. This opportunity enabled the lecturers to compare programmes and share best practices.

These processes provide an outline of the formal engagements with various stakeholders, signifying the strategic initiatives essential to effective collaboration between the two sectors in higher education. The national UPSET meetings have served the educational and strategic purpose of bringing together relevant stakeholders to develop consensus, identify differences and shape the UPSET project in the post-school sector. Hall (1996) describes such connections as linking different entities to form a temporary unity to influence policymaking. Similarly, the AICs developed a network between lecturers at TVET colleges and UoTs and shared perspectives that would serve to achieve their common goals.

The UPSET project relies heavily on the pivotal role of individual AICs, who are typically a part of centres for higher education development at universities and are positioned outside of faculties. These AICs are instrumental in driving the articulation between the two sectors and advocating an HC as an alternative access route into higher education.

Although the project is managed through various executive committees at the UoTs, lecturers perceive it as an external, university-driven initiative. This perception stems from the project's positioning in centres for higher education development, which are often separate from the faculties.

The AICs are decentralised to regions across South Africa and are represented at most universities. They convene nationally and annually to discuss their articulation plans. However, the success of the UPSET project will depend on the willingness, commitment and continued mutual engagement of senior university leaders, TVET college leaders and the AICs to advance the articulation efforts.

Monitoring progress and outcomes is limited to annual engagements that form part of the UPSET project. More stringent measures are needed to ensure accountability at universities. Significant work remains in order to promote articulation and expand its implementation. This requires both robust and decisive leadership and the political will to ensure the success of the articulation initiatives (Themane et al., 2023).

The national UPSET meetings serve as both educational and strategic initiatives, bringing together as they do relevant stakeholders to develop consensus, identify differences and shape the UPSET project in the post-school sector. However, Themane et al. (2023) argue that higher education institutions must continuously review their strategic plans to meet local communities' educational needs effectively. They emphasise the need to re-evaluate and enhance articulation policies and guidelines to help institutions to establish effective mechanisms to facilitate student mobility between undergraduate-focused institutions and those offering postgraduate programmes.

Collaborative engagements between TVET colleges and UoTs: Diverse priorities and pathways

TVET college principals and lecturers were willing to engage in discussions and share their ideas about HCs. TVET college leaders have prioritised employment outcomes for their graduates and have tended to view the UPSET project more as a collaboration between TVET colleges and UoTs rather than articulation. One principal stated:

> Ten per cent of TVET colleges are supposed to collaborate with other institutions, and we accept this. We believe in it as it is another way of improving the country's economy. To us, it is a very important cornerstone, but it is not core.

The principal also referred to three strategies that were important to TVET colleges: 'articulation, collaboration, and exit'. The TVET college leaders emphasised the crucial role of work, of connecting with industry and of establishing partnerships with companies to enable TVET graduates to find work; and the principal stressed the TVET colleges' role in ensuring that students have access to industry and work opportunities, highlighting TVET students' articulation in the workplace.

In contrast, UoT leaders emphasised the integration of educational pathways over immediate vocational outcomes and emphasised articulation rather than collaboration. Despite these differing priorities, both parties supported the development of HCs, which underscored a shared recognition of their value.

During the first meeting, UoT lecturers actively promoted the curriculum of HCs and presented an outline of the proposed programme. They focused on the rationale for HCs and on new admission criteria for HCs, emphasising 'the need for higher certificates to be multifaceted'. In contrast, the TVET lecturers' input into the curriculum was limited

and they did not engage with the substance of the proposed curriculum outline. Their limited engagement could be attributed to the fact that TVET college lecturers do not have any input into developing their qualifications, which are stipulated instead by the DHET. UoT lecturers, in contrast, do have experience in recurriculation and developing new qualifications.

The TVET curriculum has undergone significant changes over the past three decades. According to Needham (2018), the National Accredited Technical Education Diploma (NATED) (N1–N6) programmes, with their roots in the pre-1994 apartheid era, were initially designed to offer vocational training to white artisans. Post-1994, efforts were made to elevate the status of TVET colleges, as Van der Bijl and Lawrence (2019) have highlighted. However, Needham (2018:17) noted that the National Certificate Vocational (NC(V)) was primarily designed to be theoretical, aiming as it did to provide direct access to university undergraduate programmes and to facilitate articulation with universities.

Furthermore, Bhengu (2020:5), in an article on the CHE, highlights several challenges in TVET colleges that hinder this articulation. These include inadequate management, which fails to offer proper instructional guidance to lecturers and students, and underqualified lecturers, who are ill-prepared to teach. In addition, the current mix of programmes and qualifications in the sector is difficult to manage, is perceived negatively by the business sector, is confusing to students and parents, and is often poorly quality-assured. He also suggests a lack of cohesion between the various levels of management, administration, lecturing staff and students (Bhengu, 2020). Nzimande (2014:4) also revealed that only 33% of students who completed NC(V) programmes in 2013 graduated.

Notwithstanding these challenges with the TVET curriculum, the discussions between the TVET college and UoT lecturers open up the possibility of joint discussions on the curriculum and on teacher training. The jointly offered HCs and the UPSET processes would also enable TVET college lecturers to have more significant input into the curriculum and ensure equal participation.

The position of the UoTs in the post-school sector shows that they serve the higher education academy and interface directly with industry through work-integrated learning (WIL) by providing authentic learning and experiences at workplaces. The design of the curricula at UoTs integrates theoretical and practical knowledge, which is enriched by WIL components. Further, whereas UoTs and TVET colleges both maintain robust affiliations with the industrial and business sectors, given the UoTs' focus on integrating the theoretical and the practical, UoTs command a higher degree of relational autonomy.

In addition, the UoTs' curricular approach straddles the boundaries between academic study and practical engagement. Barnett (2006:153) captures this duality by stating that the UoT curriculum 'faces both ways' from theory to practice in an authentic work environment. Shay (2016) further identifies the various knowledge forms woven into the higher education

curriculum, encompassing as they do the theoretical, the practical, and a combination of theoretical and practical knowledge. This interaction between theory and practice in the UoTs strengthens their position in the post-school sector.

Epistemologically, UoTs are therefore better positioned to facilitate the development of the HCs because of their strong emphasis on the interaction between theory and practice. Themane et al. (2023) concur, asserting that universities are predominantly focused on creating knowledge. This puts UoTs in a stronger epistemological and strategic position to facilitate the jointly offered HCs to ensure articulation in higher education and the workplace. The success of articulation pathways is therefore significantly influenced by a strong relational autonomy.

Diverse curriculum designs in the UoTs

This next section focuses on the UPSET project's efforts to advocate the development of HCs in the UoT sector and to create curriculum-design teams that foster specific articulations between TVET colleges and UoTs. A significant finding that emerged from the study is the diverse approaches to HCs among the UoT stakeholders. This points to the multifaceted role of the UoTs in the post-school sector. This section does not focus on the ways in which these HCs will be taught, how they will be delivered, and the way knowledge and pedagogy will be shared across PSET sectors; instead, the focus is on the actual and the initial conceptual approaches to jointly offered HCs.

Approaching the faculties at the UoT involved representations at senior committees of faculties and institutional committees. The analysis revealed both scepticism and support among lecturers at the UoTs regarding their institutions' involvement in the UPSET project, particularly their responsibility for establishing HCs at the UoTs. Three distinct articulation approaches emerged from the author's engagement with stakeholders at the UoTs. These approaches signalled the diverse perspectives among stakeholders on adopting HCs: the 'innovators', who are characterised by their prior experience in developing HCs and their desire to pioneer new articulations; the 'developers', who concentrate on enhancing the capacity and appeal of the post-school sector, particularly in the fields of science, technology, engineering and mathematics (STEM); and the 'resistors', who have a more cautious approach to the adoption of HCs. Each group represents a unique stance on integrating and expanding HCs in the post-school sector, which serves to underline the challenges and opportunities inherent in advancing post-secondary education.

The innovators, with their long history of developing HCs, including the development of the HC in Information and Communication Technology (ICT), were a testament to the UPSET project's capacity. They thought about novel ways of developing HCs and suggested interdisciplinary approaches to the curriculum design and new, future-oriented innovative curricula, further highlighting the project's transformative power.

For their part, the developers focused on enhancing the capacity and appeal of the post-school sector, particularly in the STEM fields. They recognised the strategic importance of HCs in bridging the gap between secondary education and higher-level STEM careers. By advocating the development of HCs that articulate into STEM disciplines, the developers intended to create more accessible and seamless pathways for youths aspiring to enter these critical sectors. The developers also focused on inter-faculty collaboration as a means of obtaining an HC in the STEM field. The innovators and developers expressed their desire to develop HCs based on the model and structure of the current HC in ICT offered at the UoTs.

The resistors raised some valid concerns by adopting a more cautious approach to HCs. Their reservations stem from perceived obstacles in the current UoT infrastructure, notably curriculum misalignments, a lack of systemic articulation between TVET colleges and UoTs, and insufficient staff capacity to support new HCs effectively. These lecturers raised critical questions about the position of the UoTs and their role in the UPSET project as the initiators and leaders of the formation of HCs. They argued for prioritising reforms in the TVET college sector, particularly curriculum reforms, before embarking on any substantive attempts at articulation between these institutions and UoTs.

Internal discussions within UoTs also reflected a significant interest in evaluating alternative access programmes such as Extended Curriculum Programmes (ECPs). The participants discussed the distinctions between ECPs and HCs and probed their respective roles and disparities.

These approaches to articulation in the UoTs indicate the epistemological level of articulation and the ways in which the knowledge will be structured (Slack, 1996). They represent the ongoing dialogue in expanding the post-school sector and illustrate the complex nature of the attempts to develop HCs to enhance the accessibility and quality of post-secondary education. Although still in their nascent stages, these discussions facilitated by the UPSET project facilitate collaborative opportunities between TVET colleges and UoTs. This initiative is pivotal to developing strategies, practices and processes for the joint provision of HCs and for bridging the gap between these two educational sectors.

Conclusion

The present study and the ensuing article focused on expanding access to higher education by dealing with the articulation pathways between TVET colleges and UoTs as a strategic means of broadening access to higher education in South Africa. The article highlights the potential of strategic and substantial collaboration between TVET colleges and UoTs as a way of contributing to the public good. It does so by describing the UPSET project and its objectives aimed at formalising articulation pathways. This collaboration can pave the way for social mobility and economic growth. The article also underscores the transformative power of creating pathways for students from diverse educational backgrounds, particularly those who have been historically marginalised.

The UPSET project described here represents a significant initiative to enhance higher education access in South Africa by formalising the articulation pathways between TVET colleges and UoTs. The article highlights the initial conceptual approaches to HCs in UoTs, the varied perspectives and the challenges of adopting HCs, underscoring these institutions' multifaceted role in the post-school sector.

The collaborative efforts between TVET colleges and UoTs have revealed a fundamental difference in their priorities. Whereas TVET colleges prioritise immediate employment outcomes and industry partnerships, UoTs emphasise the integration of educational pathways and maintaining a balance between theoretical and practical knowledge. This difference necessitates a nuanced approach to curriculum development and articulation strategies if the goals of both sectors are to be accommodated.

The findings indicate the ability to develop communities of practice through discussions and the development of action plans between TVET colleges and UoTs aimed at cultivating articulation pathways. The reliance of the UPSET project on the commitment and engagement of senior university and TVET college leaders is critical to its success. Moreover, more stringent measures are needed to ensure accountability and effective monitoring. The UPSET project exemplifies the capacity for strategic collaboration between NQF stakeholders. By fostering an educational system that values both vocational and academic pathways, South Africa can more effectively equip its citizens for the demands of the contemporary world by ensuring that higher education contributes to the public good and the nation's development.

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JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Briante, F & Barabasch, A. 2024. Supporting apprentices' autonomy in vocational training: Insights into the practices at the Swiss Postal Service. *Journal of Vocational, Adult and Continuing Education and Training*, 7(1):130–150. http://doi.org/10.14426/jovacet.v7i1.394

Supporting apprentices' autonomy in vocational training: Insights into the practices at the Swiss Postal Service

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ABSTRACT

Satisfying people's basic psychological needs of relatedness, competence and autonomy plays an important role in human motivation and affects people's well-being, engagement and performance positively. Companies can contribute to the satisfaction of all three basic psychological needs by establishing autonomy-supportive working conditions, benefitting as a result from associated positive outcomes. Based on an empirical, qualitative exploratory case study, the present article supports the assumption that satisfying the need for autonomy is especially beneficial to the healthy and successful development of young adults throughout their apprenticeship. The findings indicate that various pedagogic measures support the experience of autonomy and also increase work satisfaction and the drive towards workplace learning and collaboration. Such practices include apprentices planning and steering their learning pathways together with their coaches, taking on more comprehensive responsibilities, showing greater initiative in, and ownership of, projects, and actively representing apprentices' needs in the workplace.

