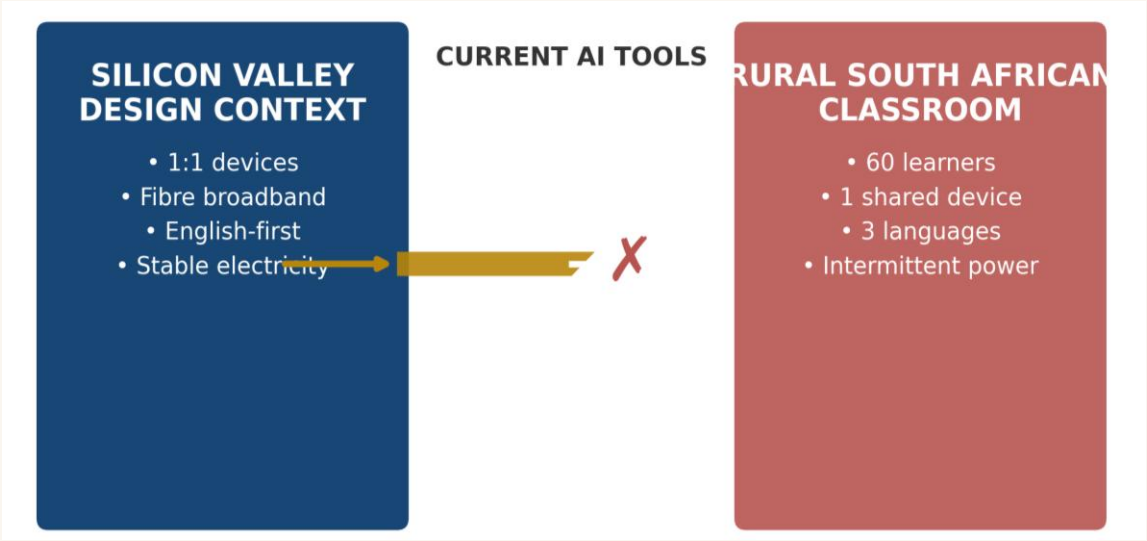
Why AI Will Fail in South African STEM Classrooms—Unless We Put Human Learning First

Clement Simuja
Human-Centred Learning and Technology Lab
University of Western Cape

NSTF proSET Discussion Forum | 18–19 August 2026

The Abundance Assumption on Why AI is Designed to Fail in Most South African Classrooms

- AI is not failing because the code is broken
- Designed for a classroom that does not exist here
- Silicon Valley assumptions: 1:1 devices, fibre broadband, English monolingualism, stable electricity
- Majority of SA STEM classrooms: 60 learners, 1 shared device, 3 languages, intermittent power
- When the design context and the deployment context diverge this radically, 'deployment' becomes 'exclusion'.





"The most sophisticated algorithm in the world cannot teach a child it does not understand, in a language it does not speak, across a connectivity gap it does not bridge."

