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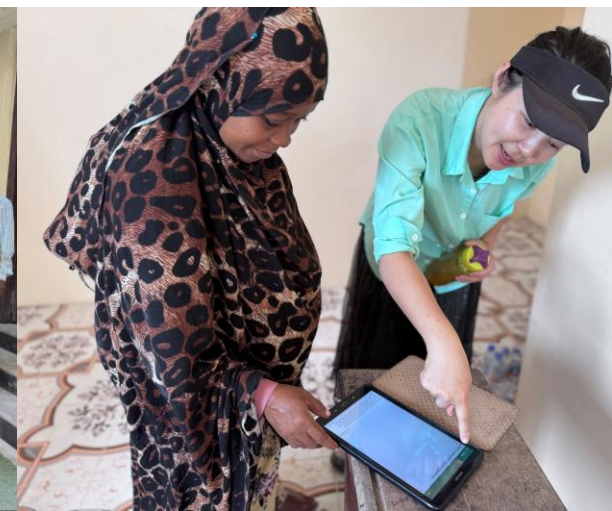
Generative AI for Geographic Education in an African Context – Tanzania Pilot Study

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GenAI in Geographic Education

Generative AI for Geographic Learning in Africa: Lessons from a Tanzanian Pilot Project

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Africa's Educational Challenges

- Teacher shortages: **116,885** additional teachers to teach 11,425,482 students (Tanzania Statistic Bureau, 2023)
- Severe classroom overcrowding (avg. **106 pupils per class**)
- Textbook scarcity (**3–4 students per book**)
- Limited electricity and internet access
- Gender and rural–urban inequalities



Research Goal

Leverage AI to facilitate education
in African countries

Research Questions

- How does AI-based education performance compared to traditional education?
 - In which way AI-based education is better than the traditional one?
 - What is the most suitable approach in African countries?

Research Team – 3 faculty from US + local NPO collaborator



Sisi Wang
Associate Professor (Teaching)
University of Southern California, USA



Xiao Huang
Assistant Professor
Emory University, USA



Xuebin Wei
Associate Professor
James Madison University, USA



Yaya Li
Founding Chair
SAY Foundation



<https://say.ngo/>

Study Area: Zanzibar

- Survey targets: 4 schools + 1 public sector
- Survey Participants: 133 teachers



- Mbuyu Tende Primary School in Northshore
- Zanzibar Public Health Institute
- Zanzibar Health School
- Kiponda Secondary School in Stone Town
- Teacher Training Center in SAY Foundation

(A) Location of Zanzibar in Tanzania; (B) Locales and road network in Zanzibar

Research Design: Curriculum

1) Fundamental geospatial concepts

- Place and Space
- Spatial Data
- Navigation (GPS, and XY coordinates)
- Maps

2) How to make a map

3) What are geospatial questions/problems

4) Application

- Transportation
- Public Health
- Urban Management
- Climate Change

What is your meaning of place?



X Y coordinates



How GPS works?



