

# Offering high quality individualised learning using adaptive intelligence

July 2018

*Diagnostic Mathematics Information for Student Retention and Success (DMISRS)  
Project Symposium, 19-20 July 2018*





si·ya·vu·la

/,sɛɪyɑ vʊo lɑ/

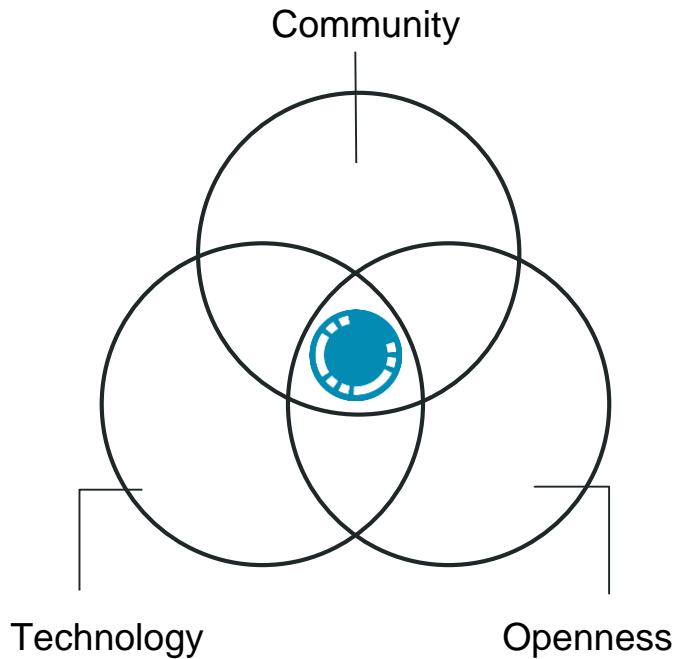
*phrase*

Common to the  
Nguni languages of  
Southeastern Africa

We open.

We are opening.