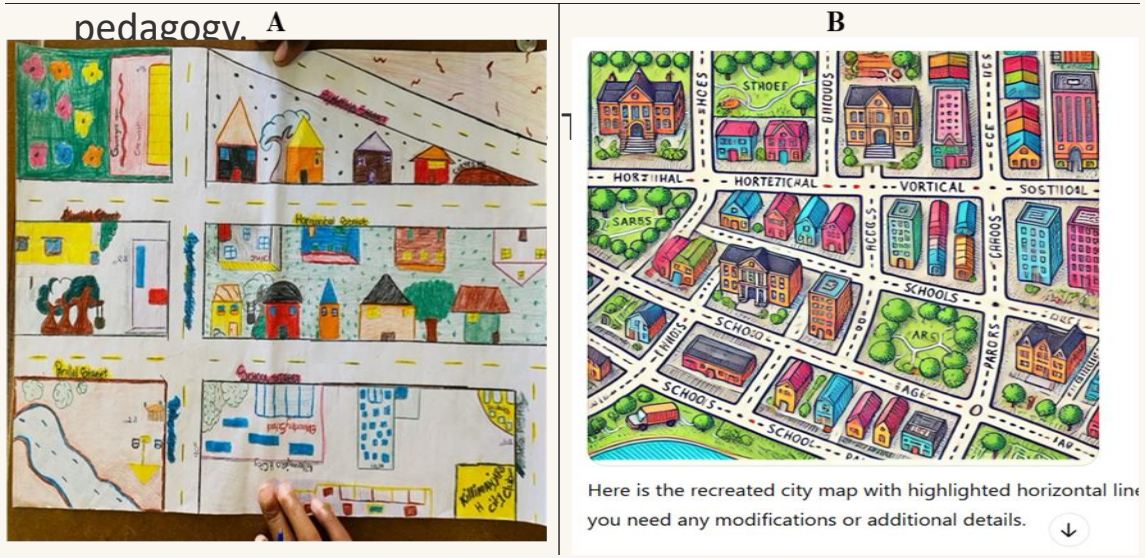
The Failure Cycle we Evidence from Rural Namibia (Hardap Region)

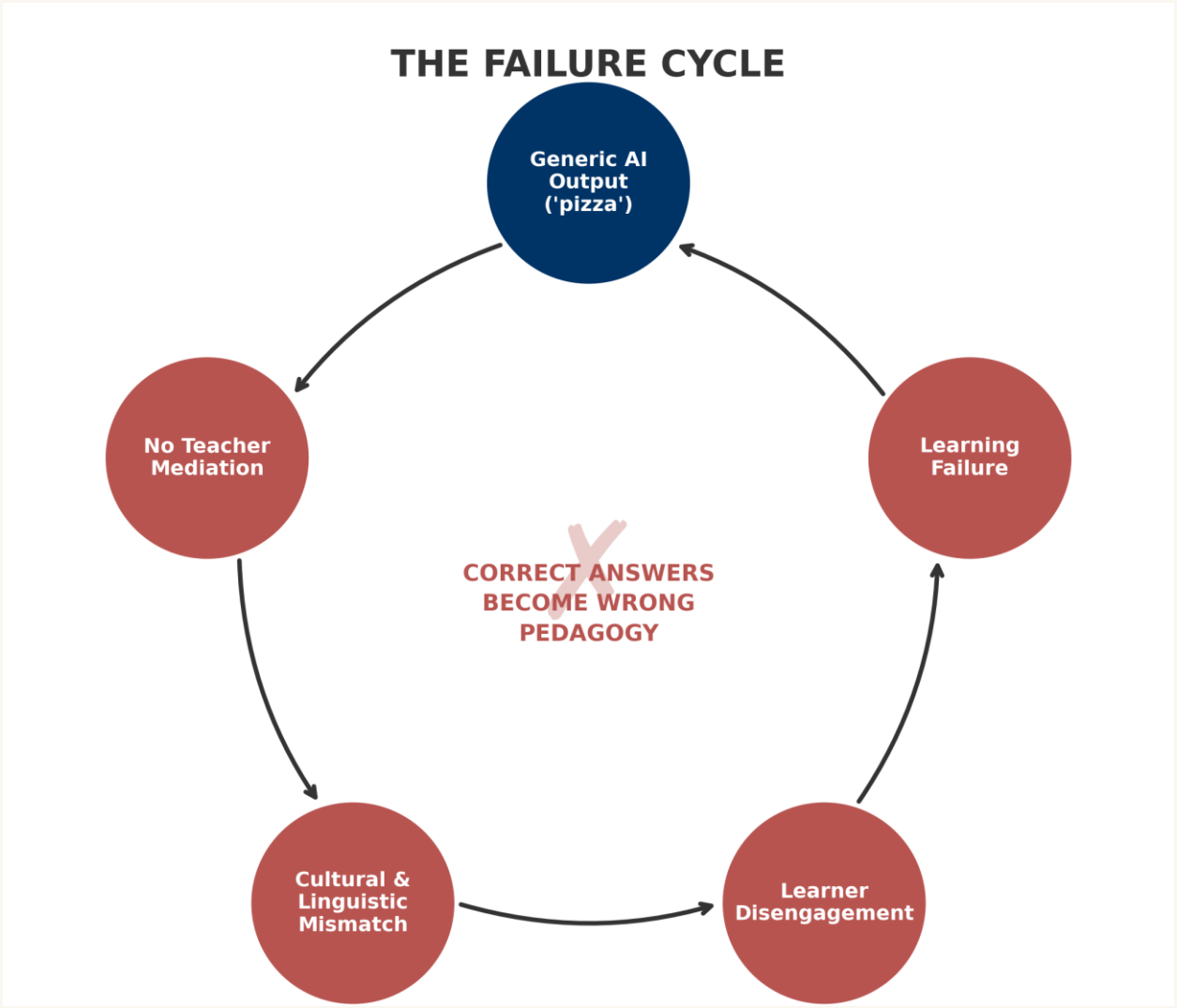
- In our intervention study, ChatGPT gave technically correct upper primary school mathematics answers(Elifasi& Simuja,2024;Elifasi,2026).

