The Hook

- **Project Title**: Efik STEM Tutor: Bridging the Linguistic Divide in Science
- **Presenter**: Ekpenyong Mfon | Institution: Ensign College
- **Competition**: Microsoft Imagine Cup 2026/2027
- **Tagline**: Empowering the next generation of African scientists in their mother tongue.

The Language Barrier

The Hidden Cost of "English-Only" Learning	**The Problem**: Over 60% of Nigerian students learn STEM in a non-native language.
	The Result: STEM failure rates skyrocket because students are fighting a "language war" instead of learning science.
	The Insight: Language should be a vehicle for knowledge, not a barrier to it.

The Core Problem: Cognitive Overload

The Double Burden of decoding	Students must decode complex English syntax and abstract scientific concepts simultaneously.
	This "Cognitive Overload" kills curiosity and causes early disengagement from tech careers.
	The Opportunity: Remove the language friction to unlock latent scientific potential.

Our Solution: The Efik STEM Tutor

A Localized AI for a Global Future

An Intelligent Tutor grounded in a **22,939-row professional Efik STEM dataset.**

Built to respect the cultural and mathematical logic of the Efik people.

Impact: Science is no longer "foreign"; it becomes observable and personal.

Architecture: The Reasoning Engine

Powered by Azure & GPT-4o

Utilizes **GPT-4o** as a high-performance reasoning engine.

The Constraint: This is not a "free-chat" bot. It is a **Guided Agent** restricted to verified scientific parameters.

The Advantage: High intelligence with zero deviation from STEM facts.

Architecture: The Grounding Layer

Eliminating Hallucinations via System-Level RAG

Architecture: Retrieval-Augmented Generation (RAG) through system-level prompt grounding.

The Guardrail: Forced use of approved Efik STEM vocabulary from our curated CSV.

Reliability: The AI cannot "invent" terminology; it must use the verified professional corpus.

Linguistic Innovation: Scientific Primitives

Beyond Translation: Interpretation

We have developed Efik "primitives" for modern STEM concepts:

- **Atom:** *Aṭọm* (The indivisible ekpri ñkpọ)
- **Energy:** *Odudu*
- **Cell:** *Ekpri ubet uwem* (The building block of life)

The "Emi" Rule: Using immediate language (*emi*) to make science feel present and real.

Mathematical Innovation: Vigesimal Logic

Respecting the Base-20 System

- Efik math is naturally **Vigesimal** (Base-20).
- Our AI calculates using indigenous logic:
  - $20 = Edịp$ | $40 = Aba$ | $100 = Ikie$
- **Equation Example:** $Edịp (20) X times Ita (3) = Ata (60)$.
- We use "Cassava Math" to teach multiplication (**Awak**) and division (**Bahade**).

Biology & Chemistry Modules

The Farm is the Laboratory

- **Photosynthesis:** Explained via cassava farming and solar energy (*Ūnwana utịn*).
- **States of Matter (Ǹkpọ ekededi emi ọyọhọde ebiet):**
  - **Solid:** *Itiat* (Stone)
  - **Liquid:** *Mmọn̄ akpa* (River water)
- **Gas:** Mmọn̄ emi etiere nte ofụm (Steam/Vapor)

Physics & Engineering

Demystifying the Physical World

Gravity: Defined as ***Odudu emi esidụri ñkpọ*** (The force that pulls things).

Engineering: Simple machines taught through farm tools and levers used in rural construction.

Outcome: Students see Physics in their daily chores and harvests.

Technical Roadmap

Scaling on the Microsoft Stack

MVP: Azure AI Foundry Playground (Validated).

Alpha: Backend deployment via **Azure Functions** and **Azure AI Search**.

Production: Full Web App deployment on **Azure App Service**.

Efficiency: Highly optimized tokens (<800 per request).

Social Impact: The "Inclusion" Metric

Measuring Success Beyond Code

Goal: 30% reduction in early STEM failure in pilot Efik-speaking schools.

Confidence: Building "Scientific Self-Efficacy" in rural students.

Pathways: Moving students from rural farms to global tech pipelines.

Scalability: The African Blueprint

One Framework, Many Tongues

The "Linguistic Grounding Model" we built for Efik is a template.

Future Reach: Can be scaled to **Igbo, Hausa, Yoruba, and Swahili**.

Vision: A pan-African AI that preserves indigenous languages while teaching global science.

Project Timeline

The Road to Graduation (October 2026)

Q1 2026: Core Dataset Grounding & Logic Verification (Complete).

Q2 2026: Beta Testing with Ensign College peer groups.

Q3 2026: Azure App Service Deployment & Pilot Launch in Calabar.

Oct 2026: Final Presentation & Graduation.

The Vision

“Science in our tongue, progress for our people.”

Preserving cultural heritage through modern technology.

The Mission: To ensure no African student is "left behind" because of the language they were born speaking.

Call to Action: Let's build a future where every child can dream in their own language.