# Mission

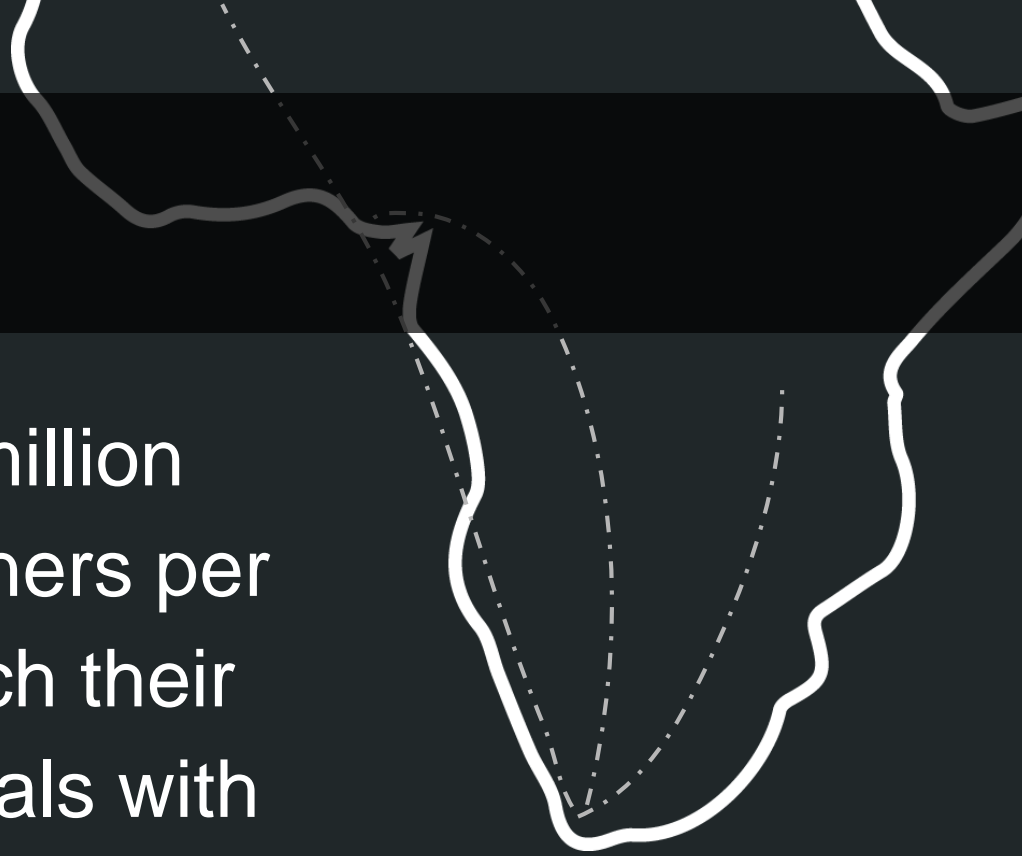


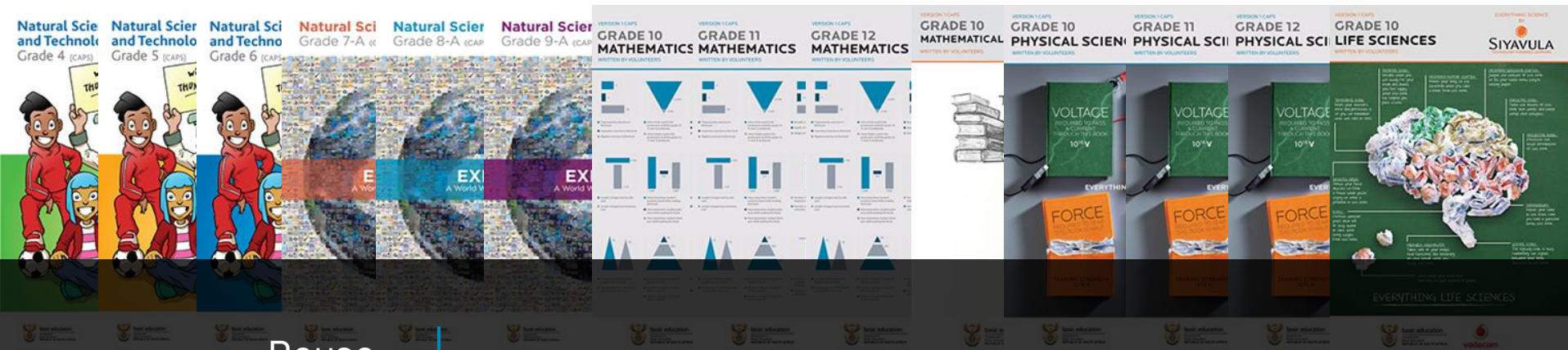
Our mission is to **champion** a love of maths and science by creating **rich, integrated learning experiences** for people **everywhere** through the use of **science** and **technology**.

---

# Goal

By 2025 help 10 million  
aspiring African learners per  
year to set and reach their  
Maths & Science goals with  
us.





Reuse  
Remix  
Revise  
Redistribute  
Retain

We've produced a catalogue of openly licensed textbooks

Print books in SA

10M copies

25 000 schools

4.5M learners

20% cost

Online reading

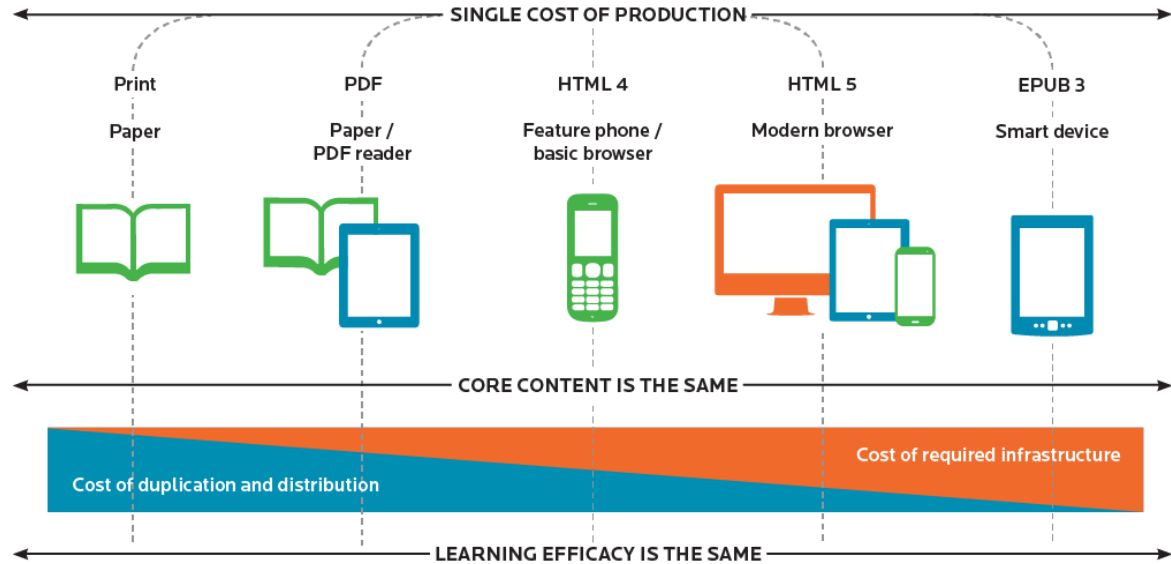
17,8M pageviews

6,3M users

11,2M sessions

free

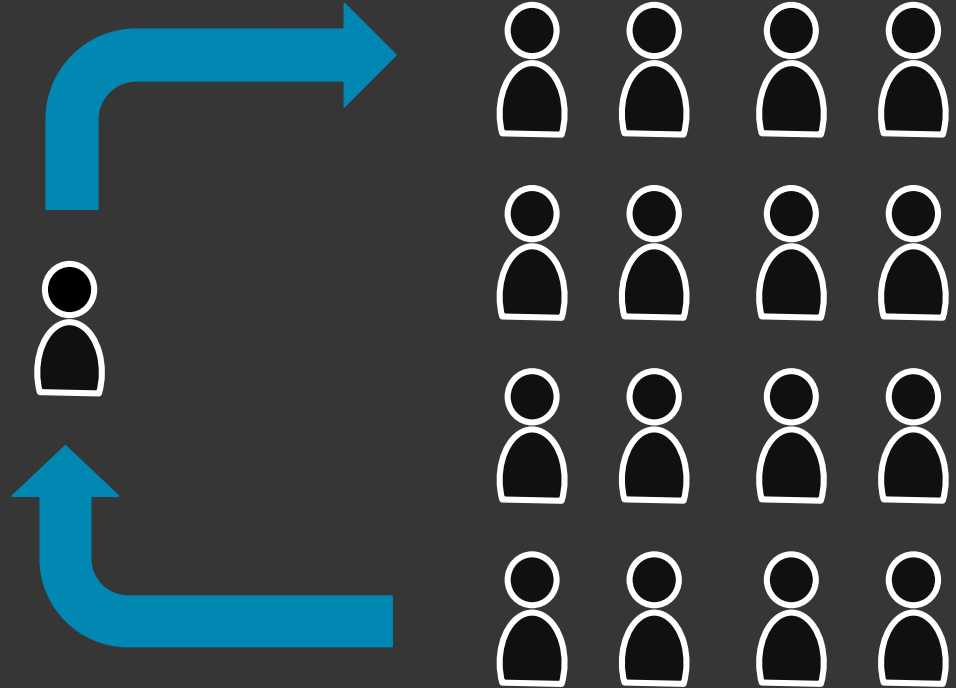
Access to textbooks is a basic requirement, but the format in which you read that book makes no difference to your learning.