KEYWORDS

Self-determination theory (SDT); autonomy support; autonomy-supportive workplace conditions; vocational training; apprenticeship in Switzerland

Introduction

People's desire for autonomy plays an important role in human motivation and development (Vallerand, Pelletier & Koestner, 2008; Vansteenkiste & Ryan, 2013). 'Autonomy' refers to the need for self-organising and self-regulating behaviour according to one's own values and commitments (Deci & Ryan, 2000). Companies that express an honest concern for their employees' autonomy establish working conditions in which well-being and agency flourish (Ryan & Deci, 2017). By positively effecting job engagement in employees (Chen, Shih & Chi, 2018), knowledge-sharing (Foss et al., 2009), creativity (Wang, 2016) and autonomy support have the potential to yield long-term benefits for companies (Preenen et al., 2016; Olafsen, Deci & Halvari, 2018). This has significant implications for the design of apprenticeships.

As we argue in this article, concerns about autonomy are not only of value to companies' performance, but are also of vital importance in the context of vocational training. Autonomy support by supervisors or trainers facilitates socialisation in organisations by contributing to the satisfaction of newcomers' basic psychological needs (Chong et al., 2020). The stance of socialising agents matters especially to apprentices, as they enter work organisations in Switzerland in their early adolescence (cf., e.g., Barabasch, Keller & Caldart, 2021). At this developmental stage, maturing teenagers have – owing to the biological, cognitive and social changes they are undergoing – an increasing desire for autonomy, the satisfaction of which is critical to their healthy psychological development and adjustment (Patall et al., 2019). In supporting apprentices' autonomy, vocational education and training (VET) can make a valuable contribution to adolescents' healthy and successful development.

One could raise the concern that placing emphasis on autonomy during vocational training, especially in the early stages, could be overtaxing for apprentices (Volodina, Lindner & Retelsdorf, 2019). In agreeing that providing apprentices with assistance and guidance is of paramount importance to their effective workplace learning (cf. Mikkonen et al., 2017), we refrain from understanding autonomy as emphasising learners' independence and self-responsibility over their learning activities in an unbalanced and neglectful manner (Fuller & Unwin, 1998). Instead, we view autonomy support as being a feature of inviting workplace affordances (Billet, 2002) and as being compatible, and even synergetic, with well-structured guiding (Jang, Reeve & Deci, 2010; Aelterman et al., 2018). This approach positively affects apprentices' learning activities (Messmann & Mulder, 2015).

However, many apprentices are not used to working autonomously in work situations and need to be socialised in the work environment in a way that enables them to feel equipped with the skills, knowledge and competences that are required to fulfil particular work tasks. This confidence needs to be built throughout an apprenticeship.

This study aimed to investigate the significance and extent of considerations of autonomy in VET. In addition, it sought to provide illustrative examples of autonomy-supportive practices in this educational context. By providing insights from a qualitative study conducted at the

Swiss Postal Services (Swiss Post) from August 2019 to September 2020, we intend to contribute to the discussion about providing more autonomy for apprentices in VET. In doing so, we will substantiate our claim that autonomy support is of key value to apprentices' successful workplace learning and that it is entirely compatible with guiding apprentices actively. Furthermore, we will explain how autonomy relates to human motivation and will review some indirect effects that autonomy-supportive supervision can possibly yield for VET.

This introduction is followed by the results of our literature analysis and by the provision of a theoretical framework for this study. After a description of our data collection and analysis, we describe and illustrate some of the measures through which Swiss Post affords autonomy support to its apprentices. The article concludes with a discussion and a summary of our findings.

Fostering identification by facilitating experiences of autonomy

Research based on self-determination theory (SDT) (for a recent overview, see Ryan & Deci, 2019) shows that the satisfaction of three basic psychological needs (BPNs) is critical to human motivation and flourishing (cf. Ryan & Deci, 2000b; 2017). This means that individuals need to experience their having an effect on their environment and achieving desired outcomes in it (competence) in addition to feeling connected to relevant others and being loved and cared for (relatedness). Furthermore, human beings have a need for autonomy, that is, for experiences of 'volition and self-direction in thought, feeling, and action' (Legault, 2016:1). Satisfying these BPNs contributes to healthy psychological development and well-being, whereas their frustration has converse consequences (cf. Vansteenkiste & Ryan, 2013).

The literature now suggests that, at least in work contexts, support for autonomy plays a key role, since, with their autonomy supported, employees would also find ways to have their other needs satisfied (Deci, Olafsen & Ryan, 2017). As we argue below, vocational training can contribute actively to the satisfaction of all three BPNs when the trainers' guidance facilitates experiences of autonomy for learners. By referring to the positive effects of BPN satisfaction, we illustrate below the importance of supporting apprentices' autonomy in this way.

Effects of autonomy support

There is reason to assume that BPN support in the workplace does not affect employees' well-being or performance directly. Recent studies suggest instead that it affects employees' motivation positively by facilitating an autonomous regulation of their behaviour, and that this motivational effect in turn yields positive outcomes (De Cooman et al., 2013; Olafsen, Deci & Halvari, 2018). Therefore, it is crucial to understand the ways in which people can self-regulate their behaviour and what it means to do this autonomously. The precondition would be intrinsic motivation, which occurs when there is a deep interest in attaining activity-inherent satisfaction such as fun, pleasure or a challenge that moves people to act – which is why we experience intrinsically motivated behaviour as fully volitional. This 'prototype

of autonomous motivation' (Ryan & Deci, 2002:10) results in task absorption, challenge-seeking, creativity and well-being (Vansteenkiste et al., 2018).

The degree of autonomy experienced depends on whether and how deeply persons attach personal meaning and valence to the reason or regulation (as, e.g., a social practice, a value or a request) that guides their action. In their internalisation process, people bring acquired regulations actively in congruence with their deeply anchored interests, values and beliefs. A sense of autonomy is further established if people see a behavioural norm as being in deep harmony with their sense of self or as an expression of their identity. For apprentices, this means that identifying them is crucial to coping well with the combined demands of vocational training and school. Furthermore, if they feel their autonomy is supported, learners will generally display better levels of performance, a higher level of emotional engagement, and persistence (Vansteenkiste et al., 2018).

In the light of such effects, the question is how we can promote identification. In order for the internalisation of behavioural norms to occur in the first place, necessary preconditions are the satisfaction of the need for relatedness (feeling connected to the socialising agents) and competence (feeling capable of performing the required actions) (cf. Niemiec & Ryan, 2009; Ryan & Deci, 2020). However, in order to reach the point of identification or integration, it is crucial that people feel 'choiceful in enacting' the applicable behaviours (cf, e.g., Niemiec, Ryan & Deci, 2010:179). We therefore present ways in which apprenticeships could introduce measures that facilitate identification by supporting learners' autonomy along with the two other needs.

Fostering experiences of choice and self-initiation

Supporting autonomy is not equivalent to a lack of structure or to a chaotic, abandoning or laissez-faire culture (Jang, Reeve & Deci, 2010; Aeltermann et al., 2018). On the contrary, autonomy support is defined as 'the instructional effort to involve, nurture, and *develop* students' inner motivational resources and capacity and responsibility for self-motivation' (Reeve, 2009:139). It therefore includes developing 'the capacity and sense of personal responsibility to generate and regulate autonomous motivation of one's own' (Reeve, 2009:139). Accordingly, supporting apprentices' autonomy requires vocational trainers to adopt 'a curious, receptive, and open attitude, which allows them to better emphasise with and nurture learners' emerging interests, values, and preferences' (Aelterman et al., 2018:3). This attitude is contemporarily reflected in coaching strategies (cf., e.g., Schiemann, Mühlberger & Jonas, 2018), teaching recommendations (Patall & Zambrano, 2019) and leadership styles (e.g. Slemp et al., 2018).

In line with various recommendations (cf., e.g., Reeve & Jang, 2006; Reeve, 2009; Vansteenkiste et al., 2018; Patall & Zambrano, 2019; Gross et al., 2020), we focus on the measures with which vocational trainers can support apprentices in experiencing a sense of volition and personal meaning in their workplace learning activities. These contribute to the effective socialisation of newcomers at a company (Deci et al., 2017; Chong et al., 2020). Our shortlist includes: (a) providing opportunities for taking ownership and the initiative;

(b) offering choices or giving meaningful rationales where this is not possible; and (c) giving learners a voice. Where this can be realised, trainers and instructors enable apprentices to work in semi-autonomous teams (Barabasch, Keller & Caldart, 2021) or apply methods such as scrumming (Barabasch, Keller & Caldart, 2019) or agile learning (Barabasch & Keller, 2021). Another effective way to encourage apprentices' ownership and initiative is to let them create and work on their own projects (Barabasch & Keller, 2020). Through such methods, apprentices not only feel a sense of choiceful self-initiation and are therefore more autonomously motivated to engage in associated learning processes, but also acquire competences such as self-organisation, a sense of responsibility or communication skills.

Where such expedient, autonomy-supportive affordances are not feasible, or where they conflict with the pressure to use apprentices for productive work, vocational trainers and supervisors can still support apprentices' autonomy. One way of doing so is to offer them meaningful choices. Choices not only contribute to experiences of autonomy, but also reduce apprentices' vulnerability to experiences of failure (Legault & Inzlicht, 2013). Furthermore, they positively affect curiosity (Schutte & Malouff, 2019), which, in turn, helps to close soft-skill gaps in volatile, uncertain, complex and ambiguous work contexts (Horstmeyer, 2020).

Even meaningless choices can have positive effects, as they facilitate people's interpretation of negative feedback in an informative, improvement-oriented way, thereby enhancing their long-term performance (Murayama et al., 2015). However, not all choices satisfy learners' need for autonomy equally well (Katz & Assor, 2007). Providing options, such as choices about topics, tasks or work methods, which learners may interpret as opportunities for self-realisation or as being of value to themselves and their personal goals in general, yield the best results regarding experienced autonomy (cf. Katz & Assor, 2007; Messmann & Mulder, 2015).

Where such choices are not affordable because of organisational or professional constraints, especially where particular tasks are not interesting per se, then offering a meaningful rationale helps to enhance apprentices' autonomy experience (Jang, 2008; cf. Vansteenkiste et al., 2018). This has various implications for the work of trainers and the training of trainers. Most often, trainers can indeed provide some choice, in that they allow apprentices to participate in defining their personal learning goals, modes, frequencies or dates of work evaluations, or in granting them some flexibility in allocating their working time (Katz & Assor, 2007).

Allowing apprentices to participate in defining the concrete elements of their apprenticeship programme is also conducive to their experience of having a voice. If supervisors and vocational trainers adopt an empathetic stance towards their trainees, they nurture feelings of being understood and listened to. This would include taking into account apprentices' interests (Patall et al., 2013), accepting their perspectives and welcoming their input (Jang, Reeve & Halusic, 2016), in addition to acknowledging their feelings and even their expressions of negativity (Reeve, 2009). By giving trainees a voice in this regard, trainers gain information that they are able to use to attune the learning activities more finely to apprentices' interests and skill level or to identify particular needs for assistance.

With this openness to apprentices' concerns, trainers not only help to satisfy learners' need for autonomy. In its empathetic aspect, this attitude also contributes to satisfying their need for relatedness (Deci & Ryan, 2013; Deci, Olafsen & Ryan, 2017; Deci & Ryan, 2020). Expressions of honest concern for apprentices' perceptions are part of an inviting and caring culture; they allow apprentices to feel genuinely liked, respected and valued. This is important, as it fosters a sense of belonging which, in turn, is an indispensable prerequisite for people's identification with the social practices and behavioural regulations of a specific group (Niemiec & Ryan, 2009).

Furthermore, the autonomy-supportive attitude described above helps trainers to identify optimally challenging learning activities and opportunities for their apprentices in order to test and expand their acquired capabilities. In this respect, it facilitates satisfying the need for competence (Niemiec & Ryan, 2009), since, after all, nurturing experiences and the development of competence need to depart from the specific capabilities and abilities of learners (Aelterman et al., 2018).

