



**Technology requires people
to enhance learning and digital
enablement**

**Virtual
Visual
Visible
Value**

**Prof Luci Abrahams
SABEN Connects 2026
30 September 2026**

Presentation and interactive discussion

1

TVET studies: For people by people

2

NRENs and RRENs for African higher education and South African TVETs

3

Meaning of the four Vs: Bandwidth promoting virtual learning, visualisation, dynamic learning environments, knowledge visibility and educational value

4

The shift towards digital learning and knowledge platforms: Learning meaningfully with technology

5

Learning enhancement for TVET students: Virtual, visual, visible, value

6

People as leaders and enablers collaborating with digital technologies

7

Open discussion (10 minutes)

TVET studies: For people by people

- Agriculture
- Art and Design
- Business Management and Economic Sciences
- Clothing Production
- Cosmetology and Haircare
- Engineering (Building, Civil, Electrical, Mechanical)
- Hospitality and Tourism
- Human Resource Management
- Financial Management
- Information Technology
- Mechatronics
- Music Performance
- Occupational Trades (AI Software Developer, Carpentry, Chef, Electrician, Freight Handling, Transport and Logistics, other)
- Social Sciences (Early Childhood Development)



Made by CHAT & ASK AI

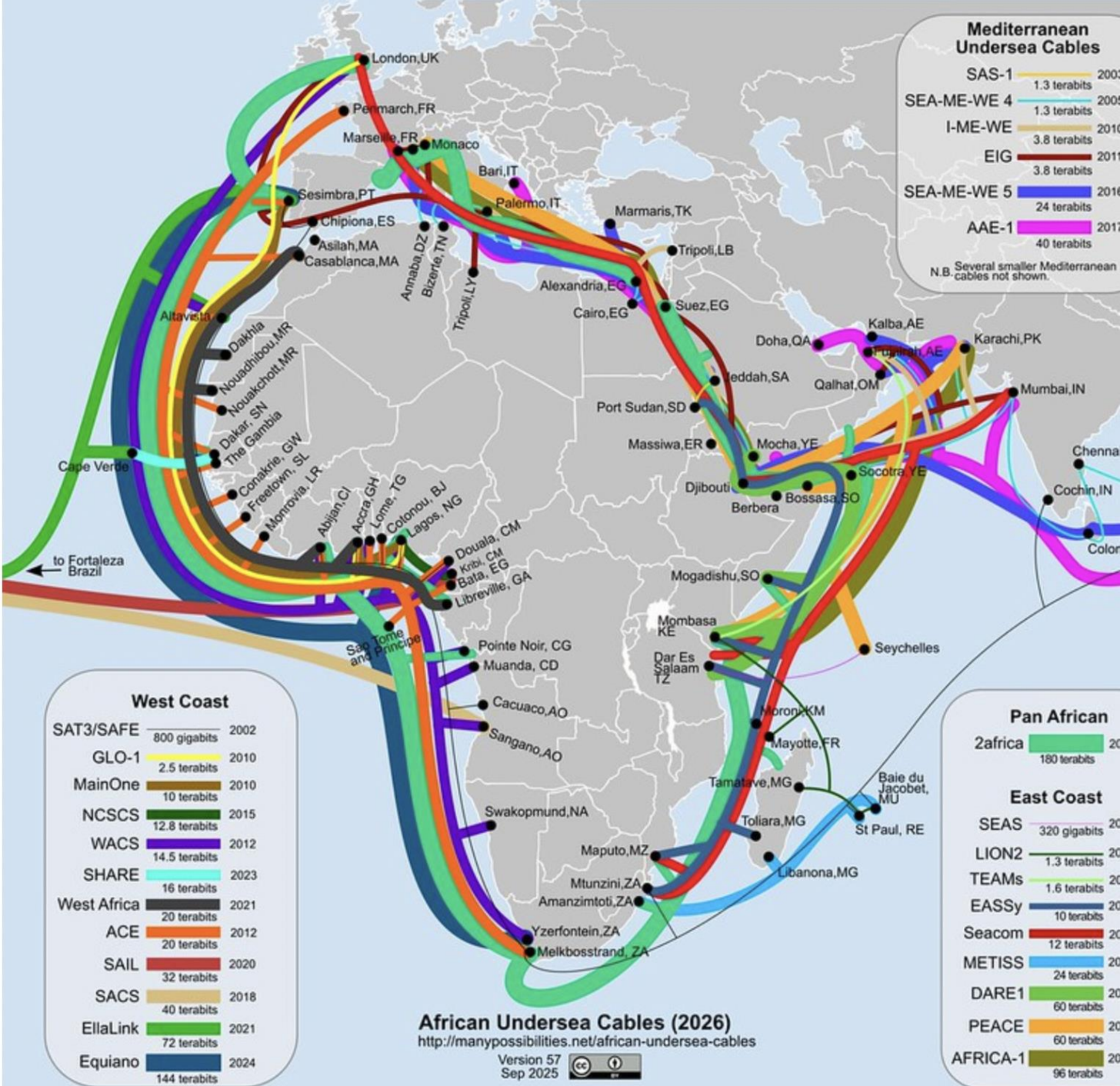


TVET institutions using digital technologies and learning platforms

- HSRC study on reimagining TVET education in the digital age
 - *Study led by Shirin Motala, Dr Stewart Ngandu, Dr Bongiwe Mncwango and Dr Jaqueline Harvey, and supported by Lindiwe Malumbazo, Amanda Diphoko Phetla, Mokgadi Mamaleka, Nondumiso Masuku and Ncediwe Mdludlwa*
- South Africa's TVET sector actively engaged in intentional reinvention, much more to be done in advancing digital technologies and online environments
- Migration to QCTO occupational qualifications requires greater digital integration ...
- SABEN and TVET institutions as partners in building this future

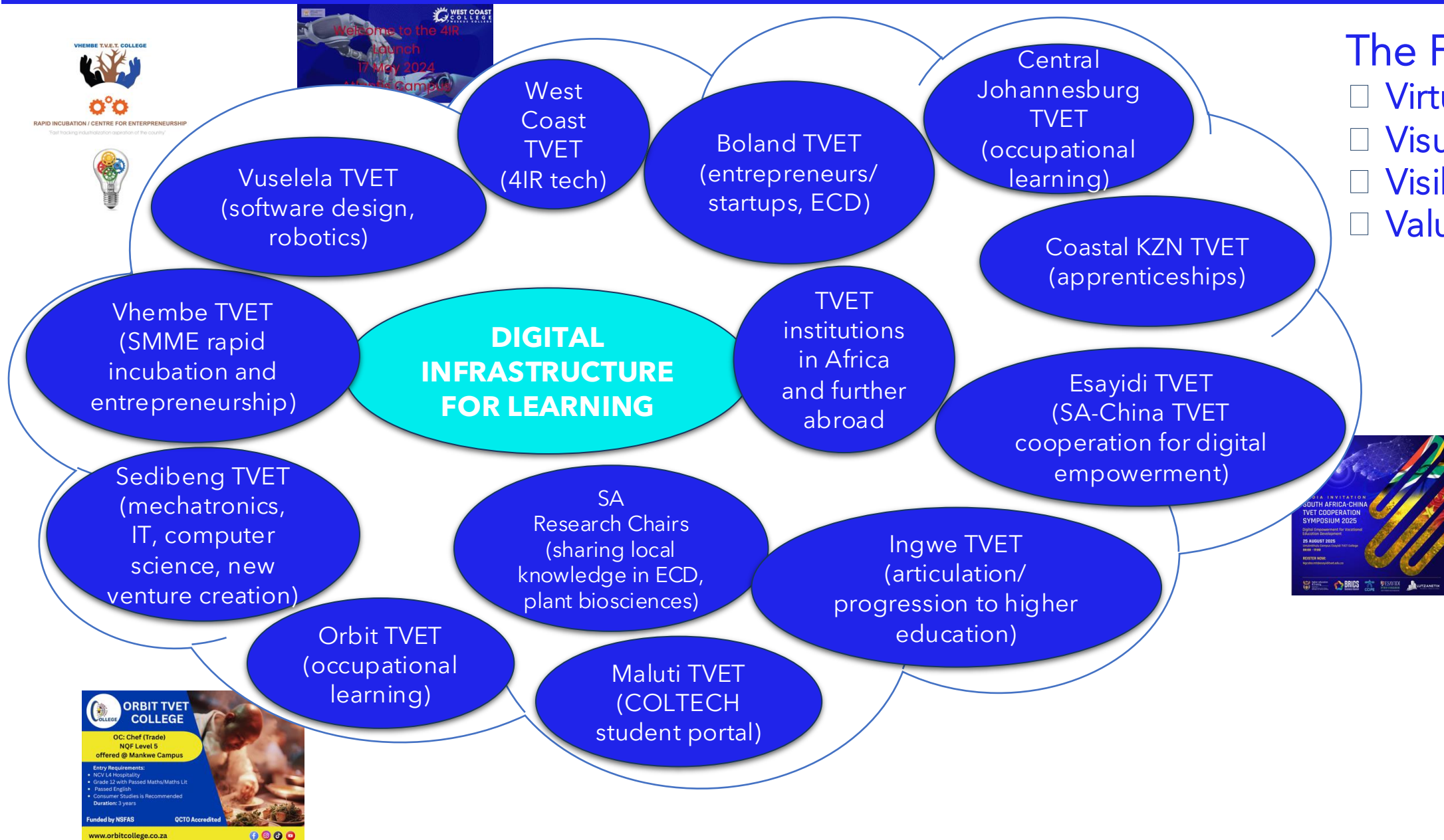
As South Africa embraces the fourth and fifth industrial revolutions (4IR/5IR), its technical and vocational education and training (TVET) colleges are undergoing a major digital transformation. An HSRC study investigated how COVID-19 and the technological shifts brought on by 4IR/5IR have reshaped the education, training and development sector. This article focuses on how these dynamics affect private and public TVET colleges.