Let machines do what machines do well to enable people to do what people do well.

1

Start with learners



2

Enable teachers

# We refocused on some foundational research

---

Research-based theory of how people learn that is educationally relevant

=

The science of  
**LEARNING**

Evidenced-based principles for how to help people learn that is grounded in cognitive theory

=

The science of  
**INSTRUCTION**





---

And explored the key elements of  
**Mastery-based learning**

# What kinds of practice enhance learning?

Practising for mastery needs to be:



Goal directed with  
targeted feedback



At the appropriate  
level of challenge



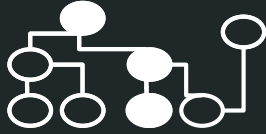
Of sufficient quantity



Sequenced  
appropriately



Generative  
question items



Adaptive engine



Delivery platform

So we built a tool that can  
give you all that.

Driven by an adaptive learning engine, Siyavula's practice service gives you the opportunity to set your own goals; practise an unlimited number of exercises at an appropriate level of difficulty; get immediate, detailed feedback; and track your progress.

On Siyavula's practice service each question is automatically generated.

Practise as much as you need to.

EVERYTHING MATHS & SCIENCE SIYAVULA

### Opposite angles of a cyclic quadrilateral: Theorem

The figure below is drawn to scale. It shows a circle with centre  $O$  and 5 points:  $A, B, C, D,$  and  $E$ . There is also one angle given:  $\hat{EBC} = 90^\circ$ .

### calculating mass

wooden block. Before it hits the wooden block, the bullet has a mass of  $m_1 = 12,8 \text{ g}$ . After it goes through the wooden block, the bullet has a mass of  $m_2$  and the wooden block moves with a velocity of  $v_2$ .

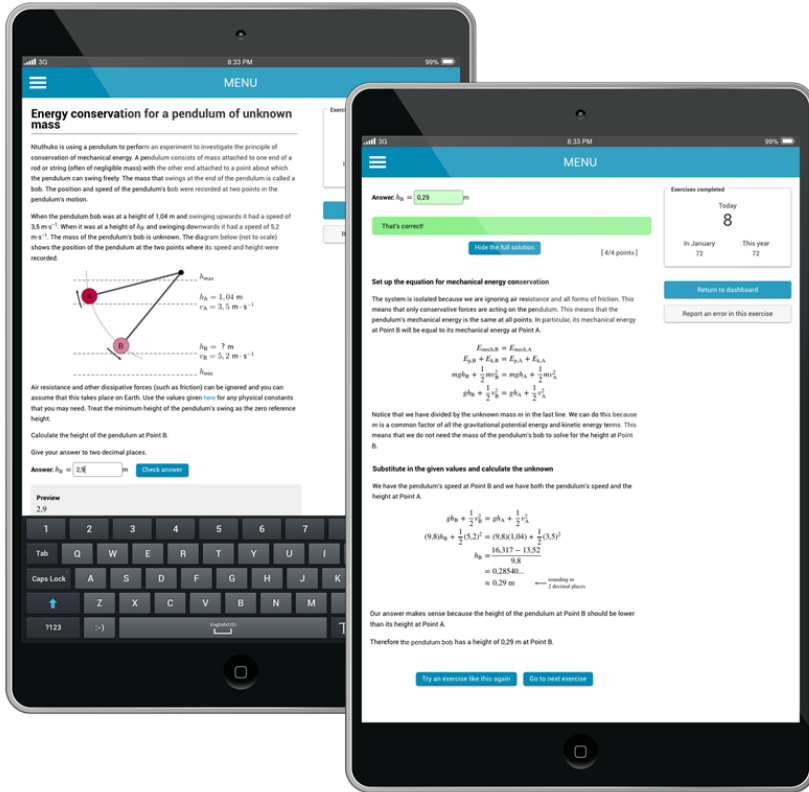
After

Determine the mass ( $m_2$ ) of the wooden block. Round your answer to 2 decimal places after the decimal comma.

### The alkanes: naming

Give the IUPAC name for:

Answer:  [2 points] [Check answer](#)



## Generative questions

Diagrams, labels, values, text etc.

