‘Glocalising’ quantitative business skills development through learning content contextualization & technology-enhanced delivery: An international collaborative case

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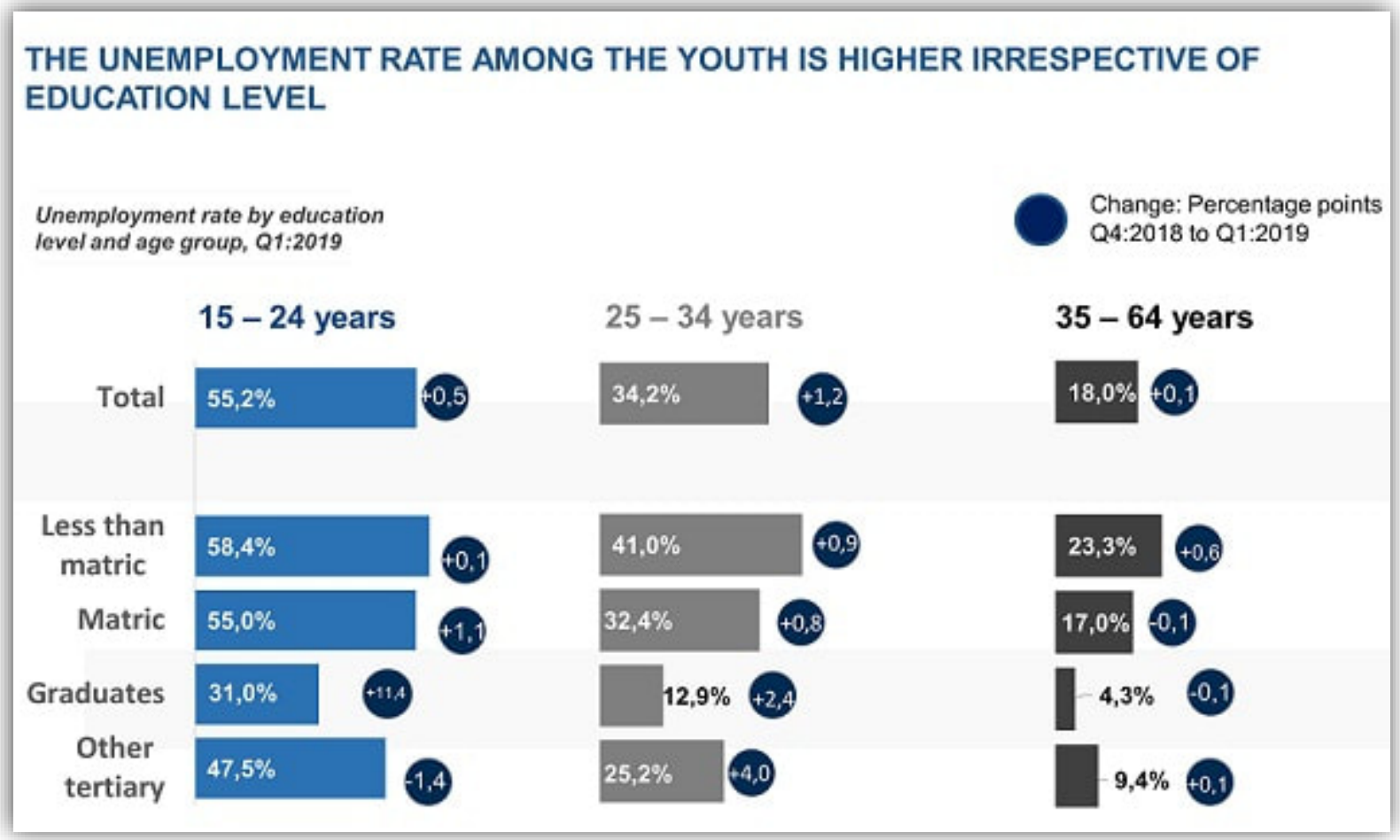
