Assessing graduate employability in the faculty of natural sciences at Mangosuthu University of Technology: A mixed-methods cross-sectional study on challenges and solutions.

Sibonelo Thanda Mbanjwa
Mangosuthu University of Technology P.O. Box 12363 Jacobs 4026 Durban, South Africa

Abstract

Background
Graduate unemployment remains a significant concern in South Africa, particularly in science-related fields where misalignment between academic training and labour market expectations persists. At Mangosuthu University of Technology (MUT), the Faculty of Natural Sciences produces graduates in various disciplines; however, many encounter challenges transitioning into employment. This study assesses the employability of these graduates, identifies employment barriers, and proposes institutional strategies to enhance career readiness.

Methods
A mixed-methods cross-sectional design was used. Quantitative data were gathered via structured questionnaires from 120 recent graduates across multiple disciplines. Qualitative insights were obtained through semi-structured interviews with 10 academic staff and 5 industry employers. The study explored graduates' perceptions of readiness, skill alignment with market needs, and employment outcomes. Data were analysed using descriptive statistics, thematic analysis, and triangulation.

Results
Only 38% of graduates secured employment within 12 months post-graduation. Key barriers included limited work-integrated learning, insufficient practical experience, and poor industry exposure. Employers reported deficiencies in communication, problem-solving, and digital competencies. Academic staff highlighted the need for curriculum reform and stronger industry collaboration. A clear disconnect between academic preparation and employability expectations emerged.

Conclusion
Graduate employability challenges in the Faculty of Natural Sciences are linked to structural gaps in the curriculum and limited experiential learning. While graduates possess core scientific knowledge, their employability is constrained by inadequate workplace exposure and soft skills.

Recommendations
MUT should enhance work-integrated learning, introduce industry-driven short courses, incorporate soft skills into the curriculum, and foster formal partnerships with employers. These interventions will better align education with industry needs, improving graduate employability and institutional impact.

Corresponding author: Sibonelo Thanda Mbanjwa
Email: mbanjwa.sibonelo@mut.ac.za ORCHID 0000000319417669
Mangosuthu University of Technology P.O. Box 12363 Jacobs 4026 Durban, South Africa

Introduction

Graduate employability has become a central concern for higher education institutions worldwide, particularly in developing countries such as South Africa, where youth unemployment remains high (CHE, 2016). Universities of technology, such as Mangosuthu University of Technology (MUT), have a mandate to produce graduates equipped with both theoretical knowledge and practical skills relevant to the job market. However, despite academic achievements, many graduates struggle to transition into the workforce, raising concerns about curriculum alignment, industry engagement, and career readiness (McGhie, 2017; Mlambo, 2021).

In recent years, the disconnect between higher education outputs and labour market needs has become increasingly evident. While South African universities have expanded access and increased graduation rates, the rate of graduate unemployment remains disproportionately high, particularly among science and technology disciplines (Letseka & Maile, 2008). Studies have highlighted the importance of work-integrated learning, soft skills development, and employer partnerships in enhancing employability (Kuh et al., 2005; Tinto, 1993). At MUT, anecdotal evidence suggests that graduates from the Faculty of Natural Sciences face considerable barriers to employment. These may include inadequate practical exposure, poor communication skills, and a lack of tailored career guidance. However, there has been limited empirical research assessing these factors within the MUT context, which this study aims to address. This study seeks to assess graduate employability in the Faculty of Natural Sciences at MUT by identifying challenges faced by graduates in securing employment and proposing institutional strategies to improve career outcomes.

Research Objectives

- To assess the employment status of graduates from the Faculty of Natural Sciences at MUT.
- To identify key challenges affecting the employability of these graduates.
- To explore employer perceptions of MUT graduates' skills and workplace readiness.
- To recommend institutional strategies to bridge the gap between academic training and labour market expectations.

Research question

What are the employment outcomes of graduates from the Faculty of Natural Sciences at MUT, and how can academic and co-curricular programs be improved to address the challenges and skill gaps identified by employers?