- In the higher education system across Africa, **NRENs and RRENs** service universities, colleges and science institutions, at regional scale. They facilitate **access to learning content** on agriculture, management, engineering, technology, science and social science websites and learning platforms
- NRENs in 20 African countries delivering reliable Internet to higher education and research institutions
- Google AI analytics suggests that USD1.3 billion (ZAR20 billion) was **invested** in undersea cable infrastructure **annually** over the period 2015 - 2024
- The **AfricaConnect3** investment is estimated at USD40.5 million 2019 - 2023
- TENET estimates that more than **ZAR3 billion** has been invested in **SANREN, TENET and SABEN** infrastructure since 2007, including ZAR1 billion in undersea cable infrastructure, with ZAR2 billion being direct investment in REN infrastructure

Empowering learning through digital infrastructure



The FOUR V's

- ☐ Virtual
- ☐ Visual
- ☐ Visible
- ☐ Value

Meaning of the four V's

- **The 4V's** is a way of thinking about virtual learning and showcasing TVET content (reward for independent learning, reward for knowledge sharing, reward for visible and valuable content)
- **Virtual:** Accessing local, African and globally available content, digital twins and virtual laboratories
- **Visual:** Visualising financial data, engineering models, technology frameworks, recommendations, in easily accessible formats
- **Visible:** Visibility of art and design, visibility of mechatronics artefacts, other visible content
- **Value:** Creating learning value, societal value
- Acknowledgement 4 diagram: Oleg Gapeenko, <https://www.vecteezy.com/free-photos/digital-twin-technology> Digital Twin Technology Stock photos by Vecteezy