To be clear, it is important to complement affordances of procedural and organisational autonomy support as sketched above with what Stefanou and colleagues called 'cognitive autonomy-support', that is, the kind of support which focuses on 'empowering students to develop self-reliance in thinking' (Stefanou et al., 2004:105). Trainers can encourage apprentices' independent thinking or 'cognitive autonomy' (Stefanou et al., 2004:100–101) by providing them with well-structured guidance. This could involve setting out clear expectations and guidelines at the pre-performance stage, providing assistance, guidance and supervision during the task, and also giving efficacy-supportive feedback that helps the learner to reflect on and develop their competences further (cf., e.g., Reeve, 2006; Vansteenkiste et al., 2012; Aelterman et al., 2018). During in- and post-performance exchanges, trainers can stimulate apprentices to reflect seriously on processes, to understand these as embedded in broader processes, and to identify and evaluate alternative solutions. In this way, vocational trainers can foster apprentices' cognitive autonomy and contribute effectively to satisfying their need for competence.

As these remarks suggest, well-structured, autonomy-supportive guidance has the potential to satisfy all three BPNs at once, and, therefore, it is conducive to apprentices' effectively identifying with behavioural regulations, such as with a company's cultural practices or with professional performance standards. Although extensive autonomy-supportive affordances sometimes seem to be at odds with using apprentices for productive work, it is nonetheless fruitful to adopt and sustain an autonomy-supportive attitude towards apprentices and to implement at least some instances of choice or participation. This approach is fruitful because, in line with SDT's reasoning, trainers' readiness to listen to the concerns of apprentices would not interfere with their productive work but instead tends to enhance its quality.

After presenting our methodology below, we illustrate some of Swiss Post's affordances that can engender experiences of ownership, choice or participation and of having a voice.

Methodology

Between August 2019 and March 2020, a comprehensive, explorative case study was conducted at Swiss Post, including the logistics, Post Finance and Post Bus divisions. The company offers 750 apprenticeship places every year. In total, more than 1 900 apprentices are trained for 19 different occupations. At the start of an apprenticeship, the trainees have completed their compulsory schooling, which, in Switzerland, consists of up to 11 school years. Recruitment is carried out by human resources (HR) in Swiss Post's Career Entry department, and, to date, some 60 000 employees have completed training and work as workplace trainers. This training is offered by private providers in Switzerland (Keller & Barabasch, 2018); at Swiss Post, trainers' training is offered internally and includes follow-up courses.

In total, 14 apprentices, 15 vocational trainers, seven regional training managers and seven managers were interviewed using a semi-structured interview guideline. The apprentices were in five different apprenticeships in logistics, informatics, technical support, customer service and office administration. The duration of the apprenticeships was either three or four years and comprised school-based instruction, instruction in specific training centres, and work at departments within Swiss Post. As part of the exploratory case study, field data were gathered by visiting 11 innovative projects and by documenting the interviewees' workplaces. Innovative projects comprised measures to improve the development of allied skills or that of autonomy and self-regulated learning.

The interviews lasted between 30 and 45 minutes for the apprentices and between 45 and 60 minutes for the other participants. The interviews were conducted in the work environment of the interviewees and were recorded and subsequently transcribed. The interviews with the apprentices comprised an open question at the beginning to obtain an initial picture of their perception of the apprenticeship. Further questions aimed at generating narratives of perceived guidance, the responsibility to manage one's learning or working, successes, difficult situations, feedback, and the culture of support for learning from mistakes, and also the degree of flexibility in the workplace environment. The 15 vocational trainers (VTs) were asked about their conception of training, their experience with the apprentices, and their expectations of them. The interviews with the regional training managers (RTMs) focused on their perceptions of the learners' socialisation in the workplace and their educational background. From both the RTMs and management, we also wanted to know what their visions and ideas were regarding the further development of the apprenticeship and the learning culture overall.

Data were processed using a qualitative content analysis (Kuckartz, 2016). After a first overall viewing of all the transcripts, they were coded. Step by step, the coding system was refined, as the codes were selected according to the themes that seemed to be important in the transcripts (inductive categorisation). The cases were then analysed based on the research questions, and some additional themes were added to the existing coding system. In this way, a detailed category system was developed. A certain cohesiveness of the coding has been

ensured by working together as a team on several transcripts. The entire material was then finally coded by two coders.

Our data revealed that the apprenticeship programmes at Swiss Post include some measures that contribute to an autonomy-supportive environment. For this reason, we use these data below to illustrate the ways in which training companies can engender experiences of autonomously motivated work engagement in their apprentices.

Findings

The substantial investments in the coaching of learners at Swiss Post ensure that apprentices receive much attention during their apprenticeships. The company adopts a triple-level approach with workplace trainers, VTs and RTMs. Whereas the workplace trainers supervise and assist the apprentices in their daily work, the VTs are responsible for their overall guidance. They set out the expectations and guidelines and ensure the individualised structuring and fine-tuning of the apprentices' programme. In regular meetings, they give personal feedback, set further learning goals, and reflect on the competence development, performance and conduct together with the apprentice. Furthermore, RTMs supervise the whole educational process, gather all the information about their assigned apprentices' development, and serve as a contact point for both the VTs and the learners in case problems or requests arise. The autonomy-supportive affordances of offering opportunities to take ownership, enabling choice and participation, and of giving learners a voice are therefore situated against a background of close and structured guiding that is an indispensable prerequisite for these measures to have the desired effect on learners' autonomy experiences.

Opportunities to take ownership

Owing to the close support of their learners, the VTs can detect and counteract feelings of over- or under-challenge at an early stage. Our data revealed that VTs throughout the company try to ensure that the apprentices' learning activities are optimally challenging. To support the development of their apprentices' autonomy competences, the coaches continuously expand the apprentices' area of responsibility at an individually adjusted pace and offer them opportunities to take ownership of some of their workplace learning. Here, we present two affordances that give apprentices the opportunity to take the initiative and to accept ownership of, and responsibility for, some of their workplace activities on both a small and a large scale: opportunities for self-study and the formation of learner teams.

Individually appointed hours for self-study

Swiss Post grants every apprentice the use of up to three hours a week for studying their VET-related materials during paid working time. During these hours, the apprentices must be present but they can decide autonomously how to use the time for personal study. They can do their vocational school's homework, prepare for examinations or work towards some of the learning objectives their coaches set them as part of their training.

At least some learners even have some choice over the scheduling of their weekly hours for study, about which they must consult their workplace trainer and ensure that their schedule is transparent to their team so that the learners do not receive any work-related tasks to perform during these time slots. The responsibility for organising these hours lies with the apprentices and they are expected to take the initiative to use this offer. However, being given the opportunity to take the initiative does not always work well, as one VT told us:

> Our apprentices are allowed to study up to two hours per week on paid work. … Although we always communicate this to them, they don't take it up sufficiently of their own accord. And so, I always have to tell the apprentices the Post is a mother company; they are really given time to learn, and it is paid for. (VT)

This may indicate a lack of interest in theoretical learning on the part of some apprentices, leading them to feel less motivated to use their allocated time for studying even if they receive poor grades at school. In some cases, this same VT tries to overcome the lack of initiative by making individual, binding arrangements regarding the use of personal study hours together with the respective learners. Another VT offered their apprentices personal support with their learning. As one apprentice reported, her VT asked her:

> Can we help you? Do you need support somewhere? Because we have learning time in the company … and we could also learn together with him. That's no problem at all. (Apprentice)

However, we found some variation between training places in the handling of learners' study hours by vocational and workplace trainers. Some logistics apprentices in particular reported that they could not take up all their study hours every week and always had to ask their supervisors before actually using them. This indicates that this offer is not equally well implemented throughout the whole enterprise. Nonetheless, some apprentices reported of their own accord that they receive a great deal of time for studying during paid work time and that they highly appreciate this offer.

In sum, we see this affordance as a small-scale measure to allow apprentices to experience responsibility, initiative and ownership as long as they receive an appropriate level of leeway and support by the VTs in organising their study hours autonomously.

Learner teams

Swiss Post offers its apprentices in commercials, retail, distribution logistics, and information and communication technology (ICT) the opportunity to apply for a place in a learner team. They recruit jobs in-house and fulfil various services. Such teams are led by a more advanced apprentice and consist solely of learners in different years of their apprenticeship. Discreetly supervised by VTs, they must organise autonomously the planning, coordination and distribution of tasks according to time and human resources, and also assume some managerial responsibilities.

Retail apprentices can also apply to spend one year at a junior post office. With only two to three experienced supervisors in the background, these branches are run solely by apprentices from different years, meaning that the customers are served exclusively by learners. In addition, these apprentices assume a great deal of responsibility, in that they process postal transactions and even manage the administration of the post office themselves.

Although their supervision and guidance are more discreet, that is, supervisors in general do not intervene actively without an apprentice asking for it, there is always the opportunity to receive help when needed, which means that the apprentices do not feel abandoned. Nevertheless, the declared aim of this supervision is not to help the apprentices with firm answers but to show them how they can help themselves when problems arise, as one apprentice illustrates:

> In case of difficulties, we can ask anything; they know how … to show us where to find the solution, because this is a little bit [of] their aim. It's not 'Find it here', it's rather 'Try, search, do it!', but they help us in a specific way. If we are really panicking, you can go, ask, and tell them I can't understand this thing; they [then] sit down with you, [and] they explain it to you. (Apprentice)

The learners in both of the trainee-run post offices we visited – Lugano Cassarate (canton of Ticino) and Prilly (canton of Vaud) – described this setting as being exciting and stimulating. They reported that their enlarged area of responsibilities motivates them more to learn by themselves, to develop their skills further or to help or tutor others. For instance, one apprentice stated that 'having had the opportunity to come to the Cassarate branch was fantastic, because here you really have 100% responsibility for your actions and for the actions of others too'. After being asked whether she experienced these responsibilities as motivating or as challenging, she answered:

> It is a challenge, but it is something that motivates you, because knowing that you can learn things by yourself, going to look for them, maybe motivates you more. You know that there is no one who will come to you to say: 'You can find it here.' It is *you* who must go to look for it. Also, the fact that you have some younger apprentices whom you can teach, motivates you a little bit more in searching, to say: 'Come on, then I can teach them too, I learned something new.' (Apprentice)

Another apprentice points to a contrast between the experiences she had at her first year's training place and those she had at the learner branch. In her first year, she felt rigidly controlled and distrusted by her supervisor, which diminished her motivation. In contrast, she described the increased autonomy at the trainee-run post offices as increasing both her self-confidence and her motivation to help herself and to try out and learn things on her own:

> Yes, I really like to work a little bit more autonomously. Because in the first year I felt they were too much on me, always watching me, not trusting me. That's a

> little … I don't know, you don't have too much motivation. Here, it's a little bit up to you. … I think this is good, because we learn ourselves, from our mistakes and so on. We learn to dare to do things. … You find out for yourself too. (Apprentice)

In the light of SDT, we interpret these reports as illustrating the positive effects of such a setting on apprentices' motivation. Those apprentices who experience more self-initiation and responsibility about their daily work tasks displayed more enjoyment or enthusiasm with respect to their workplace learning activities. Although we suspect such attitudes to be more closely related to autonomous than to extrinsic or introjected forms of motivation, we do not want to verify this claim. Overall, our data revealed a theory-fitting coincidence between reports of workplace settings experienced as yielding a relatively high level of responsibilities and opportunities for taking ownership and initiative, on the one hand, and reports of high and constant motivation for engaging in and initiating work and learning activities, on the other.

Choice and participation regarding learning activities

At Swiss Post, apprentices receive up to CHF 1 000 as a personal budget, which they may use for a language course in Switzerland, France, Germany or the United Kingdom, or for some other courses that will help them to develop further their competences related to vocational training. Apprentices must discuss their ideas about spending this credit with their VTs or RTMs on their own initiative. Although the VTs or the RTMs must accept or give their permission, it is ultimately the apprentices themselves who decide whether and how this credit is to be spent. The apprentices may choose those options that pertain to self-realisation or those that they consider to be of value to themselves or their personal goals. However, this affordance is only one measure that initiates a momentum of relevant choice over some elements of their apprenticeship at Swiss Post. Another way of engendering autonomy-related experiences is to allow the apprentices to participate in defining some of their workplace learning activities.