Methodology

Study design

This study employed a *convergent parallel mixed-methods cross-sectional design*. In this design, quantitative and qualitative data were collected concurrently during the same time frame (cross-sectional), analysed separately, and then integrated to provide a comprehensive understanding of graduate employability within the Faculty of Natural Sciences. The design allowed for the comparison and triangulation of numerical trends and in-depth perspectives from graduates, academic staff, and industry employers.

Data collection procedure and tools

Data were collected from two primary sources: recent graduates from the Faculty of Natural Sciences and key informants (academic staff and industry employers).

Quantitative data were obtained through structured self-administered questionnaires distributed to 120 graduates, designed to capture demographic details, employment status, perceptions of employability, and views on curriculum relevance.

Qualitative data were gathered through semi-structured interviews with 10 academic staff members and 5 industry employers. An interview guide was used to explore experiences, perceptions of graduate readiness, and recommendations for improving employability. All interviews were audio-recorded with consent and transcribed verbatim.

Statistical analysis

Quantitative data were analysed using descriptive statistics (frequencies, percentages, means) via SPSS software to identify employment rates, skill gaps, and perceived barriers.

Qualitative data were analysed thematically using Braun and Clarke's six-phase approach. Transcripts were coded

inductively, and emerging themes were identified around graduate skills, curriculum gaps, and employer expectations. Triangulation of quantitative and qualitative findings was performed to validate results and ensure the depth and credibility of interpretations.

Study setting

The study was conducted within the Faculty of Natural Sciences at Mangosuthu University of Technology (MUT), located in Durban, KwaZulu-Natal, South Africa. Data collection took place between March and May 2024 and included graduates from the Departments of Nature Conservation, Analytical Chemistry, and Environmental Health. Interviews with faculty, staff, and employers were conducted at the university and through virtual platforms.

Participants

The primary participants for the quantitative component were 120 recent graduates who completed their qualifications between 2022 and 2023. Eligibility criteria included having completed a diploma or degree within the Faculty of Natural Sciences and being reachable through the university alumni contact records. For the qualitative component, 10 academic staff members and 5 employers from science-related industries were purposively selected based on their direct involvement in graduate development and hiring.

Bias

To minimize selection bias, stratified sampling was used to ensure graduate representation across departments. Questionnaire items were pilot-tested to improve clarity and reduce measurement bias. Interview questions were standardized, and triangulation was applied by comparing data from graduates, academics, and employers to enhance credibility.

Study size

The sample size of 120 graduates was determined based on the estimated number of available recent graduates in the faculty's alumni database and using a 95% confidence level with a 5% margin of error. The size was deemed sufficient to generate representative findings and allow for subgroup analysis across disciplines.

Statistical analysis

Quantitative data were analysed using IBM SPSS Version 27. Descriptive statistics (frequencies, percentages, means) were used to summarize employment outcomes and graduate perceptions. Inferential analysis, including chi-square tests and cross-tabulations, was conducted to examine associations between employability factors. Missing data were handled using pairwise deletion to preserve as much of the dataset as possible without distorting overall trends.

Ethical considerations

The study was approved by the Mangosuthu University of Technology Research Ethics Committee. Ethical clearance was granted on 15 February 2024. All participants provided informed consent before participation, and confidentiality and anonymity were maintained throughout the research process.

Results and Findings

Participants and participant flow

A total of 120 recent graduates from the Faculty of Natural Sciences at Mangosuthu University of Technology were invited to participate through purposive sampling, targeting graduates who completed their qualifications between 2021 and 2023. Out of the 120 invited, 102 completed the questionnaire, yielding an 85% response rate. For the qualitative component, 10 academic staff members (from various departments within the Faculty of Natural Sciences) and 5 employers representing industries relevant to the faculty's disciplines were purposefully selected and interviewed. All selected participants consented to participate, resulting in a 100% participation rate for the qualitative phase.