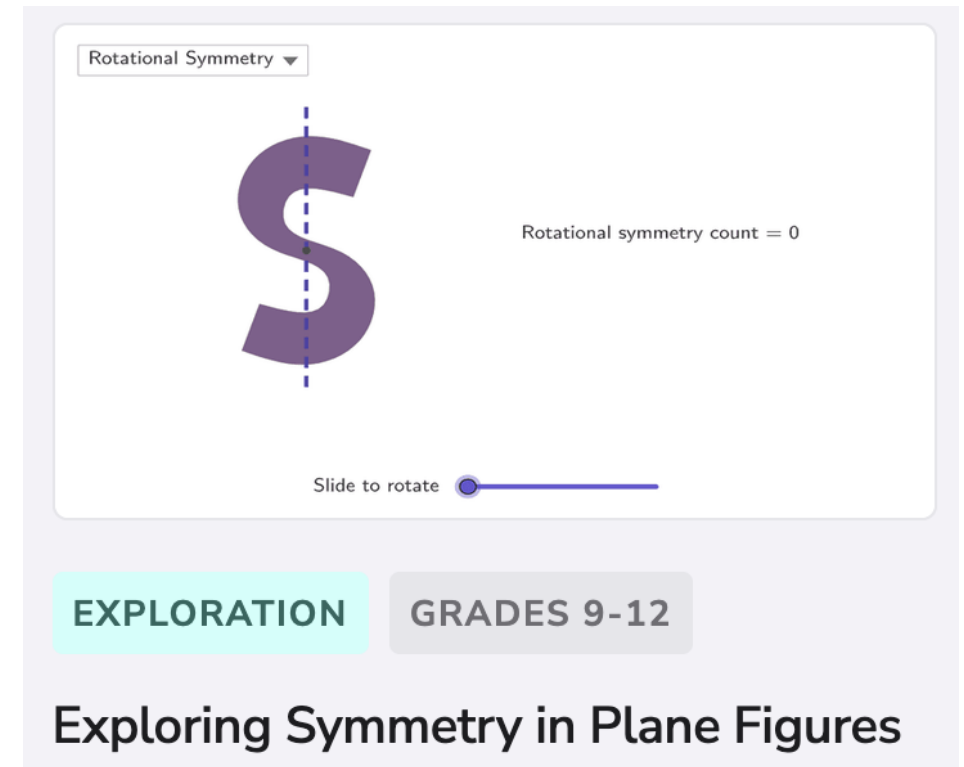
The shift towards incorporating digital learning and knowledge platforms

Domain	Learning and knowledge platforms	Educational Value
Agri Studies and Agri Tech	- Food and Agricultural Organisation (FAO) e-learning Academy https://elearning.fao.org/ - AGRICOLLEGES International online learning - AI for Farming online course	- Free, multilingual, certified courses in 25 thematic areas including agricultural risk management, plant health - Learning content on agribusiness and plant production - Learning content on agricultural automation, drone integration, predictive analytics, smart tech
Art and Design	16NetO Maputo Fast Forward Festival https://www.maputofastforward.com/en/festival/ - Massively open vocational and creative communities: Domestika https://www.domestika.org/en/courses , Alison https://alison.com/tag/art-and-design and https://alison.com/blog/free-alison-courses	- Showcasing artistic production and cultural heritage - Domestika: Online courses for creative professionals, price range from ZAR9.00 upwards - Alison: Free learning on short courses and diplomas, certificates are optional and require payment
Cosmetology and Haircare	L'Oreal online courses https://ie.lorealaccess.com/courses/hair-scalp-care_Psr39vIYzckXiXkJiMhG	Free and paid online courses on care essentials, scalp diagnosis, hair science
Computing and Data Sciences	- Masakhane African Languages Hub, Nairobi, Kenya https://www.masakhane.io/masakhane-african-languages-hub/projects - Visual Paradigm Online https://online.visual-paradigm.com/	- Promoting African language resources and technologies (ALRT) for multiple uses, language foundations for apps to translate educational content into African languages - Online productivity suite for business and learning about business
Mechatronics	Virtual Mechatronics Labs, based in Kenya https://vmlafrica.org/	- Integrates VR and mechatronics to transform learning - Example virtual reality solar system for drying crops
Occupational Trades	Alison https://alison.com/tag/trades	Core competencies ranging from technical drawing to trade mathematics and workplace safety

SABEN digital learning infrastructure for learning meaningfully with technology

SABEN provides digital learning infrastructure as part of the national and regional research and education network system (NRENs and RRENs), it provides access to learning content