Through individual coaching, the VTs at Swiss Post not only identify optimally challenging learning activities for their apprentices; we frequently observed that they also ask for their apprentices' opinions and perspectives and consider their specific interests wherever possible. One learner told us that she experiences her VT responding regularly to her requests regarding specific workplace activities, if circumstances permit:

> If, as in summer, we have a period when there is less activity, we can also make suggestions: 'Hey, we'd rather go to the cleaning service instead of gardening. This is more important for me right now', and so on, and he [the VT] always takes that into account. (Apprentice)

While, for most professions, corresponding workplace environments restrict the range of opportunities for apprentices' participation in the choice of specific workplace learning activities, in the training of ICT learners, their involvement in defining their learning tasks

is an elementary part of the coaching approach that is implemented. The specific training programmes for these professionals are not completely arranged in advance; instead, they are explicitly open to the learners' input. And by holding individual 'status meetings' regularly, ICT coaches not only give their apprentices personal feedback, but also define additional learning activities together with them:

> They always have to set a personal goal at each meeting, some topic they want to work on. It's not like we set the goals. We always discuss them together. They always have a say, depending on what is important to them or what they want to work on. (VT)

The responsiveness to ICT learners' inputs is a distinguishing feature of this apprenticeship programme, one that is based in the VTs' open and curious attitude towards their apprentices' ideas. One of the VTs told us that learners sometimes have 'exciting ideas' and that the coaches generally try to realise what is possible. Furthermore, VTs allow those learners who progress easily with their learning materials to define a personal project to work on:

> For example, one of them is currently programming something with VR [virtual reality] glasses. Or two have just asked me whether they could film and edit. Because they are learners of the faster kind, we defined time slots for filming and editing. So, if they have an idea, we try to make quite a lot possible. (VT)

As discussed above, such measures can provide moments of choice or participation, and they therefore tend to engender experiences of autonomy. Furthermore, if supervisors adopt an open and receptive attitude towards learners and their input as described here, they also foster apprentices' experience of having a voice.

Experiences of having a voice

Allowing apprentices to speak their mind and to contribute their ideas and suggestions may not only benefit a team or an organisation. We consider the opportunity to contribute one's own view as a possible way of facilitating experiences of having a voice; accordingly, we present here two approaches through which Swiss Post fosters this experience in its apprentices.

Apprentices' inclusion in Kaizen

Kaizen is a Japanese approach to continuing improvement that can be applied in organisations. As part of the Kaizen philosophy that was introduced a decade ago, Swiss Post lives a company-wide culture of welcoming inputs from its employees. Its apprentices are included in this culture. RTMs and VTs told us that they invite learners explicitly and repeatedly to contribute their ideas, especially if they notice something they would like to see changed. This might not be easy from the start, because, at this age, and especially at an early stage of their training, some apprentices might be shy about articulating their views. For this reason, the VTs give them some encouragement, as the following two reports illustrate:

> We encourage apprentices to tell us their point of view, their vision of work. It is a bit difficult because they are in training, so, many times they don't dare to say anything or to bring in their ideas, but we stimulate them in this respect. (VT)

> Right from the start of their apprenticeship, we emphatically point out that, if they think 'Why do we have to do it this way, why can't we do it any other way?', they really [should] bring in their ideas. … In commercials, we tell them even more so, because there are some long-established teams in which a breath of fresh air is never bad … they should really state it, because the departments are usually open for it. (RTM)

Apprentices can make suggestions or submit their ideas either by pinning Post-it Notes on a Kaizen pinboard or by discussing them directly with their VTs or supervisors. The ideas submitted are then discussed among the whole team at the next team meeting and, if applicable, are either passed on to higher levels or implemented directly. In this way, apprentices suggested the following changes, for instance:

- Shifting their personal study time to certain business hours;
- Introducing a table containing all the birthday dates of the team;
- Changing some applications in the distribution logisticians' scanners, and
- Developing the PostCard Creator service further.

Since every idea is taken and discussed seriously regardless of its originator, the apprentices reported that they feel listened to, as the following statements illustrate:

> We also have the whole room full of pinboards and, if you have any idea, you write it down and say, 'Hey, now we have to sit together; I have a cool idea, can't we somehow implement it, do this and that? Yes, they are always quite open. (Apprentice)

> There are a lot of people who put things there [on the pinboard]. For example, … if they see something in the office that is not going well, they can write it down and then it is often passed on. … So that's good, we're listened to anyway. If we say something, they look to see if it's possible or not. And if it's possible, they implement it. (Apprentice)

Concerning their inputs, an RTM told us that 'a group of learners is permanently far ahead with these ideas, because they come unencumbered into the working world, do not have this operational blindness', and that 'sometimes really cool things are among their inputs'. Such statements not only illustrate the potential gain of Kaizen, but also the open attitude which encourages apprentices to speak their minds. It fosters experiences of being listened to, that is, of having a voice that is heard.

Learners' union at the Swiss Post

Through a union-like institution, which until 2020 was called 'Insieme' (Italian for 'together'), the apprentices at Swiss Post have a voice regarding matters that affect them directly. During annual meetings with some of the RTMs, the apprentices can influence some aspects of their apprenticeship through their representatives. Every learner is potentially available for election as a representative of their profession and/or region. They then serve as the voice for those who elected them. One apprentice described the procedure and her role as follows:

Apprentice: If someone has an idea for doing something, adding something, eliminating, or improving something, I can propose it, then the Post processes it.

> **Interviewer1:** How did you decide to join Insieme?
>
> **Apprentice:** Basically, all our comrades decided. We had to vote for one person, and I went out for the majority and so I was chosen.
>
> **Interviewer2:** So, they identify with you?
>
> **Apprentice:** Yes.
>
> **Interviewer1:** Did you have to apply or were they all candidates?
>
> **Apprentice:** Everyone was a candidate. (Apprentice)

As an RTM told us, there are all kinds of ideas that learners have already proposed:

> Maybe there are logisticians who would like to have trainings on snow, for instance. Commercial employees, who would like computer courses … or language courses, or maybe in a job where they stand all day long, they ask, for instance, for something to support their backs that are hurting a bit. And they can make all kinds of proposals. So, we really take up their ideas and see which ones we can develop. (RTM)

The most frequently mentioned idea developed in this way was that of offering every apprentice the General Abonnement, that is, a ticket for free public transportation within Switzerland – something that has been implemented at the national level. However, 'Insieme' is not only meant to be a playground for developing ideas. A member of management told us that they regularly contact the representatives of the learners' union to involve apprentices in the further development of products and training courses in order to 'receive feedback from the people it affects'. This manager is convinced that it is 'a very important sign to the young people that they are not simply at the mercy of what is happening here, but that they can have their own say'.

Together with management, the 'Insieme' representatives are currently involved in developing this institution further to strengthen the role of the apprentices. The aim of this process, which is actively embraced by the apprentices themselves, is to give learners more responsibility in steering their participation. A member of management emphasises the significance of this process for Swiss Post by stating: 'If we include self-responsibility in our mission and want to prepare our people for the job market, then this is a big issue.'

Conclusion

The aim of this article was to explain why and to what extent considerations of autonomy matter in VET, and to give some examples of autonomy-supportive practices. Based on qualitative data from our survey at Swiss Post, we identified three groups of affordance through which companies and vocational trainers can respond appropriately to adolescents' basic psychological need for autonomy. The first group comprises measures that enable experiences of responsibility, initiative and ownership; the second group provides apprentices with meaningful choices and the opportunity to participate in the definition of workplace learning activities; the third group includes examples of giving apprentices a voice. All three groups were identified by SDT-related research as valuable contributions to satisfying the need for autonomy and as stimulating autonomous forms of motivation.

Regarding the first group, we identified the practice of granting individually appointed weekly hours which apprentices have to use self-responsibly for their VET-related studies during paid working time. As long as the apprentices receive an appropriate level of leeway and support by supervisors in organising such study hours, we see this as a small-scale measure that engenders experiences of responsibility, initiative and ownership. As an example of a large-scale affordance, we introduced Swiss Post's learner teams in which apprentices must organise the planning, coordination and distribution of daily work tasks themselves. In self-responsibly administering their team, apprentices not only learn to work self-reliably, but also experience a high level of autonomy that significantly boosts their motivation. The discreet supervision by experienced coaches and workplace trainers provides a guiding structure in the background and prevents the apprentices making serious mistakes and becoming overtaxed.

To illustrate the second group of autonomy-supportive affordances, we introduced Swiss Post's provision of a credit that apprentices can use for further training on their own initiative. This permits them to develop some of their vocational training-related competences further and to make choices that are personally meaningful to them. Furthermore, coaches regularly ask for apprentices' opinions and perspectives and consider their specific interests in scheduling their learning pathways. In doing so, they not only foster learners' autonomy-related experiences of participation, but also ensure that the learning activities for their apprentices are optimally challenging and motivating.

The apprentices at Swiss Post have access to two institutionalised opportunities for having a voice. On the one hand, coaches and workplace trainers encourage the apprentices

to participate actively in the company's Kaizen practice of submitting ideas. Owing to the company-wide culture of welcoming input and the widespread readiness to discuss submitted ideas seriously, regardless of their originator, the apprentices experience being involved and listened to. On the other hand, there is a union-like institution with elected representatives through which the apprentices have a voice regarding matters that directly affect them and through which they can influence some aspects of their apprenticeship effectively.

Based on the SDT framework, we can expect such measures to have a positive effect on learners' motivation and to enhance apprentices' performance quality, work commitment and (practical) learning. We had access to reports that were explicitly related to the autonomy-supportive practices and which demonstrate the apprentices' high levels of satisfaction with, enjoyment of and personal involvement in their workplace learning settings and activities.

A number of suggestions for practical ways in which to improve the autonomy of apprentices can be derived from this research project. First, apprentices should be provided with opportunities to self-manage parts of their work, such as individual projects or team projects. In particular, self-initiated projects should be supported. Second, apprentices should be given a choice about aspects of their training – for example, selecting additional workshops, internships or projects in the enterprise to work on, supports their experience of autonomy. Third, critical thinking and participation can be supported by allowing apprentices to represent themselves and their concerns and also by gathering their ideas about potential improvements of work processes.

While this research presents some helpful insights, it is also important to note its limitations. We could not assess the conditions under which each measure effectively leads to associable outcomes, nor could we isolate predictable outcomes for each affordance. We suspect that the types and strengths of observable effects do depend on the entirety of the framework conditions and the specific interplay of established incentives. We assume that both a company's culture and the work of coaches and their attitudes towards learners are essential concerns here and that they play a key role in creating the conditions necessary for successfully implementing autonomy-supportive affordances.

Further research could help to understand more specifically the relevant preconditions and identify those practices which are functioning well and which account for the specific needs of different professions, in addition to the differences between companies in respect of their size and their human and financial resources. In demonstrating how an organisation's being seriously concerned about learners' autonomy can stimulate apprentices' motivation and enhance their productivity and learning outcomes, we hope to have given impetus to future such investigations.

Funding details

This article was not supported by any funding.

Disclosure statement

The authors report that there are no competing interests to declare.

Data-availability statement

Since the data analysis is ongoing, transcripts have not been stored in a depository at this stage.

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JOVACET
Journal of Vocational, Adult and Continuing Education and Training

To cite: Wenger, M & Lamamra, N. 2024. Identifying the major issues facing Swiss in-company trainers by analysing their continuing education needs: An approach based on the latent class analysis. *Journal of Vocational, Adult and Continuing Education and Training*, 7(1):151–179.
http://doi.org/10.14426/jovacet.v7i1.395

Analysing the continuing education needs of Swiss in-company trainers: An approach based on the latent class analysis

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ABSTRACT

In the Swiss dual vocational education and training (VET) system, access to continuing 'extra-professional' education for in-company trainers remains relatively limited, despite their acknowledged pedagogical role. Accordingly, this study examined the continuing education needs of in-company trainers by analysing their postures in relation to different continuing-education offerings. Hence, an online questionnaire was completed by in-company trainers (n = 5 295) across Switzerland. The survey questions focused on a number of varied themes and characteristics of continuing education programmes. Latent class analyses enabled us to identify four classes of in-company trainer, distinguished by their relationship with continuing education ('thirsty for continuing education' vs 'indifferent for continuing education'), on the one hand, and by their relationship with the trainer's function ('apprentices' caretaker' vs 'dedicated to the trainer's function'), on the other. Several differences were highlighted regarding the socio-demographic characteristics and preferences for practical courses between the four classes. Our study provides an insight into this population's heterogeneity and a finer distinction between attitudes existing among in-company trainers about continuing education. In addition, these findings reflect the challenge of recognising in-company trainers as pedagogical figures for apprentices, and not merely as 'occupation transmitters'. Based on the results, some practical implications for the field are also raised.