Demographic characteristics of graduate participants (n = 102)

Age: Mean age = 25.6 years (SD = 2.8); range: 22 to 33 years
Gender: Female = 58% (n = 59); Male = 42% (n = 43)

Field of study

Environmental Science = 35%
Chemistry and Chemical Technology = 28%
Biomedical Science = 22%
Other (e.g., Physics, Mathematics, and related fields) = 15%

Employment status (12 months post-graduation)

Employed = 38%
Unemployed = 62%

Figure 1 reveals critical insights into the employment outcomes and challenges faced by graduates from the Faculty of Natural Sciences at Mangosuthu University of Technology (MUT). As illustrated in the first graph, only 38% of graduates were able to secure employment within 12 months after graduation, while a substantial 62% remained unemployed. This figure is alarming, given the increasing focus on graduate employability in higher education. It reflects not only the broader national issue of graduate unemployment in South Africa but also points to potential misalignment between the curriculum and labour market expectations in the Natural Sciences disciplines at MUT.
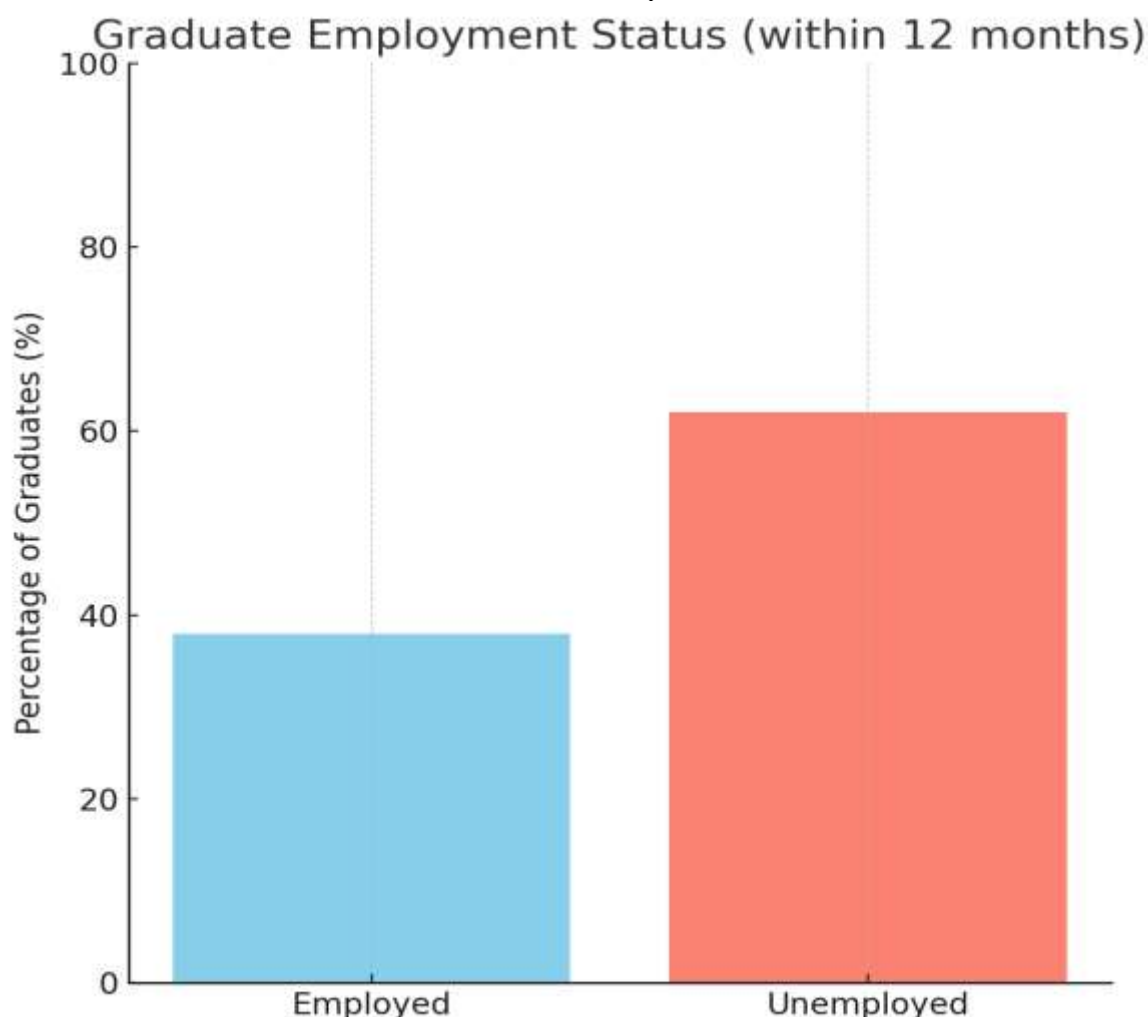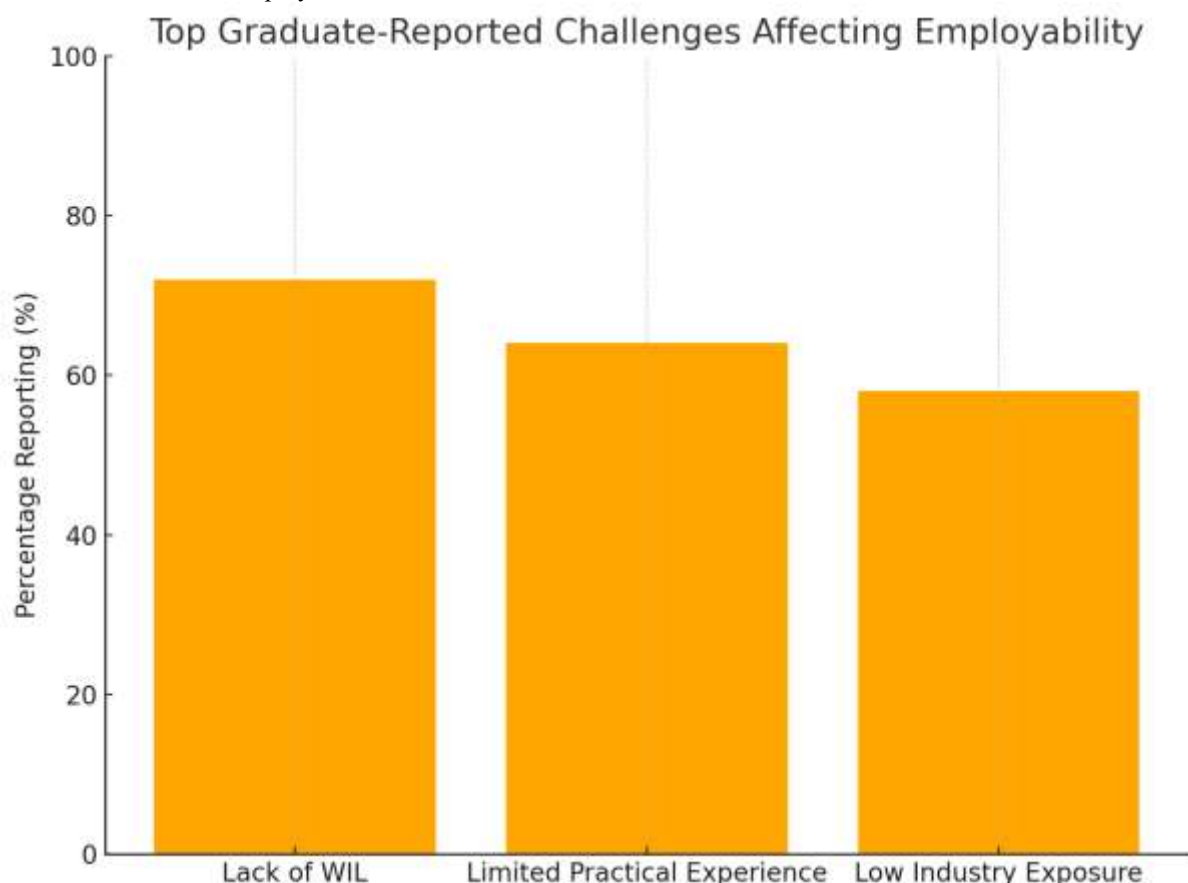