→ Enables unlimited practice

## Response types and automated marking

Fractions, formulae, set notation, chemical reactions, spectroscopic notation and more

→ Enables diverse questions

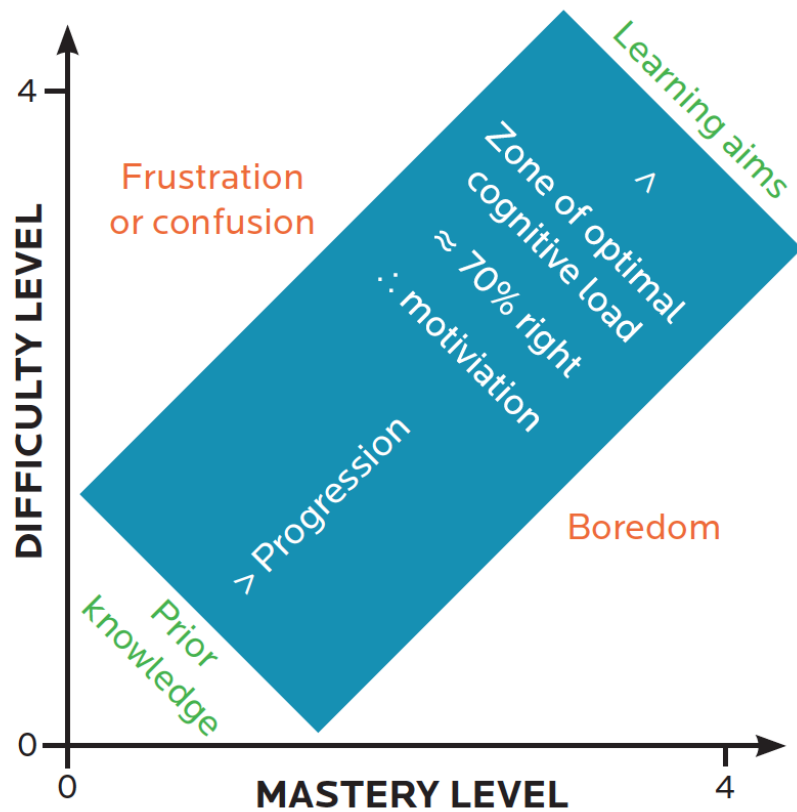
→ Enables immediate, contextual feedback

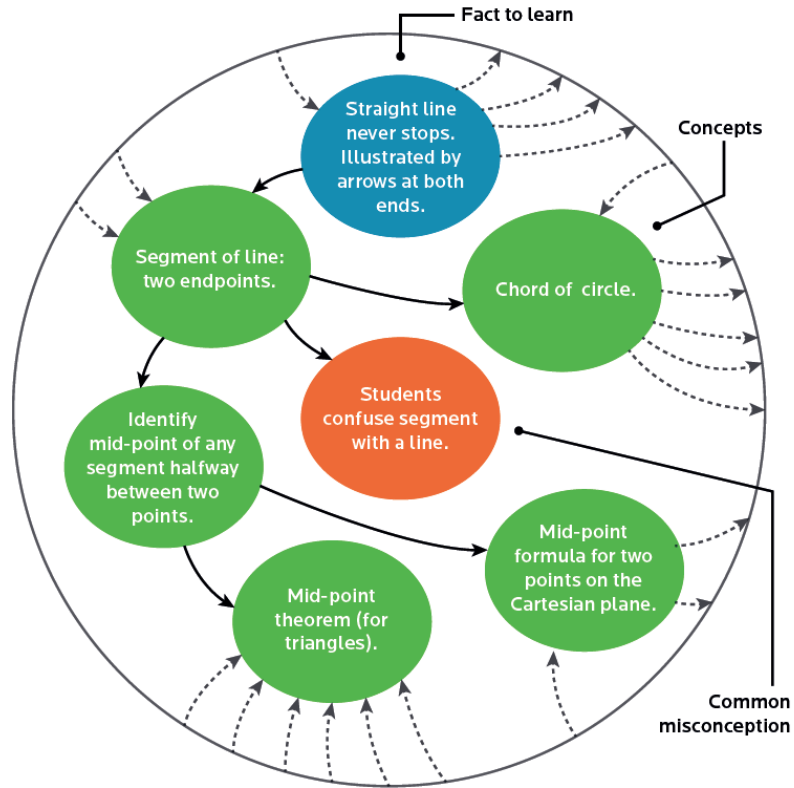
## Fully worked out, explanatory solution