KEYWORDS

Vocational education and training (VET); latent class analysis; Swiss in-company training; dual apprenticeships; continuing education

Introduction

In the Swiss educational context, after compulsory schooling, two out of three young people embark on initial vocational education and training (IVET) (FSO, 2023a). In contrast to most European countries (with the exception of Germany), the vocational education and training (VET) system in Switzerland plays a particularly important role and is globally valued (Gonon, 2017; Wettstein, Schmid & Gonon 2018), this valorisation being reflected both nationally and internationally. However, there are regional differences: the German-speaking part of the country is more in favour of the VET system than the French- and Italian-speaking parts.[1]

There are two types of apprenticeship: full-time, which takes place exclusively in vocational schools (with the possibility of in-company traineeships), and dual, which alternates between one or two days a week of theoretical courses in a vocational school and four to five days a week in a training company. The dual form of apprenticeship is predominant in Switzerland, with 90% of young people undertaking their vocational training in this way (SERI, 2022). As with the overall proportion of young people in VET, depending on the Swiss geographical region and sector of activity, the proportion of apprentices in dual VET can also vary. For example, the French-speaking cantons in the west of the country have a particularly high number of full-time vocational schools that are closer to the French model. In contrast, in German-speaking Switzerland, as in Germany and Austria (Pilz, 2012; Fürstenau, Pilz & Gonon 2014), the dual system is king (Berner & Bonoli, 2018). Given the importance of the dual system, this requires close collaboration between the private and public partners (Confederation, cantons and professional associations). It also requires a strong commitment from the companies offering apprenticeships. In this configuration, apprentices have to find a company willing to train them,[2] sign an employment contract – like any other employee – and commit themselves for the entire duration of the apprenticeship, that is, from two to four years, depending on the type of diploma planned and the occupation. From the start of their contract, apprentices are therefore the responsibility of a key figure in dual vocational training: the in-company trainer.

Central role of in-company trainers

Since the most important part of dual VET takes place in a training company (Gehret et al., 2019), the persons responsible for training apprentices play a central role, in particular professionally and pedagogically (Bausch, 1997; Lamamra & Masdonati, 2009). Moreover, whereas vocational teachers undergo between 300 and 1 800 hours of pedagogical training, in-company trainers need just 40 hours of training to perform their function. This disparity in the time devoted to pedagogical training seems to show that, despite the central pedagogical

1 For more details about these regional differences, see, for example, Gonon and Freidorfer-Kabashi (2021) or Bonoli and Vorpe (2022).

2 These are companies that have registered with their canton as training companies and have at least one in-company trainer.

role of in-company trainers, very little training – in comparison with teachers – is required of them to fulfil their function. In most cases, an in-company trainer's function is additional to that of employee and/or company owner. As a result, they not only need to master their occupation, but also to implement it well, that is, to be capable of providing a certain amount of knowledge, know-how and soft skills for apprentices. They regularly assign marks reflecting the acquisition of vocational knowledge and skills and are also informed of the marks obtained by apprentices at school.

Owing to their position between workers and trainers, they have to face several challenges, typical of the dual VET system, but in particular the tension between production and training (Moreau, 2003).

Challenges and needs of in-company trainers

The tension between producing and training (Moreau, 2003) is one of the greatest challenges facing in-company trainers when training apprentices. This tension, which is a fundamental component of dual training, is characterised by two concomitant injunctions: the necessity to be productive and the importance of training apprentices. This means finding the time to support apprentices' learning, to show them tasks, to develop pedagogical approaches adapted to workplace learning, and to organise the training with other colleagues or departments, but also to give them the opportunity to practise and monitor their progress in their chosen occupation. Bringing these two logics together can give rise to tensions because in-company trainers are torn between several roles and functions of a different nature (Bahl, 2013; Kiepe, 2021; Nicklich, Blank & Pfeiffer, 2022) and 'wear different hats' in the company.

Moreover, as their function is little known by colleagues, managers and also sometimes at the institutional level, in-company trainers regularly claim a need for recognition (Besozzi, Perrenoud & Lamamra 2017; Bahl & Schneider, 2022). On the one hand, they insist on having the time to train apprentices properly, time that is often in short supply because of the production logic in which they operate. On the other hand, in-company trainers ask, among other things, to have a set of specifications clearly indicating that they train apprentices, but also a specific status and a commitment from the company regarding their function. Recognition can also be materialised through a salary or compensation of some kind. These different factors illustrate that, beyond the recognition issue, there is another: professionalising the function. What is more, in view of the latter, which requires both professional and pedagogical commitment, in-company trainers would need continuing education that goes beyond the purely professional (technical refresher courses related to the occupation). In other words, in-company trainers should be equipped with the necessary tools to deal effectively with apprentices, both interpersonally and formally.

Accordingly, taking an interest in the continuing education needs of in-company trainers goes beyond the 'simple' issue of lifelong learning; it involves much deeper issues relating to in-company trainers' function in the dual VET.

Our study: Aims and research questions

Despite their importance in the dual system, neither companies nor trainers have received much attention.[3] Accordingly, this study aimed to identify the needs and interests of Swiss VET in-company trainers and the differences in their responses to continuing education. More precisely, the study was part of a wider project commissioned by a foundation[4] which focused on assessing the situation of in-company trainers. The first stage involved interviews with different VET stakeholders (mainly in-company trainers, apprentices and company owners, but also some trade associations) which, among other things, helped to highlight the most salient issues regarding continuing training needs. These were then used to develop an online questionnaire on the needs and preferences for continuing-education courses. Descriptive and comparative analyses were initially carried out, whereas in this study we opted for an exploratory approach – using latent class analysis[5] – to gain more information about in-company trainers. Several main research questions guided the study:

- Which needs regarding continuing education do in-company trainers have?
- Which socio-demographic features distinguish in-company trainers regarding continuing education?
- Which practical aspects of continuing education (formats, modalities, etc.) distinguish in-company trainers regarding continuing education, and how do they do so?

We hypothesise that the latent class analyses will make it possible to further explore the needs and preferences of in-company trainers regarding access to, and the content of, continuing education related to their trainer function. This person-centred statistical approach allows respondents to be grouped according to their answers and therefore enables researchers to study trends in the responses of distinct groups.

3 It should be pointed out that the literature exists mainly in the educational sciences, particularly with regard to professional didactics and pedagogical orientations (Fuller & Unwin, 2003; Kunégel, 2011; Veillard, 2017). For our part, however, we are not interested in the modes of transmission and the systems implemented for this purpose, but in the conditions under which in-company trainers work, in addition to their aspirations and needs. This literature will therefore not be used.

4 The Swiss foundation TOP Ausbildungsbetrieb, in German meaning TOP training company, is a private entity that collaborates with the state at a federal level (https://topausbildungsbetrieb.ch/). Its goal is to increase quality in the training companies by offering continuing education to in-company trainers.

5 Latent class analysis is used to group together similar responses and therefore identify respondent profiles.

Methodology

The participants in the study together with the data, data collection and data analysis are presented in this section.

Participants

The sample comprised 5 295 respondents, 75% (or 3 971) of whom were in-company trainers (i.e. employees carrying out the trainer function, having already completed the 40-hour course, or not yet having done so) and 25% of whom were company owners (with or without the trainer function). In this respect, we initially identified four functions related to apprentices' training:

1. Employees with in-company trainer function (40-hour course completed; 64.15%);
2. Employees with in-company trainer function (40-hour course not yet completed; 12.33%);
3. Company owner with in-company trainer function (17.52%); and
4. Company owner without in-company trainer function (6.00%).

Following preliminary analyses, we were able to observe that the two groups of employees with a training function responded in a similar way, as did the two groups of company owners. For this reason, the main analyses were carried out by considering the function indicator in a dichotomous way, that is, by contrasting the group of in-company trainers with the group of company owners. In addition, we decided to retain the latter, as they are in any event responsible for training apprentices even if they do not directly train them.

In addition, most of the sample (i.e. 73.28%) indicated that they worked full-time, that is, at least 90% of the time. All the Swiss regions (with a majority of German-speaking respondents, 83.68%), professional sectors[6] and company sizes were represented (see Table 1).

6 That is, agriculture, forestry and animal husbandry; industry and arts and crafts (except construction); technology and information technology (IT); construction and mining; commerce, transport and traffic; hotels, restaurants and personal services; management, administration, banking, insurance and the legal professions; and health, education, culture and scientific professions. As no significant differences were observed between the various sectors of activity, we will not consider this socio-demographic indicator.

TABLE 1: Respondents' distribution

Gender	Women 55.51%		Men 42.74%		Do not wish to answer 1.75%	
Age	≤ 24 y/o 6.04%	25–34 y/o 28.99%	35–44 y/o 24.90%	45–54 y/o 23.91%	55–64 y/o 15.63%	≥ 65 y/o 0.53%
Activity rate	Part-time (less than 50%) 2.67%		Part-time (50–89%) 24.05%		Full-time (more than 90%) 22.20%	
Company size	Micro (less than 10 employees)	Small (10–49 employees)	Medium (50–249 employees)	Large (more than 250 employees)		
Function	Employee with in-company trainer function (40-hour course completed or not) 76.48%		Company owner with or without in-company trainer function 23.52%			

Data and data collection

An online questionnaire targeting in-company trainers and company owners who train apprentices was sent out at the beginning of October 2022 by most of the Swiss cantons, the Swiss Trade Association[7] and the Swiss Employers' Association to training companies directly or to organisations representing the world of work. The deadline for responses was set at one month; at the end of this period, 5 295 valid questionnaires had been received.

The survey was structured as follows:

- Proposals[8] for continuing-education programmes (with themes based on the analysis of the interviews and the trends identified by the Confederation for vocational training):
  - knowledge of adolescents (psychology, development, etc.);
  - social and family issues;
  - intercultural issues relating to apprenticeship training;
  - roles of company trainers, tasks and challenges;
  - relationship and communication competences;
  - teaching methods;
  - time management (production/training);
  - digital competences;
  - networks (contacts, professional associations, vocational schools, etc.);
  - general knowledge of the vocational training system; and
  - legal issues relating to apprenticeship training (VPETA, LL, CO, GEA, etc.).[9]
- Classification of continuing-education offerings.

7 This is an umbrella organisation representing associations and small and medium-sized enterprises (SMEs).

8 For each subject, secondary subjects have been proposed (see Appendix D).

9 See Appendix A for correlations and proportions of selected continuing-education offerings.

- Formats, methods, periods and other characteristics of continuing education.
- Framework conditions for effective apprentice training.
- Socio-demographic information.

Data analysis

In order to identify similar groups of in-company trainers according to their preferences for 'extra-professional'[10] continuing education, we carried out a latent class analysis (LCA) using the MPlus software (version 7.11; Muthén & Muthén, 2013). We grouped respondents according to one criterion, namely their responses to various continuing-education offers linked to their trainer function (see Appendix D for the detailed list of courses). The aim of this type of analysis was to identify groups of in-company trainers who had responded in comparable ways to continuing-education offers. In the LCA, this translates into the probability of each individual belonging to one class rather than another (Sinha, Calfee & Delucchi 2021; Bauer, 2022). In addition, to highlight differences between in-company trainer groups, chi-square and ANOVA tests were also performed.

Results

To answer the first research question, that is, to know how many and which classes reflect in-company trainers' needs for continuing education, we performed latent class analyses (Ferguson, Moore & Hull, 2020). After testing models with one to six profiles, we finally opted for the four-class solution (see Appendix B, i.e. fit indices for each tested model), for several statistical and theoretical reasons:

- The improvement in the Bayesian Information Criterion (BIC) index[11] is greater in the four-class solution than when adding classes. Although this index is constantly improving, this would probably be due to the large size of the sample (Sinha et al., 2021; Bauer, 2022);[12]
- This solution has an entropy index greater than .80, which is the recommended threshold for a satisfactory solution (Weller, Bowen & Faubert 2020; Bauer, 2022);
- The average latent posterior probabilities are greater than .90, which is considered to be a good cut-off value in LCA (see Appendix C; Bauer, 2022); and
- In the literature, four profiles had already been identified – although using an ideal–typical approach (Besozzi, 2023) – and the choice of four classes could enable us to compare our results with those already observed. In this sense, the literature advises that the final solution should also be chosen based on its interpretability (Bauer, 2022).

10 By 'extra-professional' we mean offerings that are not aimed at the professional development of their primary activity.

11 The BIC is the fit index that usually plays the most important role in choosing the LCA solution (Nylund, Asparouhov & Muthén, 2007; Asparouhov & Muthén, 2012).

12 Moreover, and as Bauer points out, 'some authors consider a solution useless in which not all classes are interpretable' (2022:251), which would probably have been the case with our sample.