1.4 Maps



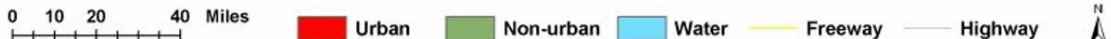
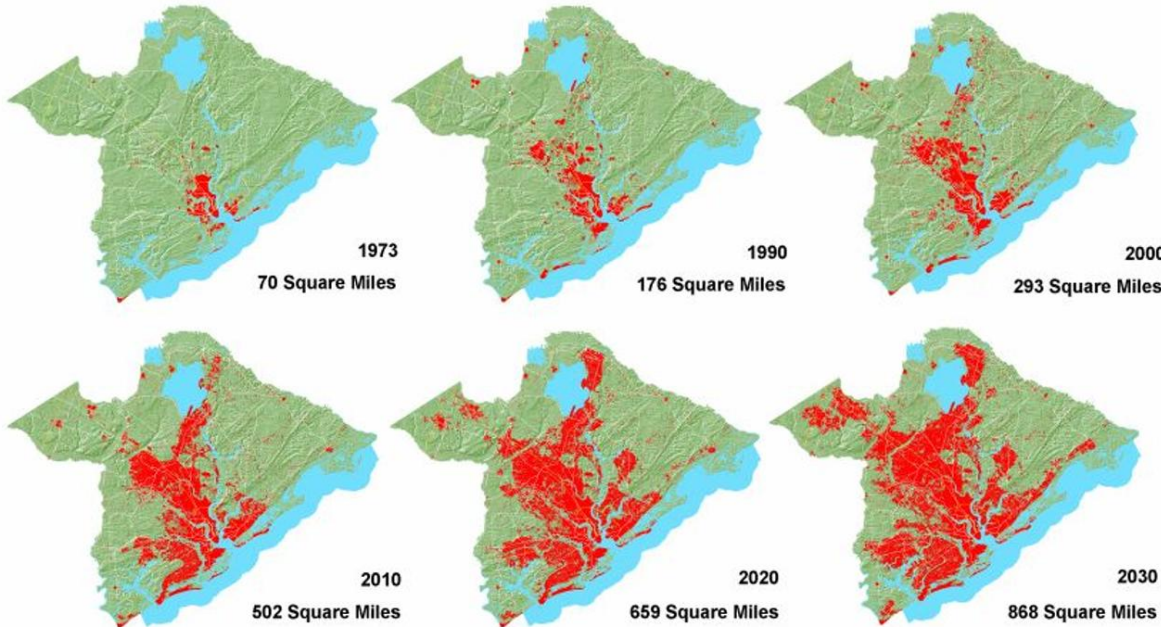
Transportation



Public Health



Urban Management



Research Design – AI tools

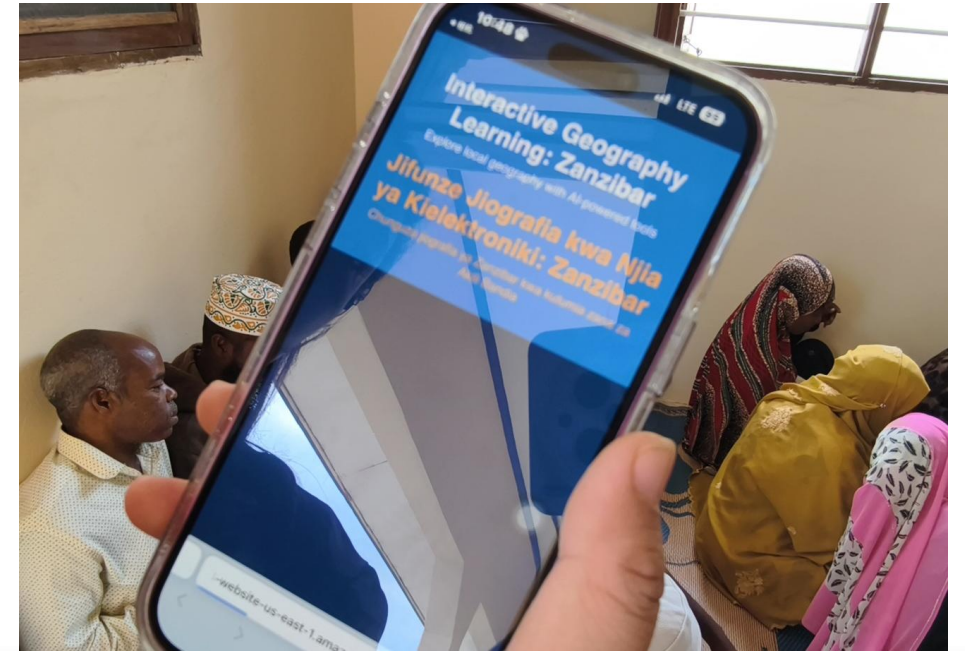
Human teaching – traditional slides



PowerPoint

AI teaching – GenAI platform

- StoryMap with interactive maps
- GPT-4 chatbot (English & Swahili)
- AI-generated videos (CapCut)
- Visual examples and local applications



◆ Section 1: Fundamental Geospatial Concepts
◆ Misingi ya Dhana za Jiografia ya Kijiografia



Video 1: Earth Basics - Where Are We in the World?
Misingi ya Dunia – Tupo Wapi Katika Dunia?