- It offered 'pizza fractions' to learners who share maize meal

- Explained geometry in abstract terms, while learners sit in traditional roundavels

- Without the teacher as cultural translator and pedagogical filter, correct answers become wrong pedagogy.

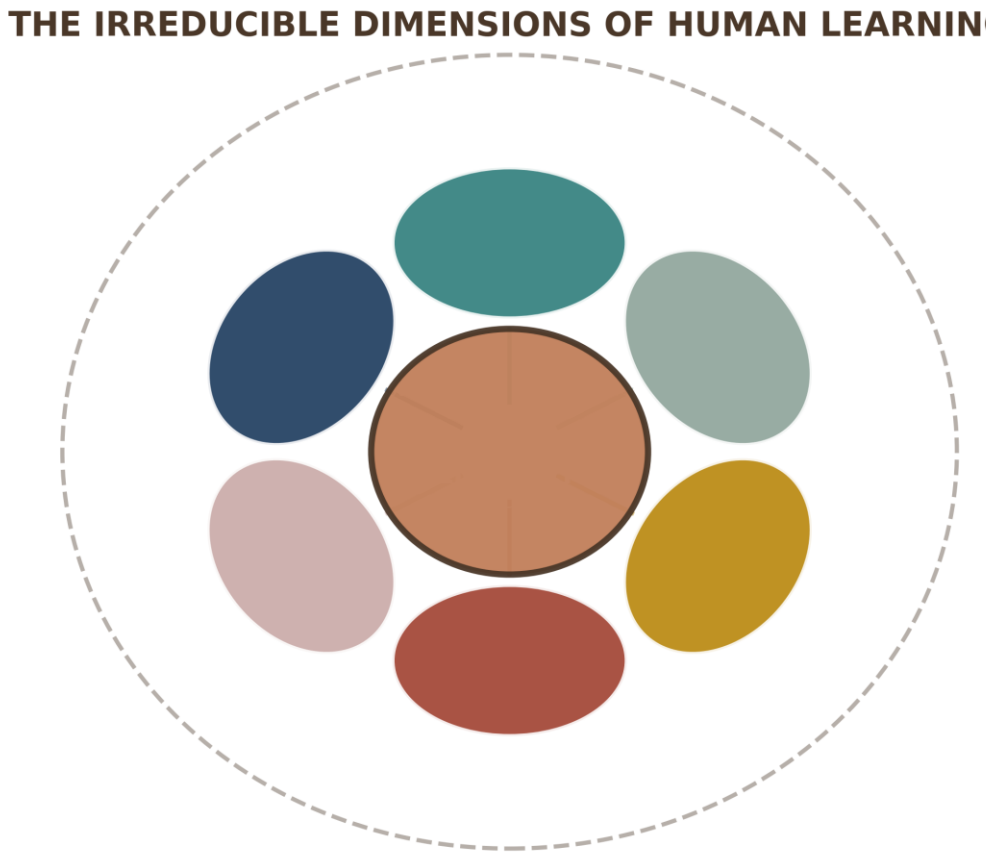




AI cannot see what the learner sees. Only the teacher can.