Figure 1: The graph represents graduate employment status

Figure 2 further elaborates on these employment outcomes by highlighting the top challenges reported by graduates. The majority (72%) identified the lack of Work-Integrated Learning (WIL) opportunities as the most significant barrier to employment. This was followed by limited practical experience (64%) and low industry exposure (58%). These results suggest that although graduates may possess theoretical knowledge, they often lack the hands-on, real-world experience needed to transition smoothly into the workplace. The

findings emphasize the importance of embedding experiential learning into academic programs to improve students' readiness for employment.

Figure 2: The graph represents graduate-reported challenges

Figure 3 presents the perspective of employers, who echoed the concerns of graduates by pointing out specific skill deficiencies that hinder employability. The most frequently cited shortfalls were in communication skills (65%), problem-solving abilities (59%), and digital literacy (53%). These findings underscore a disconnect between the competencies valued in the job market and those being cultivated through academic training. Employers appear to prioritize soft skills and digital competencies that are often not explicitly taught in traditional science curricula.
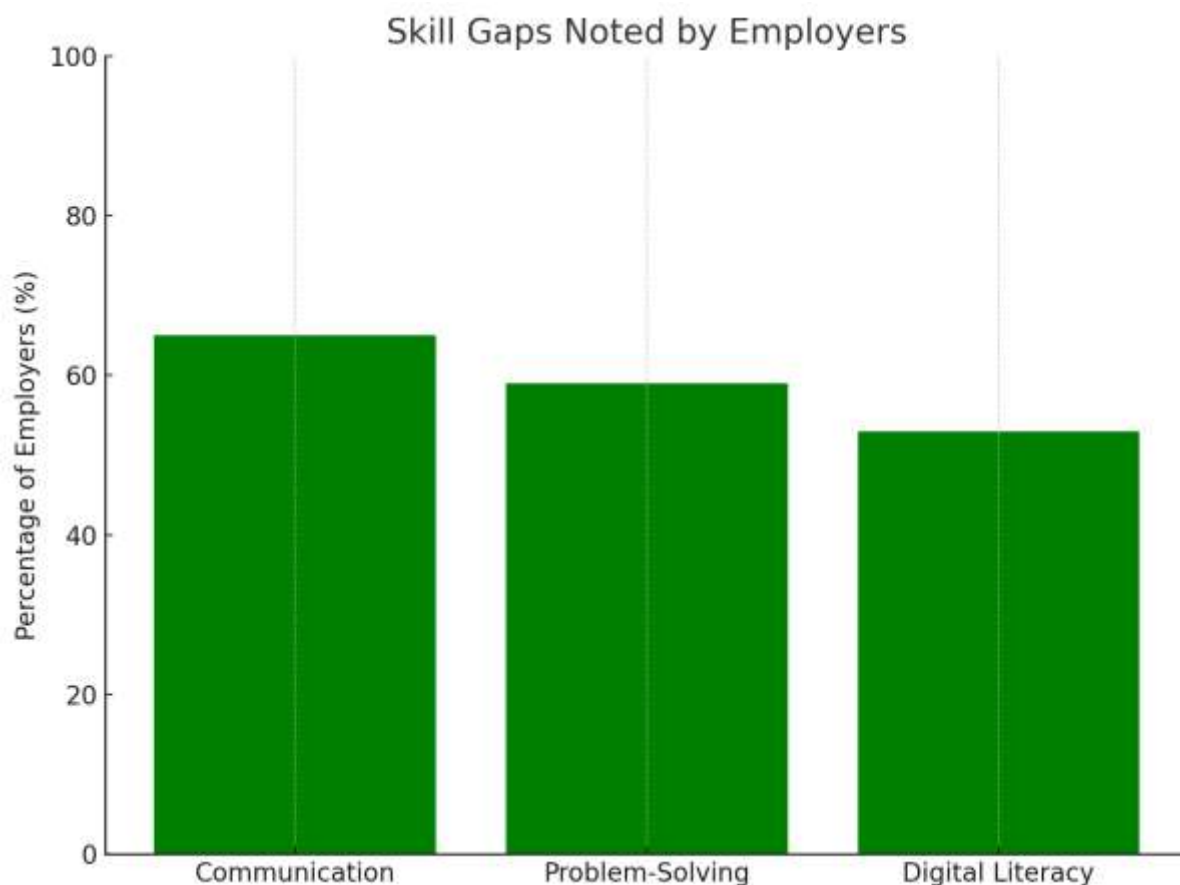
Figure 3: The graph represents employer–identified skills gaps