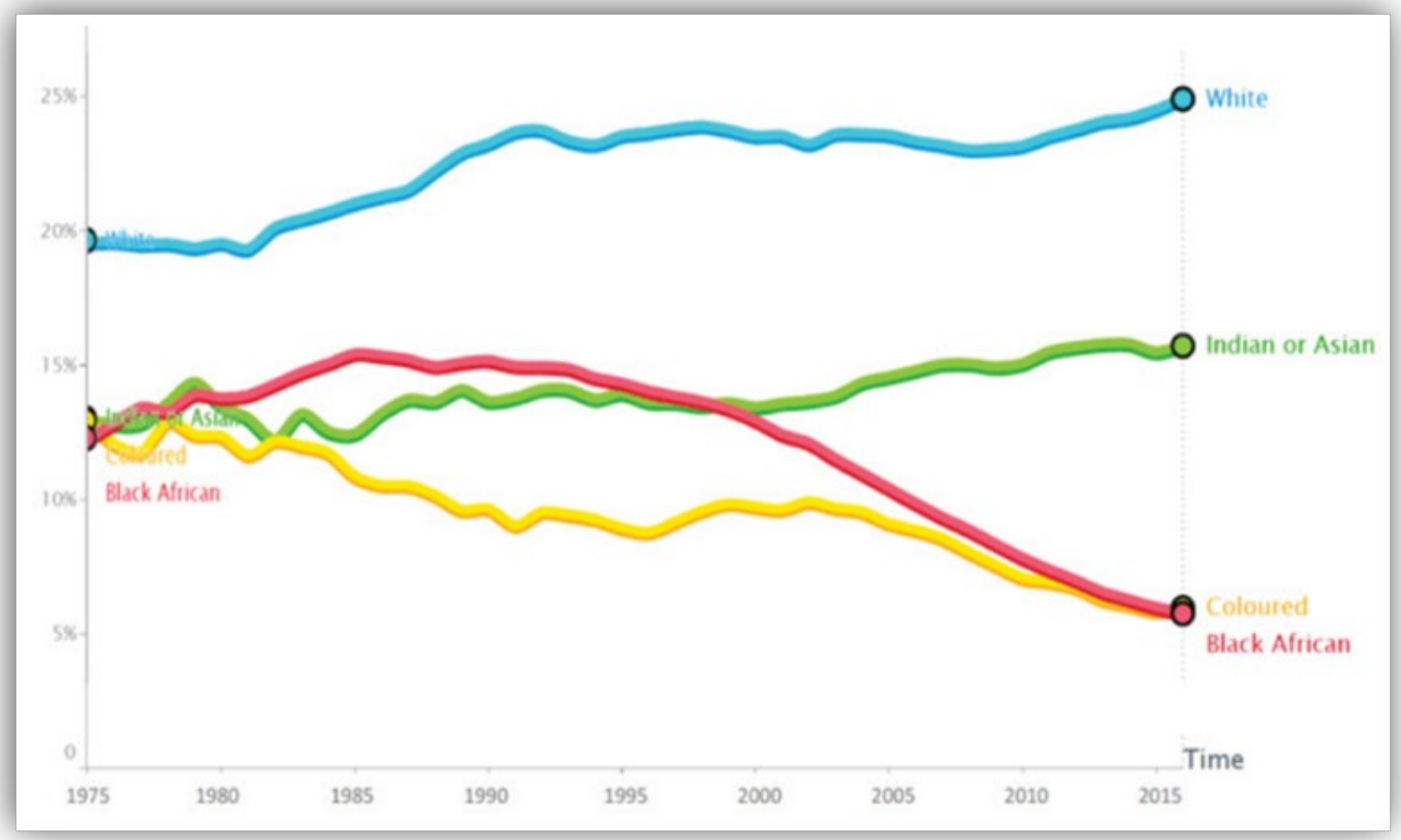
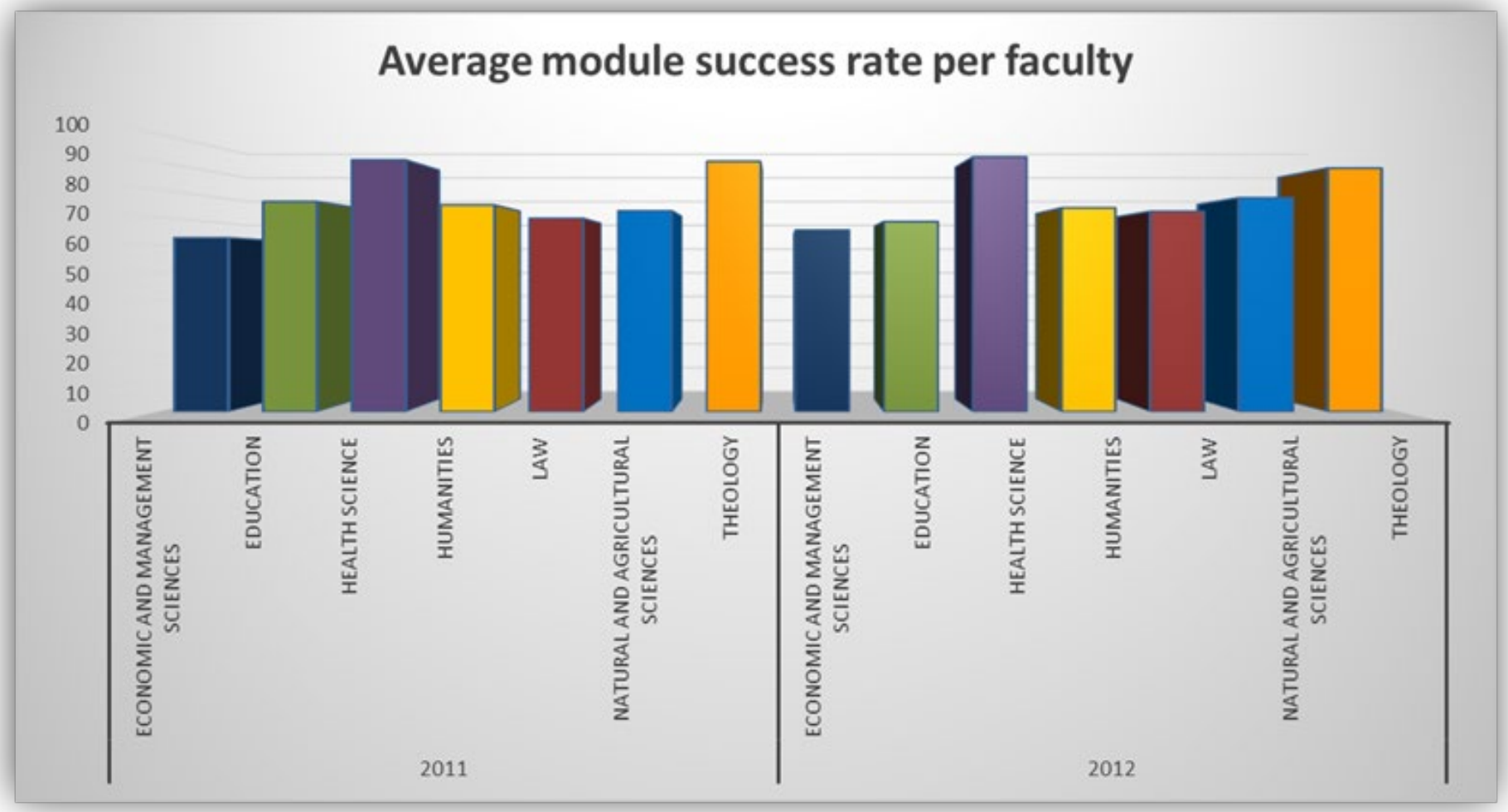
South Africa faced with high unemployment rates