A full conceptual explanation, not just marking guide

→ Enables targeted feedback & reflection

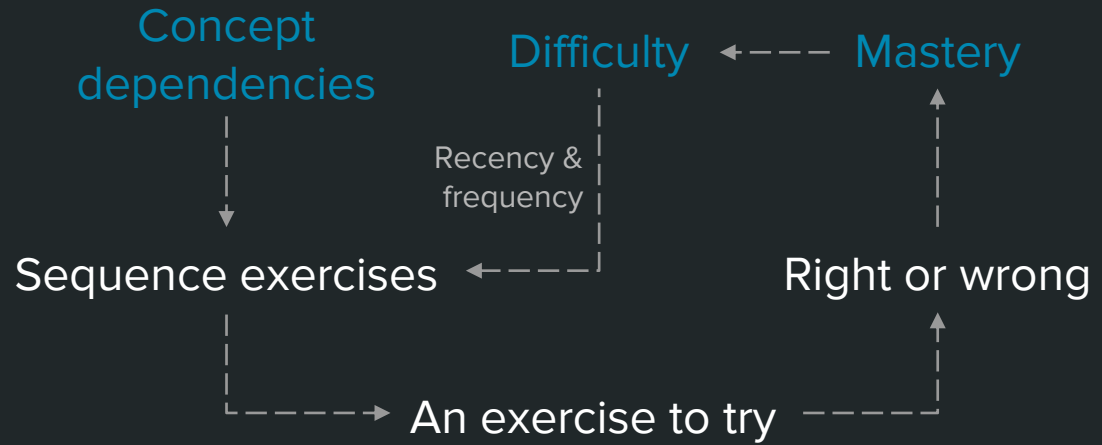
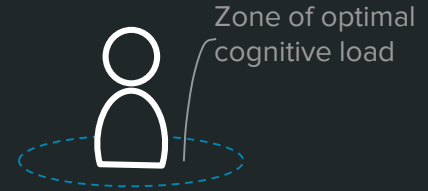
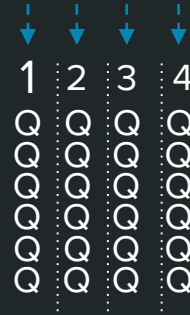
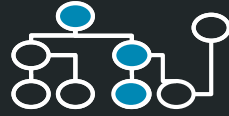
Behind the practice service is an machine learning engine to guide you through all those questions at a level just right for you.





We've paid careful attention to the way the concepts you have to learn interrelate.

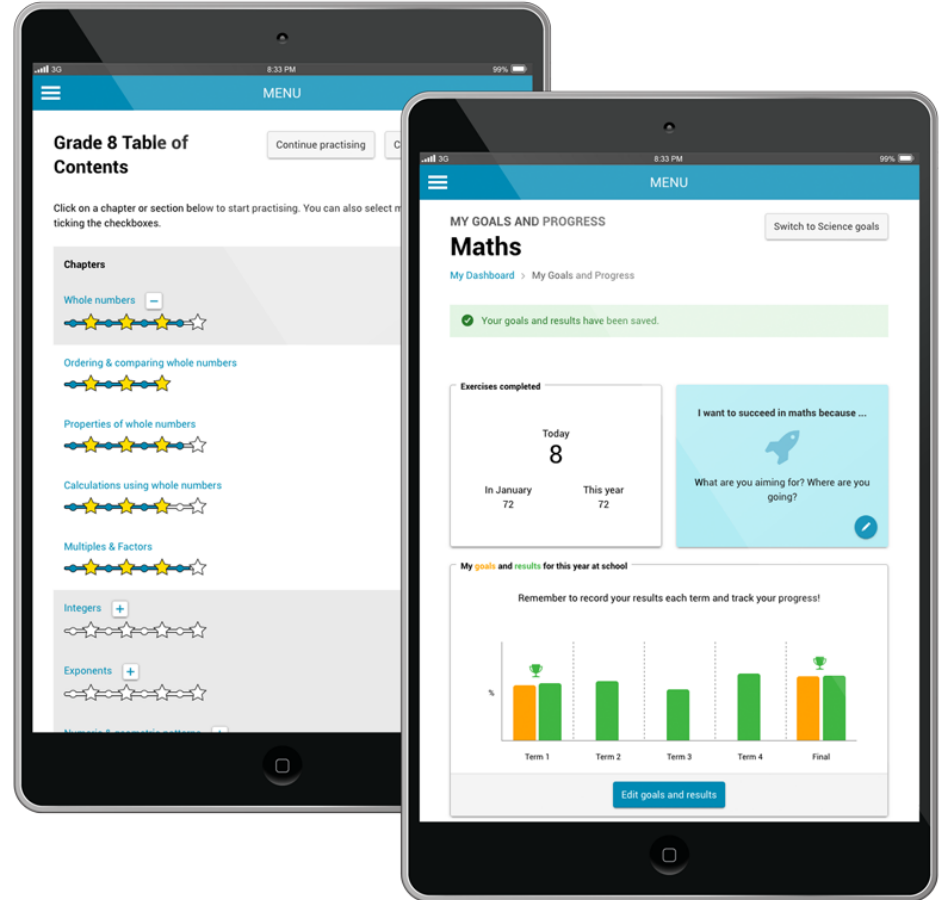
The system's goal:  
to maintain optimal  
cognitive load for  
learners and  
deliver questions in  
the most relevant  
sequence.





Track your progress.  
Measure your  
performance.  
Learn about how you  
learn.

- How am I progressing to my goals?
- What concepts have I mastered?
- What do I still need to work through?
- What are my problem areas where I should focus my revision?
- What should I work on today?