- **GeoGebra** <https://www.geogebra.org/?lang=en> **maths applets Gr4-12 relevant to NQF levels 2-4** for engineering and IT studies, business and finance, tourism, other
- **Online laboratories**
- Access to industry reports (**financial management, cybersecurity, IT/digital**)
- Storing and contributing knowledge content produced in the TVET context (**art and design artefacts**)



Connected digital learning infrastructure for learning meaningfully with technology

- Filling the pipes with **valuable content** relies on global knowledge production and on local knowledge production = **content that college communities produce and publish online**
- Regional and global interconnecting networks for higher education are already funded and available at relatively low cost to TVET institutions
- These digital networks are more valuable when they carry meaningful content such as **case studies in agriculture, music performances** shared by the more than 560,000 TVET students and lecturers at more than 300 campuses
- Trends show significant freely available content in dominant areas of African knowledge production, including **biodiversity and climate change which are relevant to studies in agriculture**, and other local content

Learning enhancements for TVET students: being virtual

- Content platforms for video and interactive tools (language learning), VR/XR immersion (engineering and technology), webinars (all content)
- Technical platforms for virtual laboratories, practical assignments, simulations, other
- Example provider **LabTech for TVET virtual learning and LMS** (transportation, computer and information systems, electrical and power, other subjects) includes animated 3D version of the item being studied
- **Acceptable and unacceptable uses** of virtual learning and AI tools and techniques
- Acknowledgement for diagram: Hadijah Nakakande, author of "Making vocational education relevant in the 21st century"



Learning enhancements for TVET students: being virtual

- Learning platforms for specific subjects, courses: agriculture, drones and connected farming; virtual reality welding and safer training: SABEN source material from False Bay College, Northlink College, Vuselela College
- Open educational resources (OER) for TVET institutions
- Future Managers = TVET content creator
- LMS for TVET colleges available from providers like Sound Idea Digital (South Africa)
<https://www.soundidea.co.za/lms-for-tvet-colleges/> addressing "the gap between theoretical knowledge and practical mastery ... where careers are built";

"...Practical Assessment System (PAS). We understand that learning often happens in workshops, fields, and remote campuses where Wi-Fi is not a guarantee".

[This is not an advert, just an example, other providers on the programme]

FROM WORKSHOPS TO ROBOTICS: THE CONNECTED FUTURE OF TVET EDUCATION

CAPE TOWN, SOUTH AFRICA, APRIL 2026



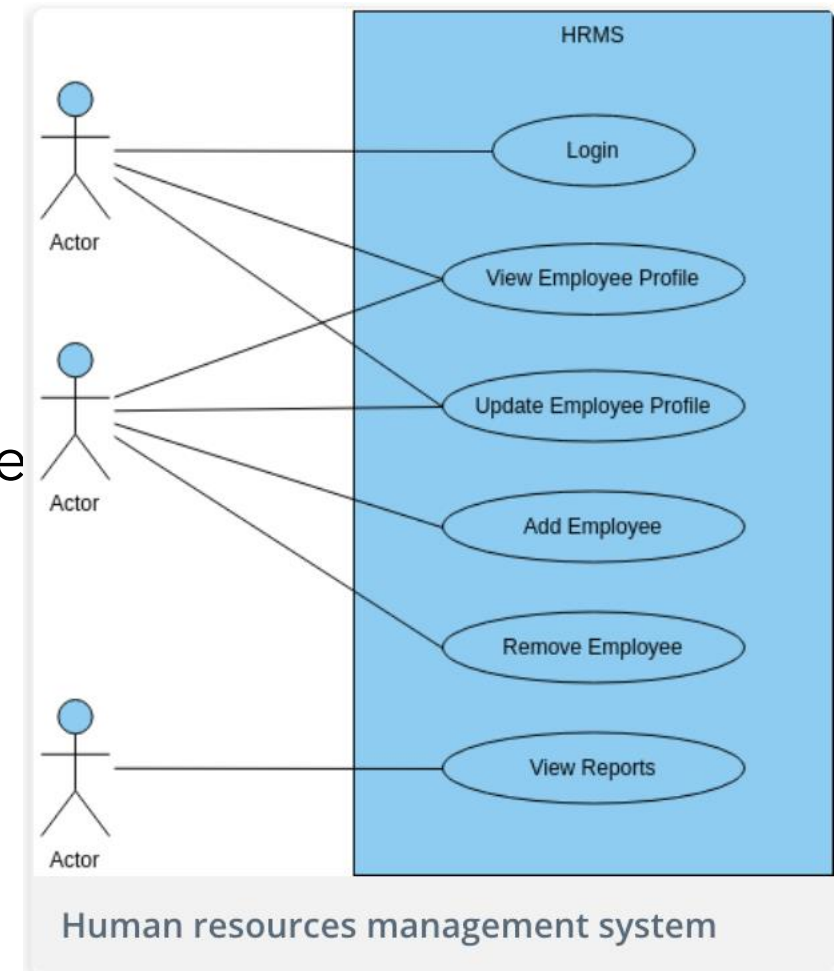
See how fast internet supports modern skills training, robotics, and virtual learning in TVET colleges across South Africa.