And… continuous achievement gaps



Challenges at the UFS



Data in the Faculty of Economic & Management Sciences (UFS)

NSC Mathematics performance

Economics I (EECF) performance

Graduation

Focus on quantitative skills development

What is Carnegie Math Pathways®?

- Proven accelerated developmental mathematics programme for US community colleges for over a decade.
- Combines research & educator experience to create an innovate approach that supports students who previously struggled with mathematics to deeply understand & even enjoy the subject.
- On average, Pathways students are achieving success at 3x the rate of their peers – through engaging in relevant content in a productively challenging and supportive environment.
- Critical elements:
  - Active instruction
  - Productive persistence
  - Relevant, authentic curriculum
  - Data inform instruction

Carnegie Math Pathways® offerings

Quantway

Quantitative reasoning course solutions designed to promote success in mathematics and to develop critical thinking and quantitative literacy.

Statway

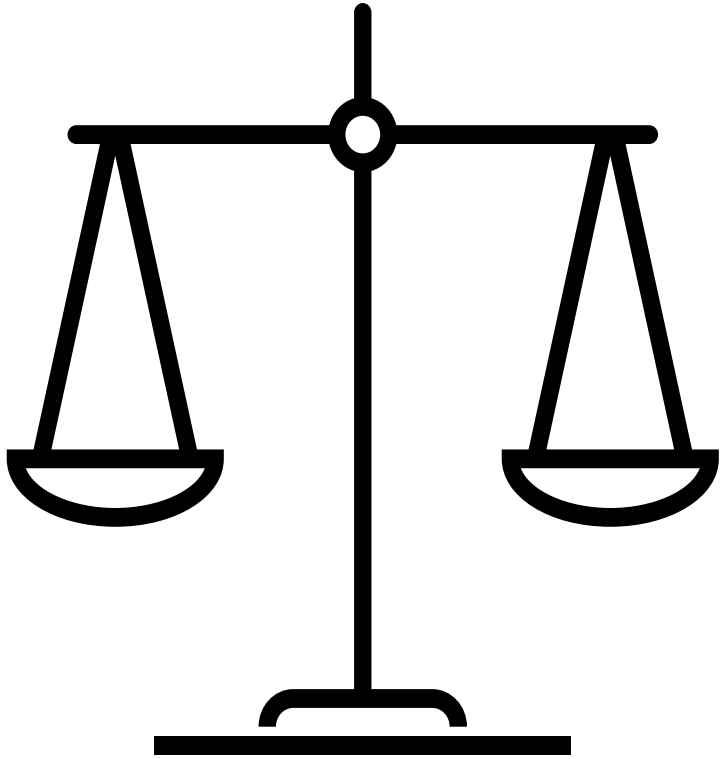
Statistical reasoning course solutions designed to teach mathematics skills essential for a growing number of occupations and needed for decision-making under conditions of uncertainty.

Comparable with existing academic courses

Meet the team!

Curriculum development (contextualization)

21st century skills/ Employable graduates

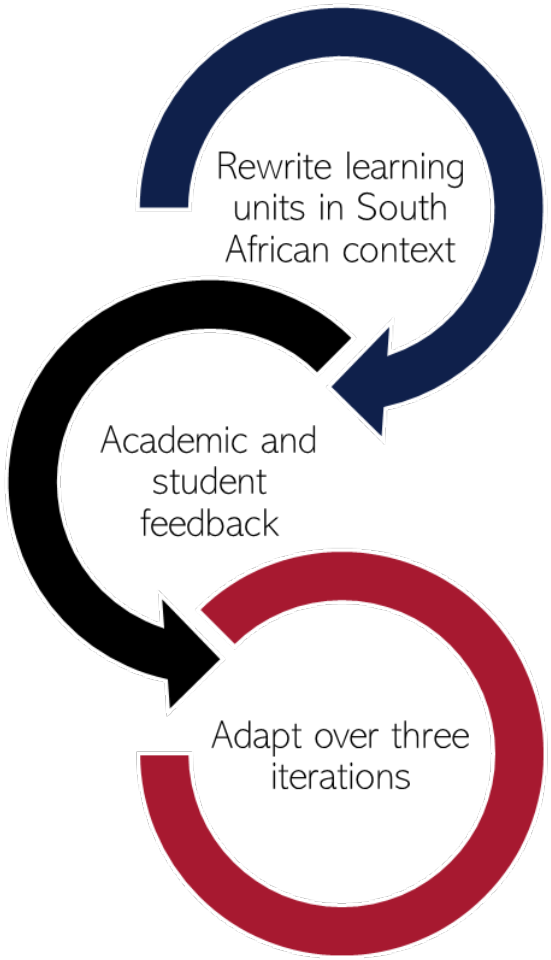


Competitive business world (local & global)

Global content

Local content

Contextualization for the South African context



Minor contextualisation

- Metric unit changes in preparation exercises and collaborations (not changed in (assessment) exercises, due to link with formal assessment)
- Phrases/ Words changed for context, e.g., Campus Principal changed to Rector, Faculty changed to Lecturer/Academic staff

Intermediate contextualisation

- Questions/ Examples within units changed completely, e.g., baseball/basketball to soccer/rugby
- American states with e.g., population, changed to South African provinces with comparable population data
- Temperature/Rainfall changed to South African areas with comparable weather conditions

Whole unit contextualization

- US census-based unit changed to South African census-based unit (focusing on the availability of water and electricity in SA households)
- US cost-of-living unit changed to South African cost-of-living unit
- US wage-based unit changed to a unit based on the South African minimum wage