Video

Google
Earth
embedding

Map 1: "Where in the World is Zanzibar?" / Zanzibar Iko Wapi Katika Dunia?

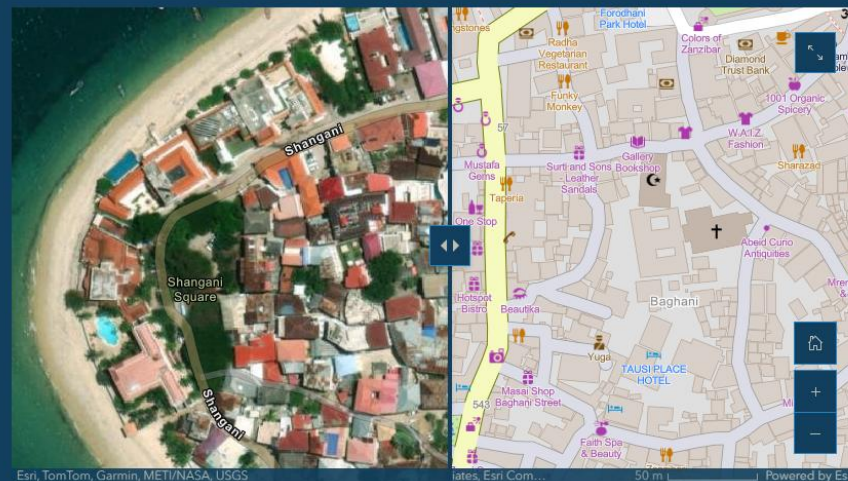
- Explore the globe, zoom in, and locate Zanzibar
- Tazama ramani ya dunia, zungusha, zomea, na tafuta Zanzibar



Esri, TomTom, FAO, NOAA, USGS | Sources: Maxar, Airbus DS, USGS, NGA, NASA, CGIAR, GEBCO, N Robinson, NCEAS, NLS, OS, ... Powered by Esri

Map 3: "Comparing Satellite and OpenStreetMap" / Ramani ya Picha dhidi ya Ramani ya Huduma

- 📖 Compare satellite imagery and OpenStreetMap features
- 📖 Linganisha picha za satelaiti na ramani zinazoonyesha huduma kama shule na barabara



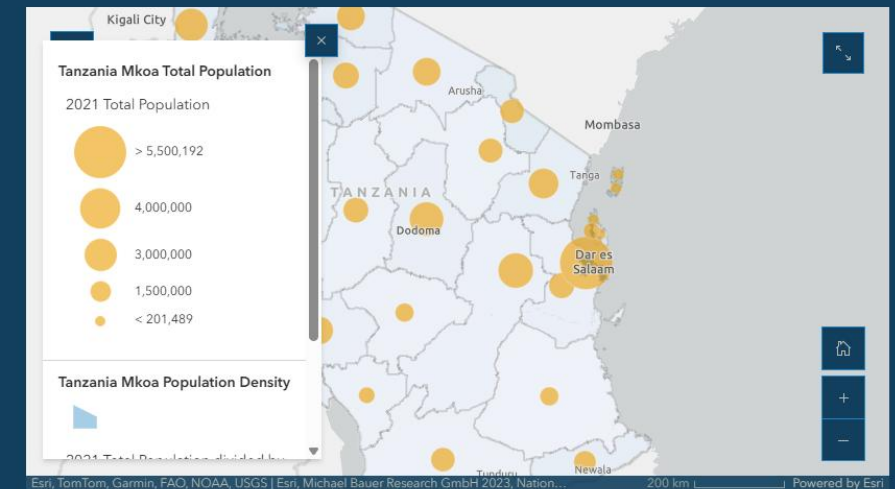
Esri, TomTom, Garmin, METI/NASA, USGS | Powered by Esri