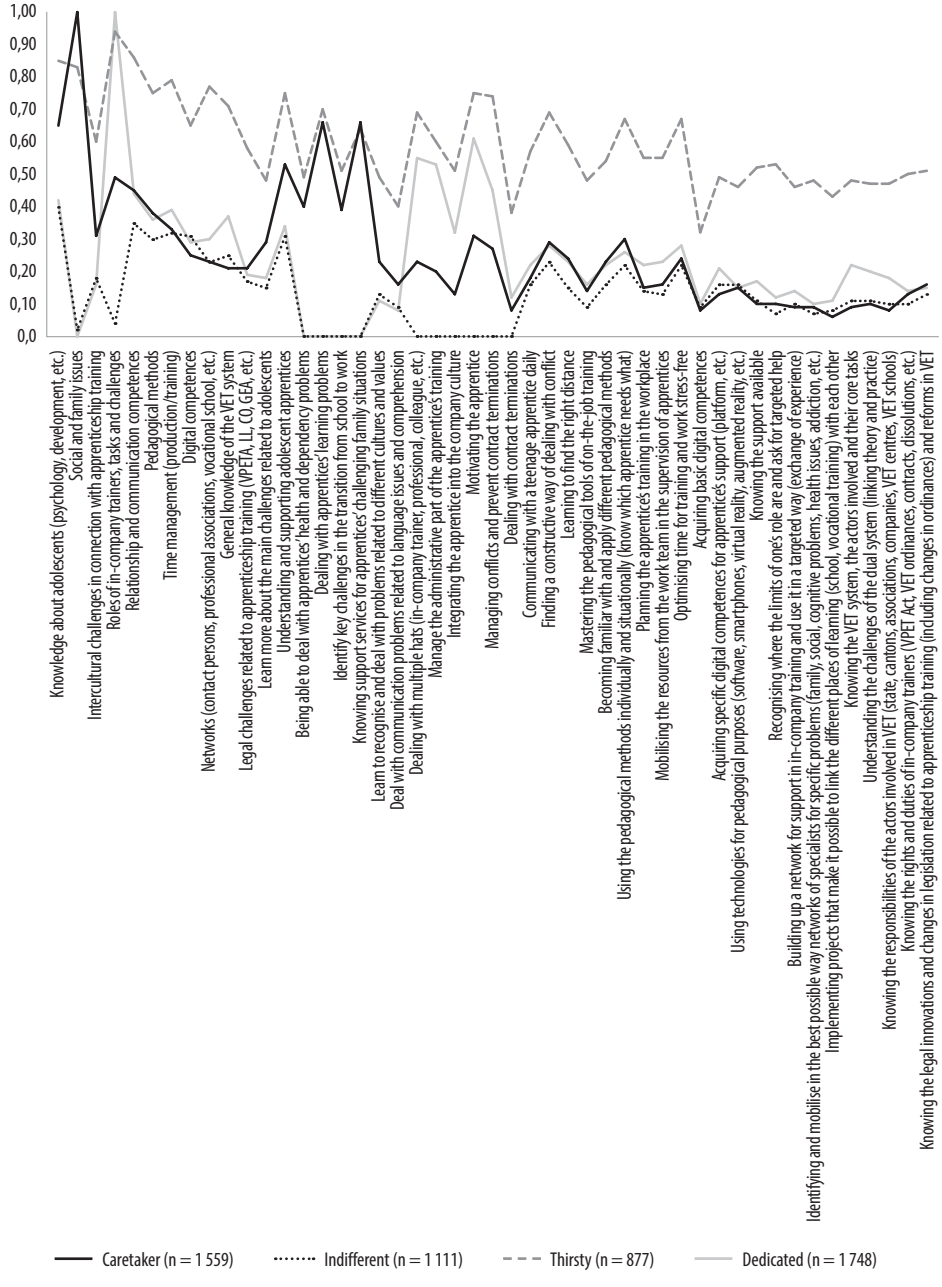

FIGURE 1: Responses of the different classes to continuing-education offerings

The four-class solution enabled us to identify several distinct groups (see Appendix D for the detailed results as shown in Figure 1).

Class 1, or the 'apprentices' caretaker' (n = 1 559)

This profile is characterised by a greater interest in social and family problems and social issues (transition and support services), and in supporting teenagers. More than in-company trainers and transmitters of knowledge and know-how, they are caretakers. Their aim, over and above passing on an occupation, is to support young people in this phase of their lives (entry into adulthood) and in their transition to the world of work.

Class 2, or the 'indifferent to continuing education' (n = 1 111)

This profile is characterised by a withdrawal from almost any course attracting their interest: the highest score is 40% (*knowledge about adolescents*), apart from an interest in *relationship and communication competences* (35%) and *understanding and supporting adolescents* (31%).

Two hypotheses could explain this situation:

1. People who distance themselves from the job, or even from work in general, and do not wish to invest in continuing education. From their in-company trainers' role, they retain above all the 'adolescent issue' and the need to communicate and relate to this particular public.
2. Pragmatic, work-focused people considering that their previous career or their position gives them the necessary competences to pass on knowledge and know-how, and who do not consider that they need any continuing education other than professional development. They consider that they have the professional competences and skills to pass on the occupation. As a result, they identify adolescent issues only as potentially interesting knowledge that they do not have.

Respondents of Class 2 do not identify themselves as caretakers like Class 1 or as in-company trainers like 'the dedicated' (Class 4). In addition, they are the exact opposite of Class 3 ('the thirsty').

Class 3, or the 'thirsty for continuing education' (n = 877)

People in this profile are interested in continuing education in a variety of areas: the role of the in-company trainer, social issues, time management, teaching methods, understanding and motivating apprentices, relationship and communication competences, and teaching competences. Almost everything seems to be of interest to them, and all the offers exceed 40%, apart from acquiring digital competences or dealing with contract terminations. This group also stands out for its marked interest not only in general themes, but also in the sub-themes proposed (whereas in the other three groups the latter are of less interest overall).

There are three possible explanations for this:

1. People who have distanced themselves from their initial job and function and who want to give meaning back to their daily lives by investing heavily in continuing education, perhaps with a view to leaving their job or function (career bifurcation).
2. People who are over-invested in their job, who want to do more training to improve their qualifications for the job, perhaps with a view to becoming a fully fledged in-company trainer in a training centre or becoming a VET teacher (career bifurcation to a more training-oriented function).
3. People who are just starting out in the job and who want to train in a 'one-size-fits-all' way, touching on a bit of everything, because they are not yet aware of the day-to-day needs, challenges and constraints. Unlike the other two profiles, which seem to indicate a desire to change careers, this third hypothesis mainly involves people seeking to invest in the in-company trainer function.

Class 4, or the 'dedicated to the trainer's function' (n = 1 748)

This profile is marked by a strong professional identity as an in-company trainer. The courses chosen by the 'dedicated' relate to an in-company trainer's role, tasks, and challenges involved, such as motivating the apprentice, managing multiple roles and managing the job's administrative side. With a more pragmatic profile, the question of the in-company trainer's function is considered through the constraints linked to the function, the numerous tasks, and the multiple roles or the administrative part of the function. This seems to reflect the interests of people with experience in the role who want to equip themselves to train despite these constraints.

Overall, these four profiles illustrate, on the one hand, the relationship with the function of in-company trainer (the 'caretaker' and the 'dedicated') and, on the other, the relationship with continuing education (the 'thirsty' and the 'indifferent'). In terms of their relationship to the job, the 'dedicated' are focused on the job and its challenges whereas the 'caretakers' are more focused on the apprentices (beyond simply passing on the job). Furthermore, regarding continuing education, the 'thirsty' are highly motivated by the variety of courses on offer whereas the 'indifferent' are more inclined to reject continuing education.

In addition, it is interesting to note that the most represented class of the four is the 'dedicated' (n = 1 748), followed by the 'caretakers' (n = 1 559), the 'indifferent' (n = 1 111) and the 'thirsty' (n = 877): the most prevalent classes are those that characterise in-company trainers in their relationship to their function. This result confirms that the responses inform us about in-company trainers' situations and needs.

Classes and socio-demographic features

To answer the second research question – that is, to know how the different classes differ in their socio-demographic features – we also performed chi-square (x^2) tests.

First, regarding respondents' gender, the two classes which emerge are those that relate globally to continuing education: men are more strongly represented among the 'indifferent' than in the other classes, and less strongly among the 'thirsty'. The opposite trend is observed among women, who are more strongly represented among the 'thirsty' and less so among the 'indifferent' (x^2 (3, n = 4 979) = 69.59, p < 0.001). In the light of Swiss statistics on continuing education (FSO, 2022), this result is interesting. Indeed, if there is no major difference between males and females concerning professional continuing education (with the gaps gradually narrowing), females are much more concerned with extra-professional continuing education. This prevalence in the 'thirsty' class could indicate that these offers have been evaluated as non-professional.

Concerning the respondents' ages, the first thing to note is that the classes are mainly those that differ in their relationship to the function. The youngest members of the group (aged 17–34) are in the 'caretaker' group, whereas the oldest members (aged 45+) are those who are in the 'dedicated' class (x^2 (15, n = 5 068) = 32.96, p = 0.005). Interestingly, the youngest respondents seem to have a more global vision of their role regarding support in the transition from school to work or towards adulthood – perhaps because these issues are still close to them. In contrast, the 'dedicated' are those who have the most experience in the role of in-company trainer and are more familiar with the issues and difficulties involved. The 'indifferent' group is made up primarily of middle-aged people (aged 35–44), that is, those who are mainly focused on work at an age when they are building or stabilising their careers. But this group also comprises people who consider that their competences and experience do not necessarily require continuing education. This result contrasts with the Swiss statistics on continuing education (FSO, 2022) showing that the 35–44 age group is the one that undertakes the most continuing education in Switzerland (FSO, 2022).

In this regard, there are two possible hypotheses:

1. Their already enormous involvement in continuing education makes it impossible to take on more courses.
2. It indicates that these offers do not appear as continuing professional development (CPD) but as 'extra-professional'. This second hypothesis echoes the difference already mentioned regarding the gender-oriented attitude towards these courses.

Regarding the respondents' function, in-company trainers are more strongly represented among the 'thirsty' and less so among the 'indifferent' group, whereas the opposite is true for company owners (x^2 (3, n = 5 068) = 57.82, p < 0.001). This division can be interpreted as a way for in-company trainers to underline the importance of their role and their desire to become even more involved in their function: requesting a large number of continuing-education courses is also a way of seeing their tasks recognised at their true value and showing that there are issues of professionalisation. This means that specific and general skills are needed to take on this function.

Regarding the activity rate, there is a clear separation between classes based on their relationship to continuing education: part-timers are more likely to be in the 'thirsty' class and, conversely, there are likely to be fewer 'indifferents'. These results are reversed for full-time workers, where the number of people in the 'indifferent' profile is particularly high (x^2 (6, n = 5 068) = 52.54, p < 0.001).

Interestingly, in the general Swiss population, full-time workers proportionally undertake more continuing education than part-timers (FSO, 2022). However, this result could be explained by the fact that full-time workers have easier access to continuing education. Furthermore, if we examine the nature of these courses, full-time workers take far more professional continuing-education courses than part-time workers, but fewer extra-professional courses (FSO, 2022). This can also be compared with the results presented above regarding gender attitude towards these offers, knowing that, in Switzerland, part-timers are mostly women (FSO, 2023b).

Finally, regarding company size, the 'indifferents' are more present than those in other classes in micro-businesses, whereas the 'dedicated' are over-represented in small businesses and the 'thirsty' in medium and large businesses (x^2 (9, n = 5 068) = 91.86, p < 0.001). These results seem to reflect a contextual effect, as the constraints (pressure to produce, less room for manoeuvre in the event of someone being absent, organisation of apprentice training) are particularly strong for micro-firms and, as a result, their propensity for continuing education is lower. Conversely, it is hardly surprising to find a high proportion of the 'thirsty' class in medium-sized and large firms, which can manage in-house or external continuing education for their staff. Finally, the over-representation of the 'dedicated' class in small firms seems to reflect the reality that the latter make up a significant proportion of training companies in Switzerland. Indeed, this class reflects the strong commitment of people from this type of company to apprentice training. Table 2 summarises the results regarding over-representation in each class in respect of socio-demographic features (see also Appendix E for detailed results).

TABLE 2: Summary of over-representation in the four classes regarding socio-demographic features

	'CARETAKER'	'INDIFFERENT'	'THIRSTY'	'DEDICATED'
Gender		Men	Women	
Age	17–34-year-old	35–44-year-old		45+-year-old
Function		Company owners	In-company trainers	
Rate		Full-time ≥ 90%	Part-time < 90%	
Firm size		Micro-firms	Medium and large firms	Small firms

Overall, it is interesting to note that the 'indifferent' class is over-represented by men in the 35–44 age bracket who are full-time company owners working in micro-firms. Conversely,

the 'thirsty' class is over-represented by women, in-company trainers and people who work part-time in medium-sized or large firms. The two opposing classes in respect of their relationship to the function differ mainly in their age. In other words, it is mainly the two classes characterised by their relationship to continuing education that stand out in respect of socio-demographic features.