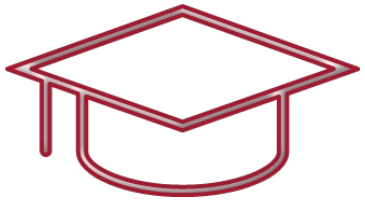
The Kresge Foundation and contextualization

THE KRESGE FOUNDATION

- Significant funding to support the contextualization of the Carnegie Math Pathways content for the South African context
- In support of quantitative skills development in South Africa

UFS UV

- Support from the UFS and the Faculty of Economic and Management Sciences to further develop quantitative skills in EMS students due to the link with academic success and ultimately graduation

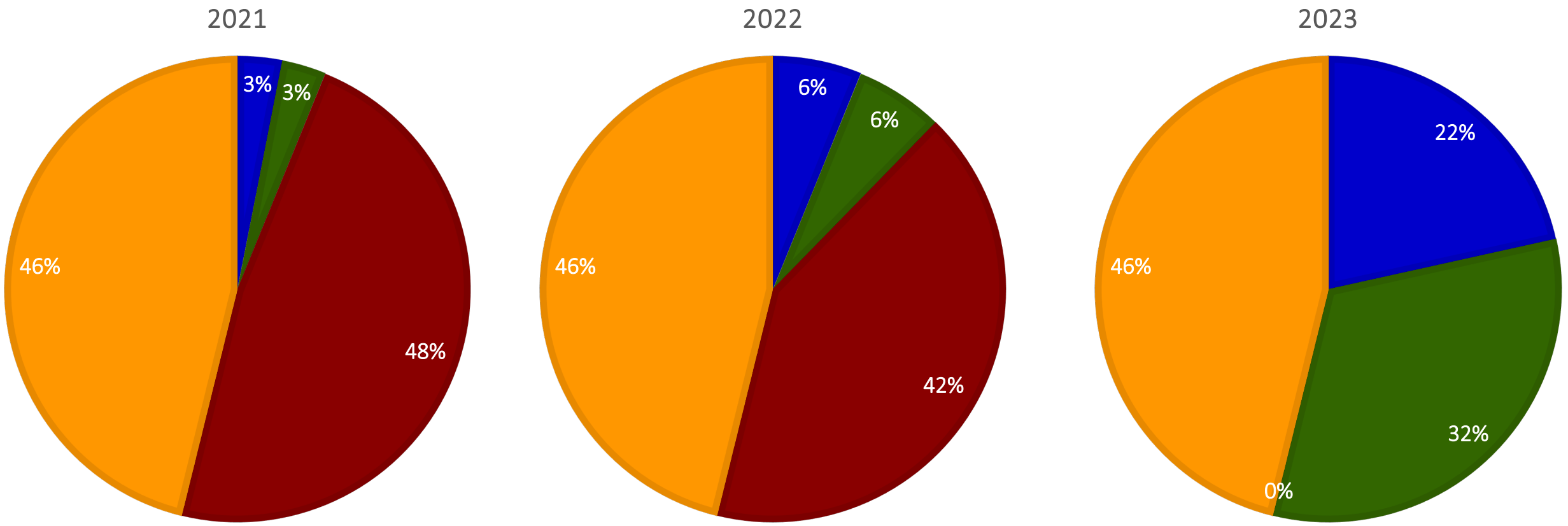


- Continue to be student-centred, but even more include students as co-creators
- Starting to move within the field of decolonization, social justice, and others

"Explain to your group any other contexts (such as from your culture, community or history) where the concepts you learned today will also be relevant."

- e.g., American children gunned down changed to South African teen pregnancies

Balancing the South African & global context



Uncontextualised (global)

Uncontextualised (US-specific context)

Total Quantway contextualized

Total Statway contextualized

Contextualization – a data perspective…

Strongly agree	Agree	Somewhat agree	So		e
I was more engaged and interested in units th					
91 (33.6%)	87 (32.1%)	57 (21%)	(3		(3.32%)
I was engaged and interested in most of the units (n=269)					
92 (34.2%)	93 (34.57%)	67 (24.91%)	13 (4.83%)	3 (1.12%)	1 (0.37%)

"…I have learned a lot about the country and how policies around the world are related. I have learned how some concepts are applied in my life like the tax system. This course has some links which can be followed to further your learning on specific concepts which is very exciting…"

Technology-driven delivery (in a South African context)