Swapping
map

Interactive
map

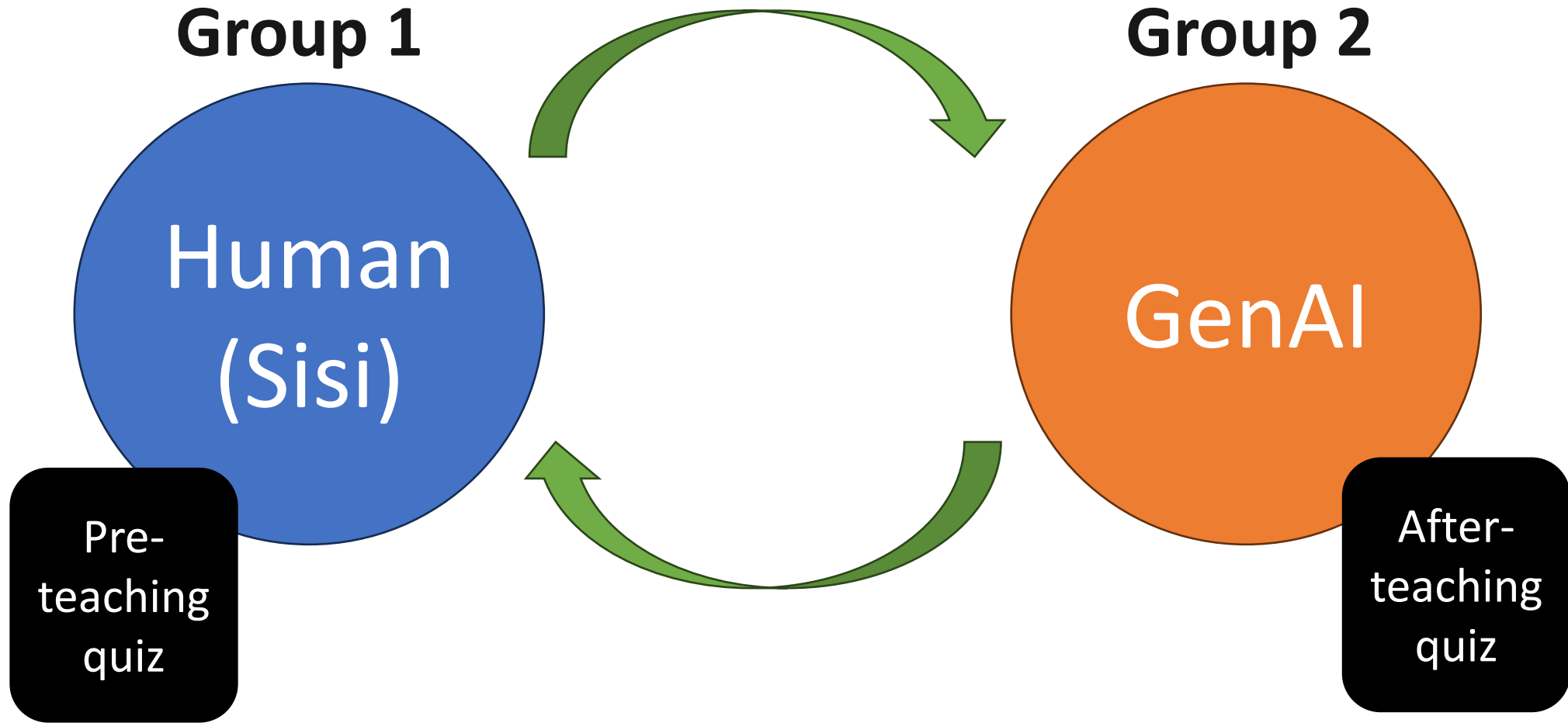
Map 2: "Tanzania Population and Density" / Idadi ya Watu Tanzania na Msongamano

- 👤 Compare population totals and density across Tanzania
- 👤 Linganisha idadi ya watu na msongamano wa watu katika maeneo tofauti ya Tanzania