What is Human Learning? The Irreducible Dimensions

Learning is not information transfer , It is a relational, cultural, emotional and intellectual becoming



These are not 'features' to be engineered. They are conditions to be nurture. No algorithm can provide them.

- Vygotsky's ZPD; Learning happens in the space between what a child can do alone and what they can do with guidance

- That guidance is not a prompt , it is a relationship

- Productive struggle such as error, confusion and retry are not bugs. They are the pedagogy .

- Emotional safety as trust and belonging enable the risk of not knowing.

- Cultural grounding in our study on mathematics lives in maize meal, not in pizza; the learner’s world is the curriculum.

- Social dialogue involved peers challenge, negotiate and co-construct meaning. No algorithm can replace the peer.

- Language and voice we noted thinking happens in the mother tongue first. Translation is not just linguistic; it is cognitive.

Human Learning involve Teacher as Irreplaceable Mediator

Evidence from the Hardap intervention: what the teacher did that the algorithm could not do

CULTURAL TRANSLATION

Ms Bernice forced ChatGPT to rewrite "pizza fractions" into "maize-meal sharing."

The algorithm knew fractions. The teacher knew the child.

IMPROVISATIONAL RESPONSIVENESS

Mr Hams: school Wi-Fi failed. He used his iPhone as a hotspot.

The algorithm needs bandwidth. The teacher finds a way.

PEDAGOGICAL ATTUNEMENT

confusion in a child's eyes. Slowir Re-explaining.

The algorithm delivers content. The teacher reads the room.

These are not skill sets ; these are human relational capacities that no model possesses.

When AI Replaced the Human and What the Machine Destroyed

• The black box effect. Learners received correct answers they could not interrogate

• Loss of productive struggle as the algorithm removes the confusion that produces understanding.

• Death of peer dialogue when every child has a private screen, the classroom becomes a room of isolated consumers.

• Cultural erasure as the LLM's default world is not the learner's world. The child's reality is treated as an edge case.

• Pedagogical love replaced by algorithmic efficiency. The machine cannot read confusion in a child's eyes.