When people think about high speed internet in education, the picture is often a research laboratory or a university lecture hall. You might imagine students in white lab coats peering into microscopes, or graduate students joining international professors on a video call. These images reflect how internet connectivity supports learning, collaboration, and access to knowledge across the world. We'll take a look at how connectivity and access to the internet is transforming the way we teach and learn practical skills and trades.

Source: SABEN, 2026 <https://saben.ac.za/robotics-and-workshops/>

Learning enhancements for TVET students: being visual

- Dynamic software for virtual learning and visualisation
- presentation tools like Canva
- use case templates, available on platforms like Visual Paradigm Online
- mind mapping tools and techniques to enhance technical design skills of students, available on sites like XMind
- Acknowledgement for diagram: Visual Paradigm Online <https://online.visual-paradigm.com/diagrams/templates/use-case-diagram/>



Learning enhancements for TVET students: being visible

- Learning content produced by the TVET community
- in business = business plans blog or software
- in creative design = logos that can be monetised
- in construction = visual drawings of solar designs
- in engineering = mechanical drawings blog
- in fashion = fashion mood boards page
- in IT/digital technologies = sharing digital designs, possible monetisation
- Acknowledgement 4 diagram: Pexels
<https://www.pexels.com/photo/illustration-of-stacks-of-coins-and-an-arrow-12920750/>



People as leaders and enablers collaborating with digital technologies

1

Graduates and expertise

- Greater success in graduations versus enrolments
- Greater technical knowledge and expertise of graduates

2

Inclusiveness

- Monitor and measure value and learning inclusiveness
- Economic inclusiveness is supported by entrepreneurial capability

3

Digital platforms for collaboration and visibility

- Create and publish local TVET content across qualifications and courses
- Contribute to the growing national and international body of TVET relevant content

4

Human resource development

- Digital skills development opportunities = learning by making content (in addition to coding)
- Build capacities for disciplinary, multi-, and interdisciplinary communities of learning

Using applications of AI tools and techniques in learning

1

AI enabled tools for virtual learning

- Khanmigo from Khan Academy (maths, science, humanities)
- Recommended by UWC for lecturers <https://libguides.uwc.ac.za/AI-resources/AI-teachingtools> Diffit “tailored resources, modify existing materials, create resources suited for any topic, edit and share resources with students”

2

AI enabled tools for visual learning

- Canva Classroom Magic for lecturers to create attractive visual learning designs
- Visual Paradigm Online templates including generative AI tools
- XMind for mind maps; many AI-based tools

3

Ethics of AI applications in learning

- Institutional AI policy = conditions under which AI should or should not be used in research production = who is a researcher, who is an author
- Transparency a key requirement for ethical and responsible use

4

Human resource development for responsible use of AI tools and techniques

- Training in AI enabled teaching and learning techniques
- Training in exploration and appropriate use of AI tools
- Training in ethics of responsible AI use in teaching and learning

OPEN DISCUSSION

OPEN DISCUSSION