## Features we can enable in targeted assessment a.k.a. homework and testing



Goal directed with  
targeted feedback



Hamper any  
copying



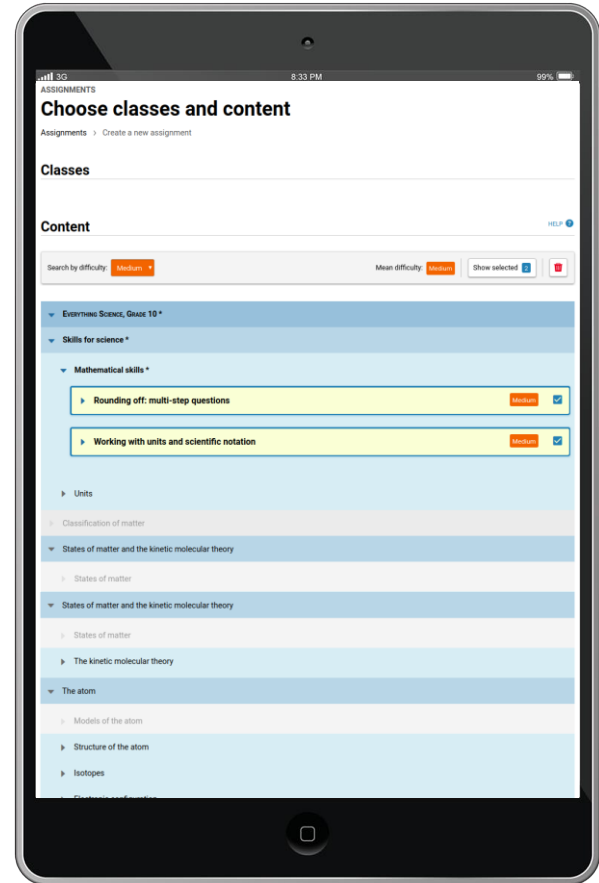
Of sufficient quantity



Reporting

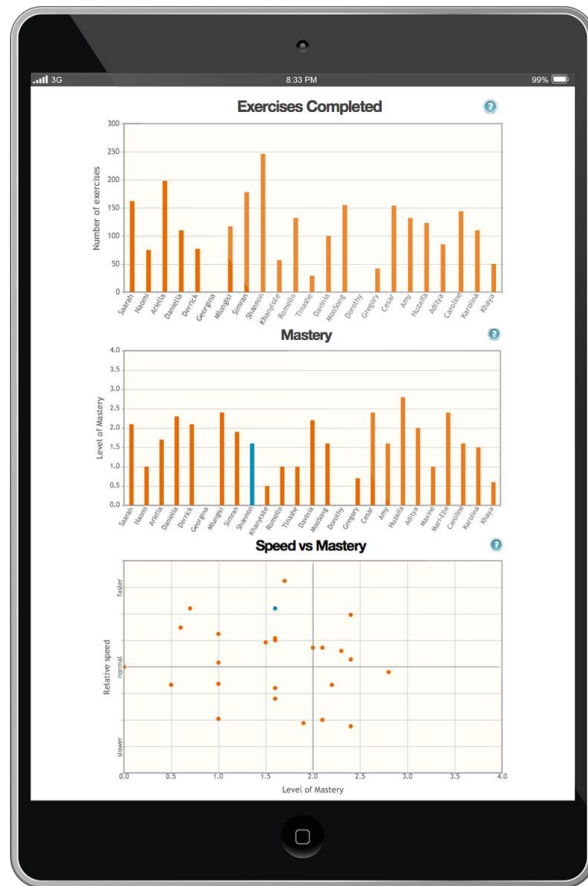
# Set targeted assessment and homework

- Choose the items your learners will see
- Get immediate marking and feedback
- Generative items stop copying, enhance collaboration and discussion
- Get immediate reporting on performance on items
- All data included in all reports



# Teacher? Get your own diagnostic tool for your class.

- How much effort have my learners put in?
- What concepts have they mastered?
- Which learners are struggling?
- Which concepts are most problematic?
- What do I need to revise with my class?
- Where should I intervene?
- What can I report to my learners and parents?



Opportunity:  
A single tool  
for ...

### On-demand practice for mastery (Learners)

1. **Time** - practice anywhere, any time
2. **Engagement** - immediate marking
3. **Learning** - model solutions
4. **Reporting** - progress tracking towards goals

### Homework and tests (Teachers)

1. **Time** - Bulk, machine-friendly task off your hands
2. **Engagement** - Disrupts copying, promotes discussion
3. **Learning** - Immediate marking, can promote learning
4. **Reporting** - Targeted reporting
5. **Focus** - Do what teachers do best, focus on learners

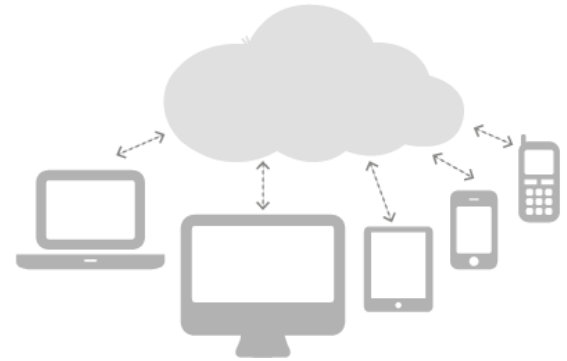
### Reporting (Districts & Province)

1. **Reporting** - usage, progress and mastery



By sticking to **open web standards** when we build our technology we make sure our tech doesn't become outdated.

By releasing our product as an online offering, or **Software as a Service**, we maximise our technological reach.



Putting our service in the cloud could mean data costs. The **good news** is that it is zero-rated on South Africa's two largest networks. Anyone with a sim card from either of them can **read their textbooks and practice with no data costs.**



So what does that mean?

---

Anybody, anywhere,  
with any device that can  
connect to the web, can use  
Siyavula's practice service.