Discussion

The results of the study reveal critical insights into the employment outcomes and challenges faced by graduates from the Faculty of Natural Sciences at Mangosuthu University of Technology (MUT). As illustrated in the first graph, only 38% of graduates secured employment within 12 months after graduation, while a substantial 62% remained unemployed. This figure is alarming in light of national data, where graduate unemployment in South Africa remains a persistent challenge, particularly in science, technology, engineering, and mathematics (STEM) fields (CHE, 2021; StatsSA, 2023). Similar patterns have been reported in other South African studies, which show that while higher education enrolment has increased, many graduates still face difficulties transitioning into the labour market (Akoojee & Nkomo, 2007; Mlatsheni, 2014).

The second graph elaborates on these outcomes by highlighting key barriers to employment. A majority of graduates (72%) cited the lack of Work-Integrated Learning (WIL) opportunities as the most significant challenge, followed by limited practical experience (64%) and insufficient industry exposure (58%). These findings are consistent with studies by Archer & Chetty (2013) and Erasmus & Loedolff (2020), which emphasize that WIL and practical experience are critical enablers of employability in science-related fields. The mismatch between theoretical knowledge and practical competencies continues to hinder graduates' transition into the workforce (Papier, 2017).

The third graph reflects employer perspectives, with major skill gaps reported in communication skills (65%), problem-solving abilities (59%), and digital literacy (53%). This aligns with previous research (Pitan & Muller, 2020; Walker & Fongwa, 2017), which highlights those employers increasingly value transferable soft skills and digital proficiency in addition to technical expertise.

The evident disconnect between the competencies cultivated within the academic programs and the skills demanded in the job market calls for urgent curriculum reform and closer collaboration between MUT and relevant industries.

Generalisation

Despite being institution-specific, the study's findings are highly relevant to other universities of technology and higher education institutions serving similar student populations in South Africa. The challenges identified, limited work-integrated learning, insufficient soft skills training, and weak industry linkages are common across many academic institutions in developing contexts. Therefore, while the findings should be applied with contextual sensitivity, they offer valuable insights that can inform broader national discussions on graduate employability and curriculum reform. Future research involving multiple institutions, extended follow-up periods, and comparative industry analysis would further enhance the understanding and transferability of the results.

Conclusion

The results suggest that the employability challenges faced by graduates from MUT's Faculty of Natural Sciences are both structural and skills-based. While graduates demonstrate strong foundational scientific knowledge, their competitiveness in the labour market is weakened by limited practical training, weak industry linkages, and inadequate development of transferable skills. The absence of applied learning and insufficient exposure to professional work environments compromises their job readiness. These findings underscore the need for strategic interventions in curriculum design, industry collaboration, and career preparation to address the current employability gap.

Limitations

This study faced several limitations. First, while graduate participants were purposefully sampled, not all invited graduates responded, resulting in an 85% response rate; therefore, there is potential for non-response bias, as the views of those who did not participate may differ from those who did. Second, the study was confined to the Faculty of Natural Sciences at Mangosuthu University of Technology, which limits the scope of findings and reduces their transferability to other faculties or institutions. Third, logistical constraints limited the number of industry employers interviewed to five, which may not fully represent the diversity of employer expectations across all relevant sectors. Fourth, the cross-sectional design provided a single point-in-time perspective, which does not account for how graduates' employment outcomes might change over time. Lastly, the study did not capture variables such as students' socioeconomic status, geographic location, or prior work experience, factors that could influence employability outcomes and should be explored in future research.