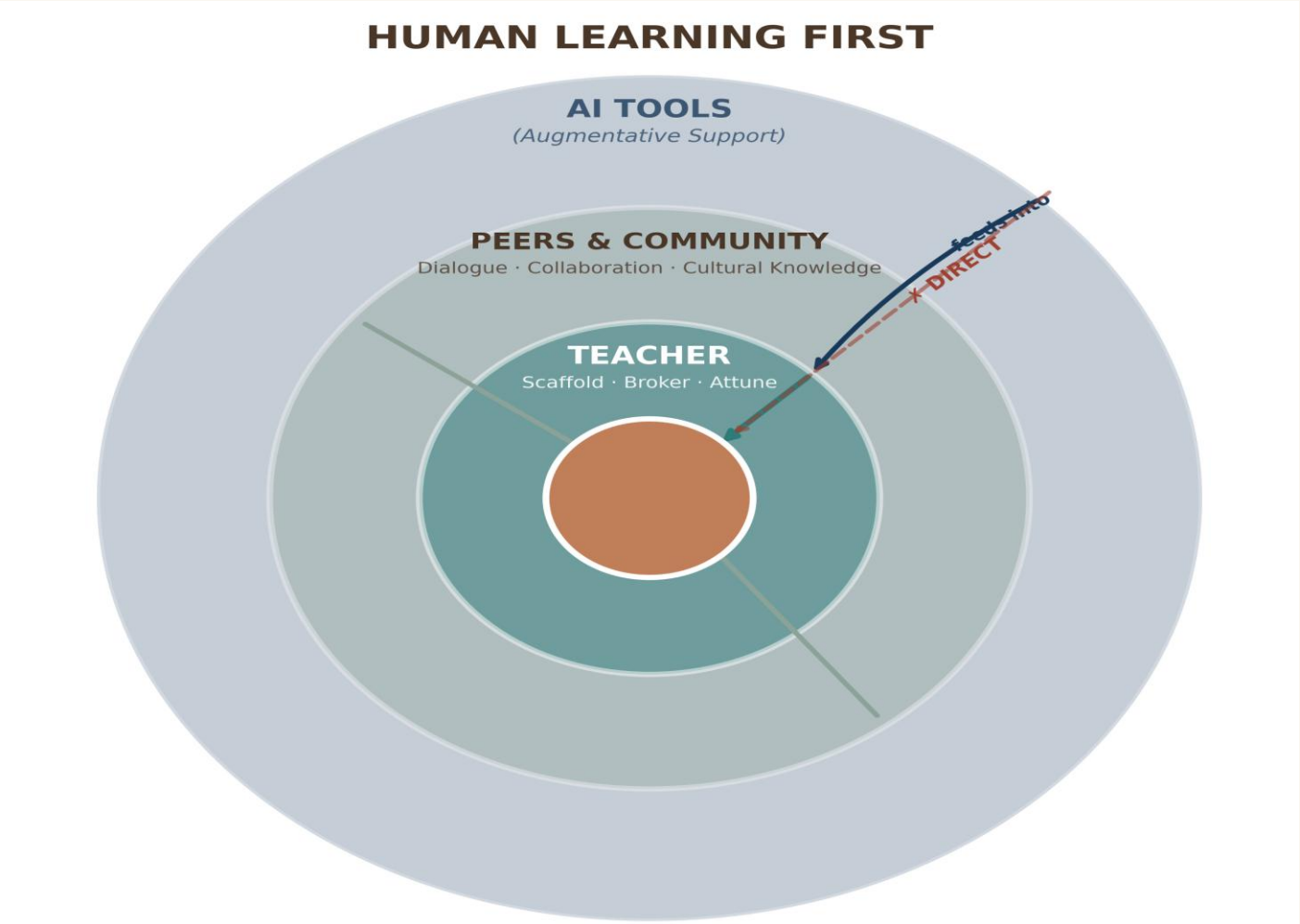
• Result in technically correct answers, pedagogically empty learning.

The algorithm cannot tolerate ambiguity. But learning is born in ambiguity. The machine wants efficiency. The child needs struggle.



The Human Learning First Architecture

A conceptual framework: AI must orbit the pedagogical relationship. It must never replace it.



- **AI feeds into the teacher. The teacher feeds into the learner. The community feeds into the learner.**
- **The forbidden zone: AI must never cross the pedagogical boundary to reach the learner directly.**
- **This is not a technical architecture. It is an ethical one.**

The Policy Imperative from Exclusion Technology to Empowerment Technology

We do not need smarter algorithms. We need braver policy that puts human learning first

AI-FIRST DESIGN

- Algorithm delivers content
- Learner interacts with screen
- Teacher becomes monitor
- Culture is "localisation"
- Struggle is a bug to fix

RESULT: Exclusion Technology

THE SHIFT

Policy must mandate

HUMAN-FIRST DESIGN

- Teacher mediates every AI touch
- Learner is in social ZPD
- AI is augmentative, not substitutive
- Culture is the foundation
- Struggle is the pedagogy

RESULT: Empowerment Technology

We are not waiting for Silicon Valley to solve African education.

The question is whether we have the courage to build it for our children, not for their children.

Thank you. Questions and debate are welcome.