Classes and practical features

To answer the third research question, that is, on the more practical questions of course organisation (formats, modalities, etc.), we carried out x^2 and ANOVA tests (see Appendix F for detailed results). Results show that, as far as the duration of courses is concerned, the class indicating the most that they would like to have half-day courses are the 'dedicated' (x^2 (3, n = 5 295) = 28.17, $p < 0.001$). This is probably a 'reality effect', as these people are aware of the arduous management of their tasks (production–training tension) and no doubt anticipate the difficulties caused by their absence due to continuing education. Full-day courses are more popular with the 'thirsty' (x^2 (3, n = 5 295) = 99.09, $p < 0.001$), whereas the 'indifferent' are more likely to be prepared to take continuing-education courses in the evening, compared with the other groups (x^2 (3, n = 5 295) = 6.72, p = 0.08[13]). Although they are generally reluctant to take part in continuing-education courses, people with this profile seem to be willing to do so, if necessary, but during their time away from work. This would be in line with hypothesis 2 concerning this profile, that is, pragmatic people focused on work and favouring continuing education outside of working hours.

As for weekends, the 'thirsty' had the highest percentage, whereas the 'dedicated' had the lowest (x^2 (3, n = 5 295) = 9.49, p = 0.023). Therefore, the relationship with continuing education could predict a readiness to train at certain times outside of work, whereas the relationship with the job would indicate that continuing education is part of the job. The two classes determined on the basis of their relationship to the function ('the caretaker' vs 'the dedicated'), in contrast, do not differ in these practical elements of continuing education.

Regarding the ideal average duration of continuing-education courses, ANOVA showed statistically significant differences between groups (F (3, 5 054) = 42.75, $p < 0.001$): the 'thirsty' class indicated an average of 2.95 days per year, followed by the 'caretaker' class with 2.54 days per year, the 'dedicated' class with 2.34 days per year and the 'indifferent' class with 2.24 days per year. These results confirm the trends already highlighted with the readiness for training, with the 'thirsty' class being those who would like to devote the most time per year to continuing-education courses, whereas the 'indifferent' class would be prepared to devote less time. Except for the differences in means between the 'indifferent' and the 'dedicated' classes, all the other differences revealed by Tukey's post-hoc test were significant. This means

13 We are, however, aware that this result is based on a trend and that its interpretation must therefore be treated with caution, as the p-value is slightly higher than the 0.05 threshold.

that the 'thirsty' group would ideally like a significantly longer course than the other three groups, but also that the average durations indicated by the 'indifferent' and 'dedicated' classes are not statistically different.

Classes and ideal framework conditions

We also asked about ideal framework conditions, that is, which framework conditions in-company trainers consider to be necessary for good apprentice training. To compare the four classes' answers, we performed x^2 tests which showed that, overall, the 'thirsty' class indicated all the framework conditions to a greater extent than the other classes, whereas the 'indifferent' class had the lowest proportions of selected framework conditions. We can see from these results that the 'thirsty' class considers that good training requires not only aspects such as having specifications for in-company trainers, but also salary recognition for their function. In addition, the question of framework conditions is linked to the issue of professionalisation for in-company trainers, that is, giving their role a recognised status, which ties in with the issue of continuing training. It should also be noted that, overall, the framework condition which received the most support concerns having time to train apprentices, a finding that echoes the tension between producing and training which is characteristic of in-company trainers.

Discussion and conclusion

The many results presented above highlight several considerations about in-company trainers and their relationship with continuing education.

First, a person-centred approach through latent class analyses enabled us to account for the heterogeneity of the population studied (Lüthi, Stalder & Elferling, 2021; Wenger, Sauli & Berger, 2022; Besozzi, 2023), that is, of in-company trainers and their attitude towards continuing-education needs. In addition, and as mentioned at the beginning of this article, despite the key role played by in-company trainers in the dual VET system, there is evidence that their access to 'pedagogical' (or non-professional) continuing education is very limited (Cedefop, 2010). Accordingly, the large sample that responded to the survey highlights the relevance of continuing education as an issue for in-company trainers in the Swiss context.

Overall, the four classes that emerged from our analyses echo the statistics on continuing education in the Swiss population (FSO, 2022), but not in the way we would expect. Compared with the Swiss general population, our in-company trainer sample shows some differences in their attitudes towards continuing education: we have highlighted the over-representation of women in the 'thirsty' group and the over-representation of men in the 'indifferent' group, whereas the proportion of men and women in the Swiss population taking part in continuing education is the same for both genders (FSO, 2022). However, the behaviour of the trainers surveyed is comparable with that of the general population in

respect of extra-professional continuing education, where women are over-represented. This could reveal that the training courses on offer are not considered by most of the participants as being directly related to professional continuing education.

One paradox should be noted, though: the practical aspects of continuing education (formats, modalities, etc.) in our results show that the 'thirsty' class, despite its overall profile of strong enthusiasm about the idea of taking part in continuing education, is reluctant to do so at any time, and particularly not in the evening.[14] This suggests that the offer is considered as CPD that should be completed during working hours and a way of gaining skills in relation to the activity. These contrasting results reveal the tension in the 'thirsty' class between two attitudes towards continuing education: sometimes considering it as extra-professional, sometimes as qualifying. In contrast, the 'indifferent' class showed themselves to be more open to taking part in training courses outside of working hours (i.e. during evenings and/or at weekends), which seems to indicate that, overall, they consider the courses as being extra-professional training.

Linked to the perception of continuing education – either professional or extra-professional – another issue seems to be emerging: Who is responsible for offering or taking these courses? Is it in-company trainers themselves or should their employers take responsibility for continuing education? More broadly, is the continuing education of in-company trainers a private responsibility of the company owner or is it a public responsibility of the state? In some European countries, this aspect is in fact managed at the state level, which seems to enable more equal access to training for all in-company trainers (Cedefop, 2010). We know that company owners are more likely to free up time for in-company trainers to take professional or technical continuing-education courses, but what about those more related to their pedagogical role? This raises the issue of the vision regarding continuing education: although these courses are linked to the in-company trainer's activity, they are rarely considered to be professional-development training, even though they are essential for the proper monitoring of apprentices (Cedefop, 2010). The challenge is therefore to situate this type of content within continuing education, which would then be recognised as a professional activity and be assumed as a responsibility of the employer.

Accordingly, the four classes identified through the latent class analyses allow us to reflect about in-company trainers beyond the question of continuing education. The aim is to highlight the position of the function, which is partly linked to the reasons for training, but also to the vision of the apprentice (Kirpal & Wittig, 2009; Lamamra, Duc & Besozzi, 2019). In this regard, two in-company trainers' profiles have been highlighted: on the one hand, those who take care of apprentices more broadly (by accompanying them towards their transition between school and work, but also between childhood and adulthood). On the other hand, there are those who are strongly focused on their function and therefore on their

14 That said, we would reiterate that the results of this analysis are statistically only trend-based and should therefore be treated with caution.

challenges and trainers' issues. This reminds us of the heterogeneity of the trainers' situation, as already highlighted in the literature, the two profiles overlapping in part with some of the ideal types identified (Besozzi, 2023). This heterogeneity of profiles and postures points to the need to develop different measures to support in-company trainers in order to ensure that their role is recognised and valued, and more besides. The measures put in place must take into account the different ways of being an in-company trainer as described in this article, the motivations for the role, and the day-to-day management practices.

To conclude, we can assert that the challenges associated with continuing education for in-company trainers go well beyond 'simple' access to this type of training: on the one hand, it is a question of recognising the status of these key people in apprentice training, not only from a purely professional point of view, but also from a pedagogical perspective. From these perspectives, a more general recognition of the dual apprenticeship system can emerge, a system that too often continues to have a 'bad reputation' in post-compulsory training in Switzerland (Berger, Lamamra & Bonoli, 2018). On the other hand, access to continuing education related to the in-company trainer's function increases their competences and, consequently, the quality of VET and of the labour market too (Kirpal & Wittig, 2009; Wenger et al., 2019). Indeed, since in-company trainers are part of a production logic, giving them regular and easy access to all types of continuing education would also have a beneficial effect on the way in which they themselves train future employees (Cedefop, 2010; Käpplinger, 2016). In addition, this same logic of production means that some of them do not consider the offers to constitute CPD, which reproduces the social representations made of them. In this way, their professionalism is recognised only in relation to their job and not in relation to their function as in-company trainers. This is a major contribution of our study findings, which should help to encourage the debate on this subject and raise the awareness of VET stakeholders. Indeed, as long as they are regarded as 'mere' workers with the additional function of training apprentices, their access to pedagogical training will remain complicated.

More generally, our study could provide food for thought about access to continuing education for people with dual status, that is, employees and 'pedagogues'. In this sense, and as we have emphasised in this article, the aim would be to highlight the possibility of in-company trainers remaining up to date not only in their profession, but also in their role as educators.

Ethics statement

This research adhered to the ethical guidelines outlined in the Declaration of Helsinki for human experimentation. Prior informed consent was obtained from all the individuals who participated in the study.

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Appendix

A. Correlations and proportions of selected continuing education course offers

	%†	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Knowledge about adolescents (psychology, development, etc.)	55.95	–										
2. Social and family issues	43.98	0.29	–									
3. Intercultural challenges in connection with apprenticeship training	28.43	0.22	0.25	–								
4. Roles of in-company trainers, tasks and challenges	64.41	0.06	–0.02	0.05	–							
5. Relationship and communication competences	49.77	0.18	0.16	0.16	0.16	–						
6. Pedagogical methods	42.23	0.18	0.13	0.14	0.11	0.22	–					
7. Time management (production/training)	42.59	0.00	0.09	0.09	0.14	0.13	0.07	–				
8. Digital competences	34.43	0.09	0.07	0.16	0.07	0.11	0.08	0.16	–			
9. Networks (contact persons, professional associations, vocational school, etc.)	34.49	0.07	0.09	0.13	0.16	0.12	0.10	0.15	0.15	–		
10. General knowledge of the VET system	35.67	0.04	0.02	0.09	0.19	0.10	0.05	0.14	0.12	0.24	–	
11. Legal challenges related to apprenticeship training (VPETA, LL, CO, GEA, etc.)	25.97	0.11	0.13	0.18	0.10	0.09	0.14	0.12	0.10	0.18	0.13	–

Note: n = 5 295; †: corresponds to the percentage of respondents who selected the course offer; correlations ≥|.03| are significant at the level of p = 0.05; correlations ≥|.04| are significant at the level of p = 0.01.

B. Fit indices for the latent class analysis

MODEL – NUMBER OF LATENT PROFILES	LOG LIKELIHOOD	AIC	BIC	SSABIC	ENTROPY	SMALLEST CLASS %	LMR (*P*)	LMR MEANING	BLRT (*P*)	BLRT MEANING
1	–140395.119	280884.238	281193.240	281043.889	–	–	–	–	–	–
2	–130180.244	260550.488	261175.067	260873.188	0.892	30	<0.001	2>1	<0.001	2>1
3	–125889.050	252064.099	253004.256	252549.848	0.949	21	<0.001	3>2	<0.001	3>2
4	–123126.823	246635.647	247891.380	247284.444	0.964	17	<0.001	4>3	<0.001	4>3
5	–121013.664	242505.329	244076.639	243317.174	0.961	8	<0.001	5>4	<0.001	5>4
6	–119151.935	238877.870	240764.757	239852.764	0.979	9	<0.001	6>5	<0.001	6>5

Note: n = 5 295; LMR and BLRT tests compare the current model with a model with k – 1 profiles. AIC: Akaike's Information Criterion; BIC: Bayesian Information Criterion; SABIC: Sample-Size Adjusted BIC; LMR: Lo-Mendell Ruben; BLRT: bootstrap likelihood ratio test.