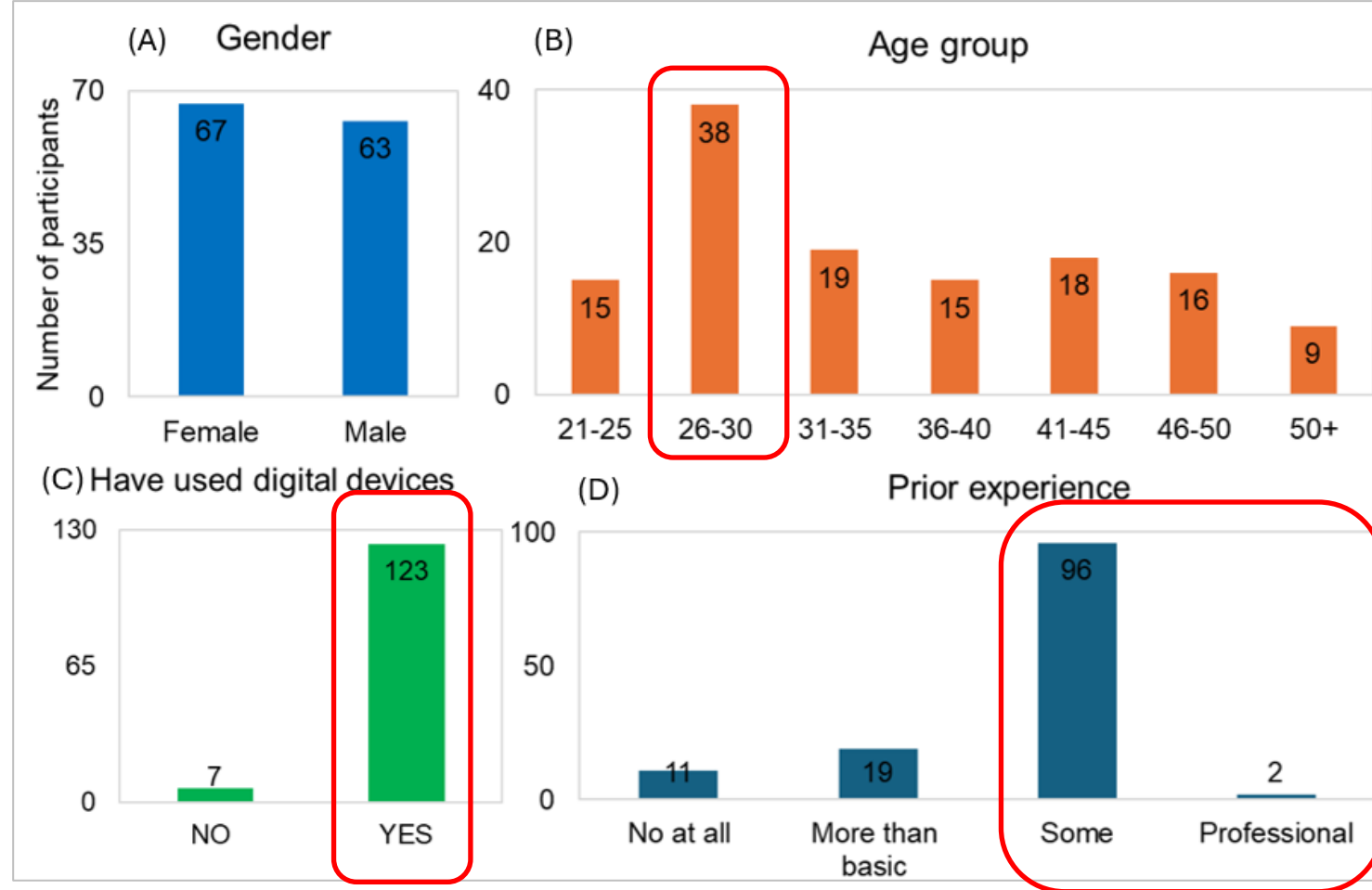
Esri, TomTom, Garmin, FAO, NOAA, USGS | Esri, Michael Bauer Research GmbH 2023, Nation... 200 km | Powered by Esri