Everything Maths

### Circles: finding the gradient of the radius

Determine the gradient of the line between the point  $(3; -4)$  on the circle

$$(x - 4)^2 + (y + 4)^2 = 25$$

the centre of the circle. Write your answer as a fraction and if your answer is undefined write 'undefined'.

Exit



## Individuals

- 500 000+ reading
- 200 000+ practice accounts



## Tutor groups

- 24 centres



## Schools and sponsorship

- 30,000 75+ School clients
- 250,000 Sponsored learners ~ 285 schools (2017)



## Other platforms

- Integrated into another content platform and already being used by 20 schools



Our clients include top-end schools and school groups



As well as thousands of learners given access through corporate sponsorship projects.

Sineliso Sithole, seen here posing in front of the only place in his village with mobile reception. From this spot he did **17 000 exercises** in 2015, all on a basic smart phone.

Vodacom Intelligent Practice Project:

- 80 Quintile 2-4 schools
- 3500 learners adopted
- All using phones
- Practising in the evenings



**Change in learner performance in Mathematics from Gr 9 to Gr 10, grouped by use, compared to class (Bokgoni school)**



# Learners like Sineliso that are motivated ...

MY SUMMARY REPORT

## Marie's Science Report 2016

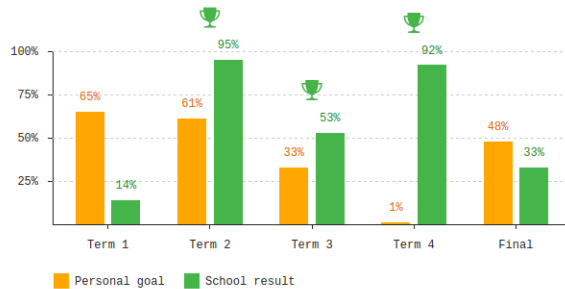
Marie Curie

Grade 8  
Hogwarts School  
Cape Town, South Africa

3 May 1987  
Female

Change

### Goals and results for this year at school



“ I want to succeed in Science because commodo duis anim eu qui esse eu dolore quis mollit proident consectetur voluptate duis sint aliqua nostrud nulla labore fugiat ”

Change

Change

vodacom



# Learners like Sineliso that are work consistently ...

## Practice effort

6 769

Questions attempted

### High scores and winning streaks

7

Questions in 1 month  
(Feb)

2

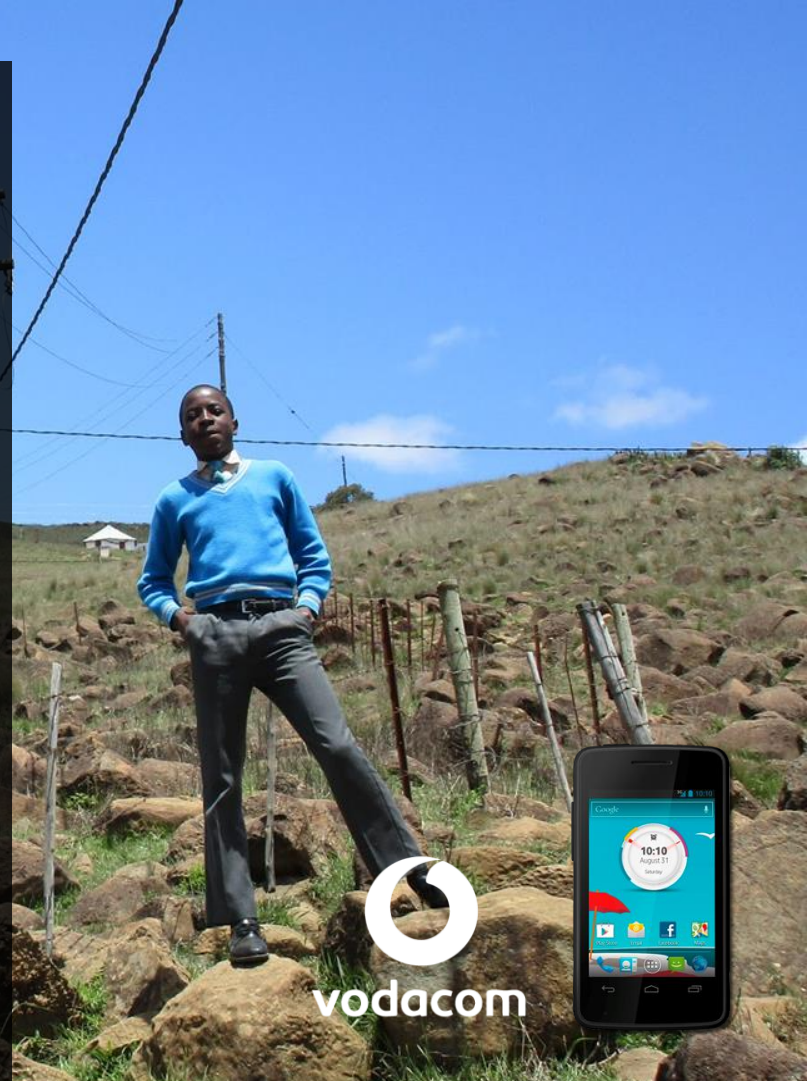
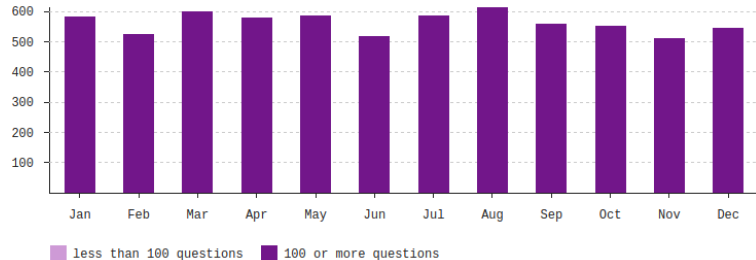
Questions in 1 day  
(9 Mar)