C. Average latent class probabilities for most likely latent class membership (row) by latent class (column)

	1	2	3	4
1	0.975	0.003	0.021	0.001
2	0.003	0.986	0.001	0.010
3	0.032	0.001	0.953	0.015
4	0.000	0.001	0.008	0.991

D. Proportion of respondents by class who selected continuing education courses

	'CARETAKER' (*N* = 1 559)	'INDIFFERENT' (*N* = 1 111)	'THIRSTY' (*N* = 877)	'DEDICATED' (*N* = 1 748)
Knowledge about adolescents (psychology, development, etc.)	0.65	0.40	0.85	0.42
Social and family issues	1.00	0.02	0.83	0.00
Intercultural challenges in connection with apprenticeship training	0.31	0.18	0.60	0.16
Roles of in-company trainers, tasks and challenges	0.49	0.04	0.94	1.00
Relationship and communication competences	0.45	0.35	0.86	0.44
Pedagogical methods	0.38	0.30	0.75	0.36
Time management (production/training)	0.33	0.32	0.79	0.39
Digital competences	0.25	0.31	0.65	0.29
Networks (contact persons, professional associations, vocational school, etc.)	0.23	0.23	0.77	0.30
General knowledge of the VET system	0.21	0.25	0.71	0.37
Legal challenges related to apprenticeship training (VPETA, LL, CO, GEA, etc.)	0.21	0.17	0.58	0.19
Learn more about the main challenges related to adolescents	0.29	0.15	0.48	0.18

	'CARETAKER' (*N* = 1 559)	'INDIFFERENT' (*N* = 1 111)	'THIRSTY' (*N* = 877)	'DEDICATED' (*N* = 1 748)
Understanding and supporting adolescent apprentices	0.53	0.31	0.75	0.34
Being able to deal with apprentices' health and dependency problems	0.40	0.00	0.49	0.00
Dealing with apprentices' learning problems	0.66	0.00	0.70	0.00
Identify key challenges in the transition from school to work	0.39	0.00	0.51	0.00
Knowing support services for apprentices' challenging family situations	0.66	0.00	0.64	0.00
Learn to recognise and deal with problems related to different cultures and values	0.23	0.13	0.49	0.11
Deal with communication problems related to language issues and comprehension	0.16	0.09	0.40	0.08
Dealing with multiple hats (in-company trainer, professional, colleague, etc.)	0.23	0.00	0.69	0.55
Manage the administrative part of the apprentice's training	0.20	0.00	0.60	0.53
Integrating the apprentice into the company culture	0.13	0.00	0.51	0.32
Motivating the apprentice	0.31	0.00	0.75	0.61
Managing conflicts and prevent contract terminations	0.27	0.00	0.74	0.45
Dealing with contract terminations	0.08	0.00	0.38	0.12
Communicating with a teenage apprentice daily	0.18	0.16	0.57	0.22
Finding a constructive way of dealing with conflict	0.29	0.23	0.69	0.28
Learning to find the right distance	0.24	0.15	0.59	0.23
Mastering the pedagogical tools of on-the-job training	0.14	0.09	0.48	0.16

	'CARETAKER' (N = 1 559)	'INDIFFERENT' (N = 1 111)	'THIRSTY' (N = 877)	'DEDICATED' (N = 1 748)
Becoming familiar with and apply different pedagogical methods	0.23	0.16	0.54	0.22
Using the pedagogical methods individually and situationally (know which apprentice needs what)	0.30	0.22	0.67	0.26
Planning the apprentice's training in the workplace	0.15	0.14	0.55	0.22
Mobilising the resources from the work team in the supervision of apprentices	0.16	0.13	0.55	0.23
Optimising time for training and work stress-free	0.24	0.22	0.67	0.28
Acquiring basic digital competences	0.08	0.09	0.32	0.10
Acquiring specific digital competences for apprentice's support (platform, etc.)	0.13	0.16	0.49	0.21
Using technologies for pedagogical purposes (software, smartphones, virtual reality, augmented reality, etc.)	0.15	0.16	0.46	0.15
Knowing the support available	0.10	0.11	0.52	0.17
Recognising where the limits of one's role are and ask for targeted help	0.10	0.07	0.53	0.12
Building up a network for support in in-company training and use it in a targeted way (exchange of experience)	0.09	0.10	0.46	0.14
Identifying and mobilise in the best possible way networks of specialists for specific problems (family, social, cognitive problems, health issues, addiction, etc.)	0.09	0.07	0.48	0.10

	'CARETAKER' (*N* = 1 559)	**'INDIFFERENT' (*N* = 1 111)**	**'THIRSTY' (*N* = 877)**	**'DEDICATED' (*N* = 1 748)**
Implementing projects that make it possible to link the different places of learning (school, vocational training) with each other	0.06	0.08	0.43	0.11
Knowing the VET system, the actors involved and their core tasks	0.09	0.11	0.48	0.22
Understanding the challenges of the dual system (linking theory and practice)	0.10	0.11	0.47	0.20
Knowing the responsibilities of the actors involved in VET (state, cantons, associations, companies, VET centres, VET schools)	0.08	0.10	0.47	0.18
Knowing the rights and duties of in-company trainers (VPET Act, VET ordinances, contracts, dissolutions, etc.)	0.13	0.10	0.50	0.14
Knowing the legal innovations and changes in legislation related to apprenticeship training (including changes in ordinances) and reforms in VET	0.16	0.13	0.51	0.15

E. Sociodemographic features[15] by class (in numbers and percentages)

Respondents' sex

	'CARETAKER' (*N* = 1 492)	'INDIFFERENT' (*N* = 982)	'THIRSTY' (*N* = 843)	'DEDICATED' (*N* = 1 662)	X^2
Men 42.74%[16]	643	526	290	707	69.59***
	43.10%	53.56%	34.40%	42.54%	
Women 55.51%	849	456	553	955	
	56.90%	46.44%	65.60%	57.46%	

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

Respondents' age

	'CARETAKER' (*N* = 1 512)	'INDIFFERENT' (*N* = 1 009)	'THIRSTY' (*N* = 858)	'DEDICATED' (*N* = 1 689)	X^2
17–24 y/o 6.04%	120	52	50	84	32.96**
	7.94%	5.15%	5.83%	4.97%	
25–34 y/o 28.99%	473	282	247	467	
	31.28%	27.95%	28.79%	27.65%	
35–44 y/o 24.90%	376	261	216	409	
	24.87%	25.87%	25.17%	24.22%	
45–54 y/o 23.91%	331	245	201	435	
	21.89%	24.28%	23.43%	25.75%	
55–64 y/o 15.63%	209	163	138	282	
	13.82%	16.15%	16.08%	16.70%	
>65 y/o 0.53%	3	6	6	12	
	0.20%	0.59%	0.70%	0.71%	

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

15 From this table on, 100% could not be calculated for the entire sample, as some people did not wish to respond or were excluded from the analyses. The numbers are therefore slightly reduced.

16 Corresponds to the percentage of the total sample.

Respondents' function

	'CARETAKER' (N = 1 512)	'INDIFFERENT' (N = 1 009)	'THIRSTY' (N = 858)	'DEDICATED' (N = 1 689)	X^2
Trainers 76.48%	1 198	694	708	1 276	57.82***
	79.23%	68.78%	82.52%	75.55%	
Owners 23.52%	314	315	150	413	
	20.77%	31.22%	17.48%	24.45%	

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

Respondents' activity rate

	'CARETAKER' (N = 1 512)	'INDIFFERENT' (N = 1 009)	'THIRSTY' (N = 858)	'DEDICATED' (N = 1 689)	X^2
Part-time (<50%) – 2.67%	42	24	25	44	52.54***
	2.78%	2.38%	2.91%	2.61%	
Part-time (50–89%) – 24.05%	328	194	278	419	
	21.69%	19.23%	32.40%	24.81%	
Full time (90–100%) – 73.28%	1 142	791	555	1 226	
	75.53%	78.39%	64.69%	72.59%	

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

Respondents' firm size

	'CARETAKER' (*N* = 1 512)	'INDIFFERENT' (*N* = 1 009)	'THIRSTY' (*N* = 858)	'DEDICATED' (*N* = 1 689)	X^2
Micro (<10 employees) – 17.88%	244	253	114	295	91.86***
	16.14%	25.07%	13.29%	17.47%	
Small (10–49 employees) – 34.29%	516	331	252	639	
	34.13%	32.80%	29.37%	37.83%	
Medium (50–249 employees) – 25.63%	374	250	262	413	
	24.74%	24.78%	30.54%	24.45%	
Large (>250 employees) – 22.20%	378	175	230	342	
	25.00%	17.34%	26.81%	20.25%	

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

F. Practical aspects of continuing education by class (in numbers and percentages)

Moments

	'CARETAKER' (*N* = 1 559)	'INDIFFERENT' (*N* = 1 111)	'THIRSTY' (*N* = 877)	'DEDICATED' (*N* = 1 748)	X^2
Half days – 58.61%	864	569	528	1 054	28,17***
	55.42%	51.22%	60.21%	60.30%	
Full days – 63.65%	1 010	574	636	1 050	99.09***
	64.79%	51.67%	72.52%	60.07%	
Evening – 17.46%	247	216	145	287	6.72(*)
	15.84%	19.44%	16.53%	16.42%	
Weekend – 4.21%	64	40	52	62	9.48*
	4.11%	3.60%	5.93%	3.55%	

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

Ideal duration of continuing education courses

	'CARETAKER' (*N* = 1 505)		'INDIFFERENT' (*N* = 1 016)		'THIRSTY' (*N* = 841)		'DEDICATED' (*N* = 1 696)		*F*	η^2_p
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*		
Duration (days/ year) – 2.48	2.54	1.49	2.24	1.49	2.95	1.58	2.34	1.42	42.75***	0.03

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

Framework conditions for a good training

	'CARETAKER' (*N* = 1 559)	'INDIFFERENT' (*N* = 1 111)	'THIRSTY' (*N* = 877)	'DEDICATED' (*N* = 1 748)	X^2
Having a company commitment to apprentices' training that all employees are aware of and support – 53.08%	803	435	594	858	163.25***
	51.51%	39.15%	67.73%	49.08%	
Having a set of specifications – 43.01%	617	321	505	737	169.02***
	39.58%	28.89%	57.58%	42.16%	
Having a recognised status within the company – 61.52%	940	527	659	992	160.48***
	60.30%	47.43%	75.14%	56.75%	
Having the time to train apprentices (time off) – 82.99%	1283	752	789	1382	161.36***
	82.30%	67.69%	89.97%	79.06%	
Having annual objectives in line with the in-company trainer's function – 39.40%	574	330	466	627	122.21***
	36.82%	29.70%	53.14%	35.87%	
Having a specific remuneration (salary, bonus) – 39.86%	600	327	483	610	150.15***
	38.5%	29.4%	55.1%	34.9%	

*Note: *: p < 0.05; **: p < 0.01; ***: p < 0.001.*

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EDITORIAL POLICY AND PROCEDURE

The *Journal of Vocational, Adult and Continuing Education and Training* (JOVACET) recognises the need for critical engagement through studies in TVET and Adult and Continuing Education and Training, and for encouraging critical scrutiny of this expansive knowledge area on the African continent.

The voices and experiences of practitioners, reflecting on all aspects of teaching and learning within vocational education and adult education settings, should be heard through publication of empirical and robust research. While the journal clearly wishes to take forward academic scholarship, it also seeks to strengthen opportunities for reflective practice that makes a scholarly contribution to the field. New knowledge emerging out of complex developmental contexts has significant value and needs to be showcased beyond existing geographical and political boundaries. The journal is therefore committed to also supporting the development of emerging researchers by providing them with a space to present and defend their research among a network of global scholars. Within the field of vocational and continuing education there is substantive 'grey literature' that remains in project report form. The journal is potentially a vehicle for the translation of this important work into an academic contribution to a wider community of practice and thereby enhancing its value.

The JOVACET will appear at least once a year. Unsolicited articles are welcome for consideration and should be uploaded onto the JOVACET's website online journal or else emailed to the journal's managing editor.

The editors are accountable for everything published in the journal and should therefore:

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- ensure that all manuscripts have been reviewed by appropriate reviewers;
- ensure quality assurance processes are in place for the material that is published; and
- uphold the highest standards of integrity, intellectual rigour and ethics.

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Journal of Vocational, Adult and Continuing Education and Training

VOLUME 8, ISSUE 1

You are invited to submit an article for the eighth volume of JOVACET to be published in October/November 2025. JOVACET is an accredited publication with the Department of Higher Education and Training.

Articles should be topical with regard to current debates/discourses and recent research in the TVET, Adult, and Continuing Education and Training domains. Submissions should be of high quality and follow academic research/writing conventions of journal articles in the social sciences. Specifications can be found on the JOVACET website (www.jovacet.ac.za) or obtained from Dr Catherine Robertson at cathy@tcrobertson.co.za.

Articles should comprise a maximum of 8 000 words, including the abstract of approximately 200 words and a list of references, and be submitted in MS Word format via the journal website at www.jovacet.ac.za or emailed to Dr Catherine Robertson at cathy@tcrobertson.co.za. Kindly follow the style guide which is provided on the website.

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National Research Foundation

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ISSN 2663-3639 (print)
ISSN 2663-3647 (electronic)