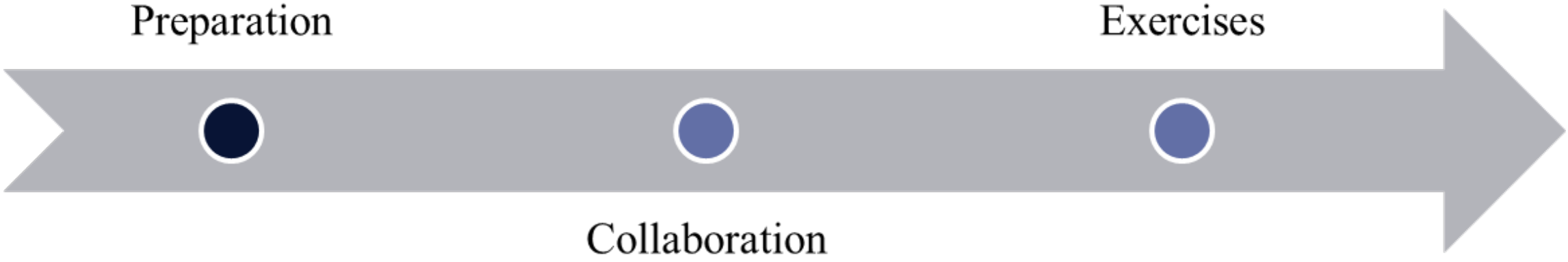
Large classes (600+)

Device/ data availability

COVID-19

Load shedding

Carnegie Math Pathways® learning journey



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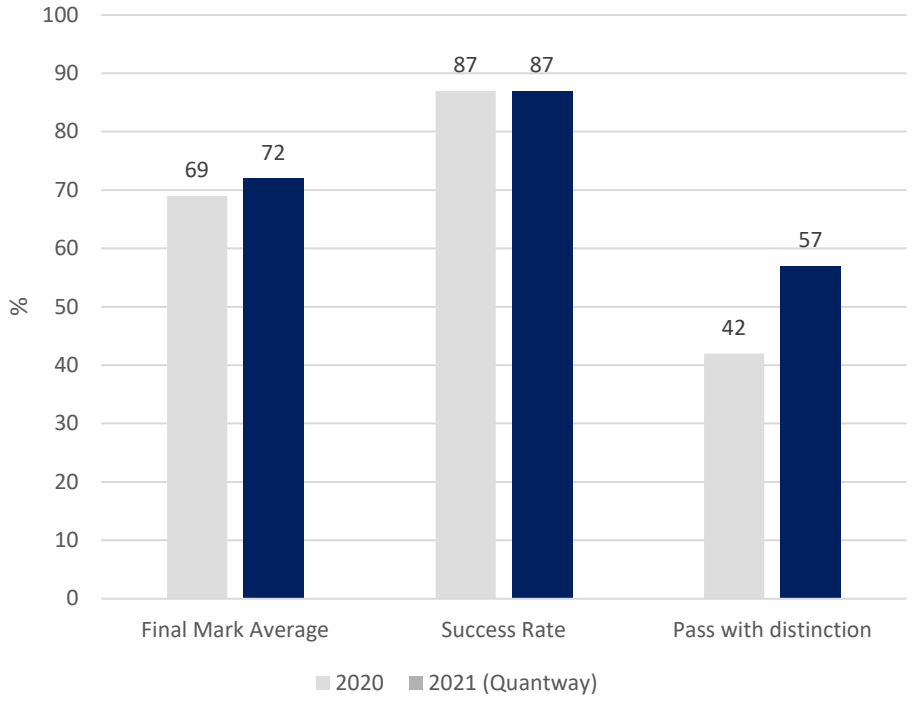
Small groups in large classes!