7

Days practice in a row  
(15 Apr – 6 Jun)

## Monthly practice

Consistency is the key to long term success. How consistent is your effort over the months in the year? (A good goal to aim for is at least 100 questions in a month.)

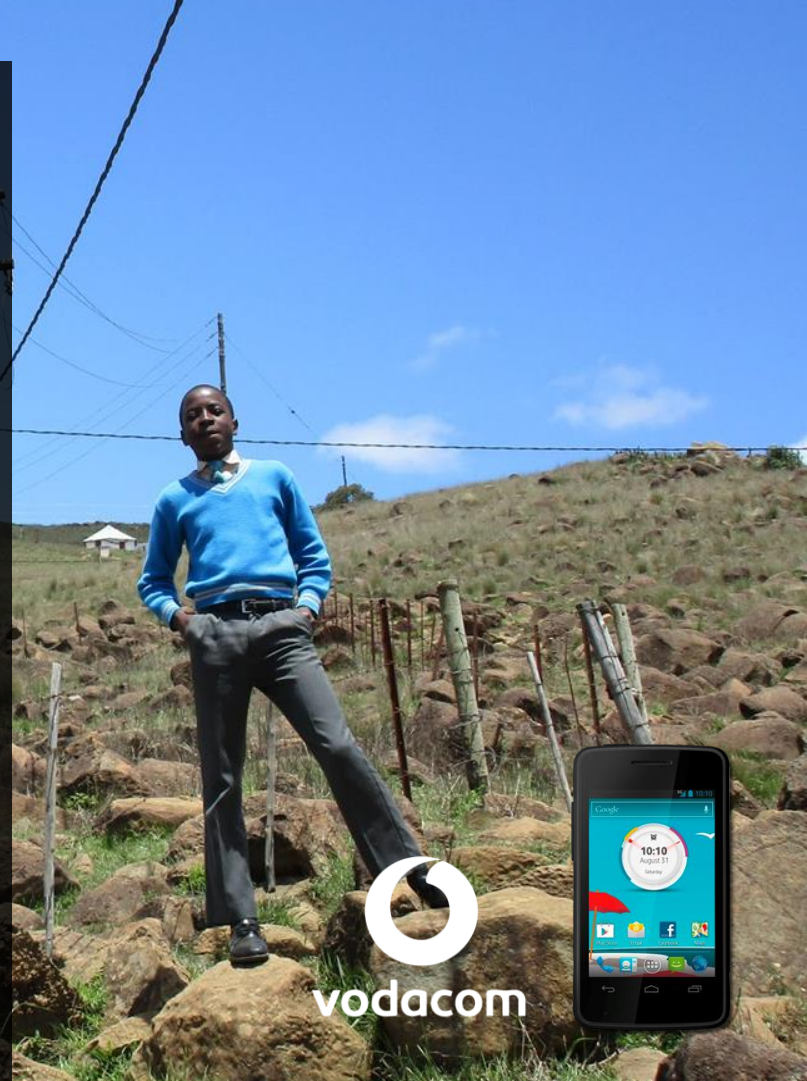
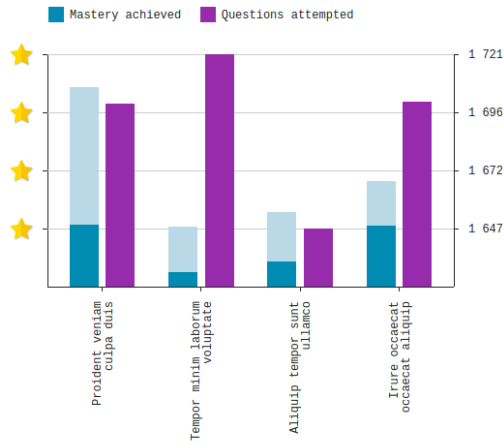


# Learners like Sineliso that are work perform in maths and science ...

## ★ Learning and mastery

### Mastery and effort

What level of mastery did you reach, and what effort did it require to get there, in each learning area?



1

100 000s self-motivated learners, like Sineliso means opportunity.

2

Providing them with support makes for impact.

3

Extra motivational levers are required for maximum engagement.

4

Schools are not the ideal drivers in a rural context. Getting to learners and parents directly is key.





Our aim is to deliver adaptive maths and science practice sessions to learners everywhere at an affordable price, and link their effort to tertiary opportunities.

Target parents and learners directly through a trusted relationship

Make affordable rather than free

Reward learners for regular practice

Link to tertiary acceptance, student loans, bursaries, employment

Provide sponsored access for those truly unable to afford, but willing to meet a threshold level of practice



# SIYAVULA

TECHNOLOGY-POWERED LEARNING