Recommendations

To enhance graduate employability, the study proposes several key actions. First, MUT should prioritize the expansion and formalization of Work-Integrated Learning (WIL) programs by embedding internships, project-based learning, and job-shadowing opportunities into the curriculum. Second, the university must collaborate closely with industry partners to co-develop practical modules and short courses that reflect evolving labour market needs. In addition, soft skills training, including communication, teamwork, digital proficiency, and problem-solving, should be systematically integrated into academic programs through interdisciplinary modules, group projects, and mentorship initiatives. Finally, the establishment of a structured graduate tracking system and ongoing employer feedback mechanisms will allow MUT to monitor graduate outcomes and continuously refine its employability strategies.

Biography

Dr. Sibonelo Thanda Mbanjwa is a dedicated lecturer in the Department of Nature Conservation at Mangosuthu University of Technology (MUT), South Africa. He holds a Ph.D. in Environmental Science and specializes in biodiversity conservation, sustainable development, and environmental education. Dr. Mbanjwa is deeply committed to community engagement, student mentorship, and the integration of indigenous knowledge systems into conservation practices. His work bridges academia and practical application, empowering students and communities through innovative teaching, research, and outreach initiatives.

Acknowledgements

Conservation, Faculty of Natural Science, Mangosuthu University of Technology.

Funding

Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

Author Contributions

I, the author, contributed to the study conception and design. Material preparation, data collection, and research were performed by Mbanjwa S.T. The first draft was written by Mbanjwa S.T.

Data Availability

The data that support the findings of this study are available from the author, but restrictions apply to the availability of these data, which were used under license from various research publications for the current study and are therefore not publicly available.

References

1. Akoojee, S. & Nkomo, M., 2007. Access and quality in South African higher education: The twin challenges of transformation. South African Journal of Higher Education, 21(3), pp.385-399. https://doi.org/10.4314/sajhe.v21i3.25712

2. Archer, E. & Chetty, Y., 2013. Graduate employability: Conceptualisation and findings from the University of South Africa. Progressio, 35(1), pp.134-165.

3. Council on Higher Education (CHE), 2016. South African higher education reviewed: Two decades of democracy. Pretoria: Council on Higher Education.

4. Council on Higher Education (CHE), 2021. VitalStats: Public Higher Education 2019. Pretoria: Council on Higher Education.

5. Erasmus, J. & Loedolff, P., 2020. Graduate employability: What do graduates and employers think? Industry and Higher Education, 34(5), pp.290-301.

6. McGhie, V., 2017. Entering university studies: Identifying enabling factors for a successful transition from school to university. South African Journal of Higher Education, 31(1), pp.136-153. https://doi.org/10.20853/31-1-1006.

7. Mlambo, V.H., 2021. Exploring the factors affecting undergraduate academic performance in South African universities. Perspectives in Education, 39(1), pp.234-249. https://doi.org/10.18820/2519593X/pie.v39.i1.14. https://doi.org/10.18820/2519593X/pie.v39.i1.14

8. Mlatsheni, C., 2014. Youth unemployment and the transition from school to work in Cape Town. REDI3x3 Working Paper 15. University of Cape Town. https://doi.org/10.5235/2049761148114222476

9. Pitan, O.S. & Muller, C., 2020. Students' employability and its implications for curriculum reform in higher education: A literature review. Industry and Higher Education, 34(5), pp.339-347.

10. Statistics South Africa (Stats SA), 2023. Quarterly Labour Force Survey: Quarter 4, 2022. Pretoria: Stats SA.

11. Walker, M. & Fongwa, S., 2017. Universities, employability, and human development. London: Palgrave Macmillan. https://doi.org/10.1057/978-1-137-58452-6

PUBLISHER DETAILS