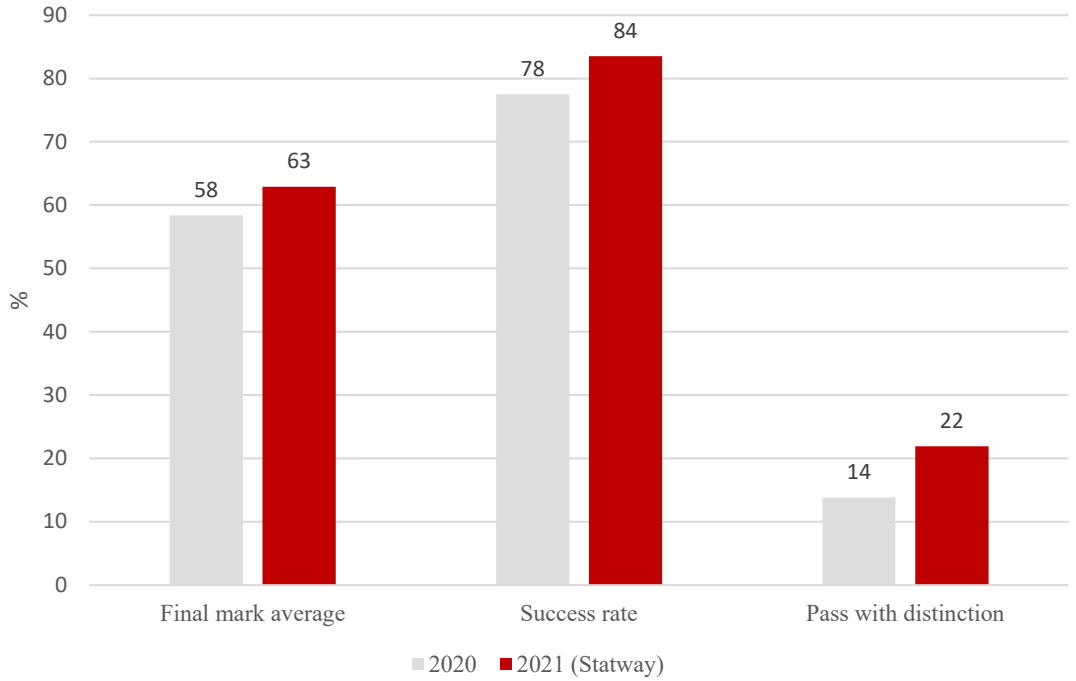
Metric	Mean	Correlation with Final Mark	
Completion of Collaborations	25 out of 31	.69	
Attendance of Collaborations	19.11	.72	p< .001
Marks for Collaborations	84.4%	.35	p<.001

Firstly, the collaboration sessions are helpful because we get to discuss and share ideas on how to solve problems. We are exposed to new strategies. That is one valuable aspect about this module.

Source: UFS end of year review 2021, WestEd

Academic performance





How do we compare internationally?

	Quantway Core	Statway College	Statway Corequisite
UFS	85.3%	83.5%	83.5%
Network	69.1%	69.4%	62.4%

Source: UFS end of year review 2021, WestEd

	QW W1	QW W5	QW EOT	SW W5	SW EOT
Growth Mindset	3.21	3.84	3.73	4.21	4.29
Stereotype Threat	3.77	3.88	3.96	3.92	3.87
Math Anxiety	2.77	2.93	3.19	2.90	2.67

Student perspectives on additional skills developed (beyond quantitative skills)

*"I have learnt to be more outspoken about my ideas, ask for assistance when needed and this has enhanced my **communication skills**"*

"Working in groups has allowed me to see things in different perspective and how various methods lead to similar results. Thus, this allowed me to listen to other people's opinion to broaden my knowledge."

"The course was fun and a lot of technology was there."

"Skills I developed was to think outside the box."

*"The discussions and being taught on how to **solve problems** have enlightened me on how to approach a certain problem."*

Musawandile Mchunu

- 2nd year BCom student
- Enrolled EQMB1514/24 in 2022

Challenges

- Time to institutional readiness
  - Contract and data sharing agreement
  - Tech approval and ICT integration of systems
  - Academic approval processes for new modules
- Funding for pilot research project and student licensing fees
- Resources for curriculum preparation
  - Time and human resources (initial mapping, contextualisation, admin)
- COVID-19 lead to implementation changes
  - Timing of roll-out
  - Modality and initial technical and access challenges
- Turnover of contract staff

Successes

- ❑ Extension of Carnegie Math Pathways® network to Africa
- ❑ Contextualisation for the South African context
- ❑ Small group collaborations in a large class
- ❑ Multi-level collaboration and support
- ❑ Academic success

Students involved:

- 2021 = 960 students
- 2022 = 1191 students
- 2023 = 1263 students

Total of **3414 students** thus far

Way forward

Locally relevant
Regionally impactful
Globally competitive

Way forward

Locally relevant

Regionally impactful

Globally competitive

Invitation

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Thank you

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