Research Design – Teaching procedure and evaluation



Results: Demographics of Participants

- Age: 21–56 years (majority in 26–30 range)
- Digital device experience: 93% had prior exposure
- Geographic knowledge: majority “some knowledge,” 2 with professional-level expertise



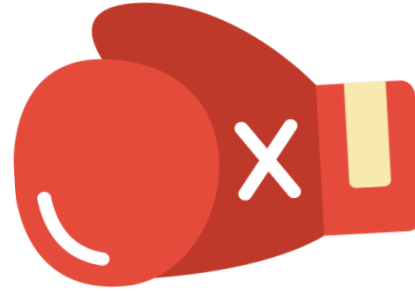


ROUND
1

Results: Knowledge Gains

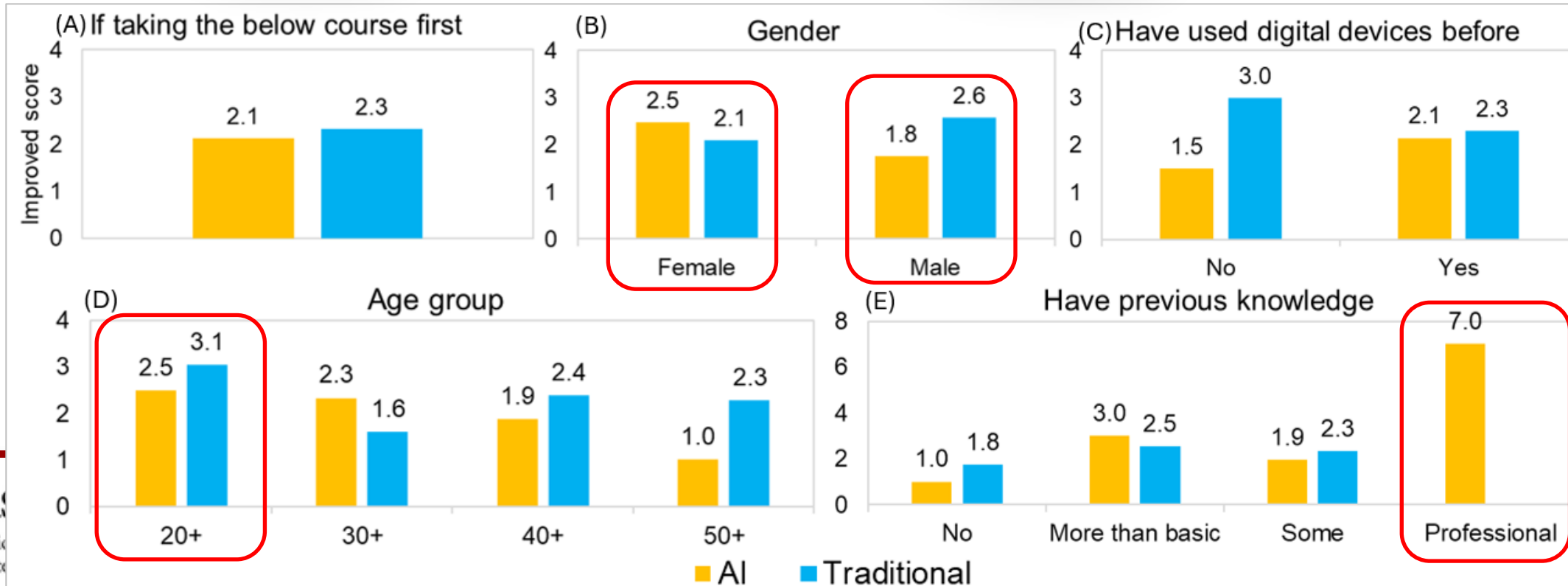


+2.1 points



+2.3 points

- Gender differences:
 - Women learned more with AI (+2.5 vs 2.1)
 - Men learned more traditionally (+2.6 vs 1.8)
- Age differences: the young (+20) gains more traditionally
- Professionals gain more via AI (7 points)



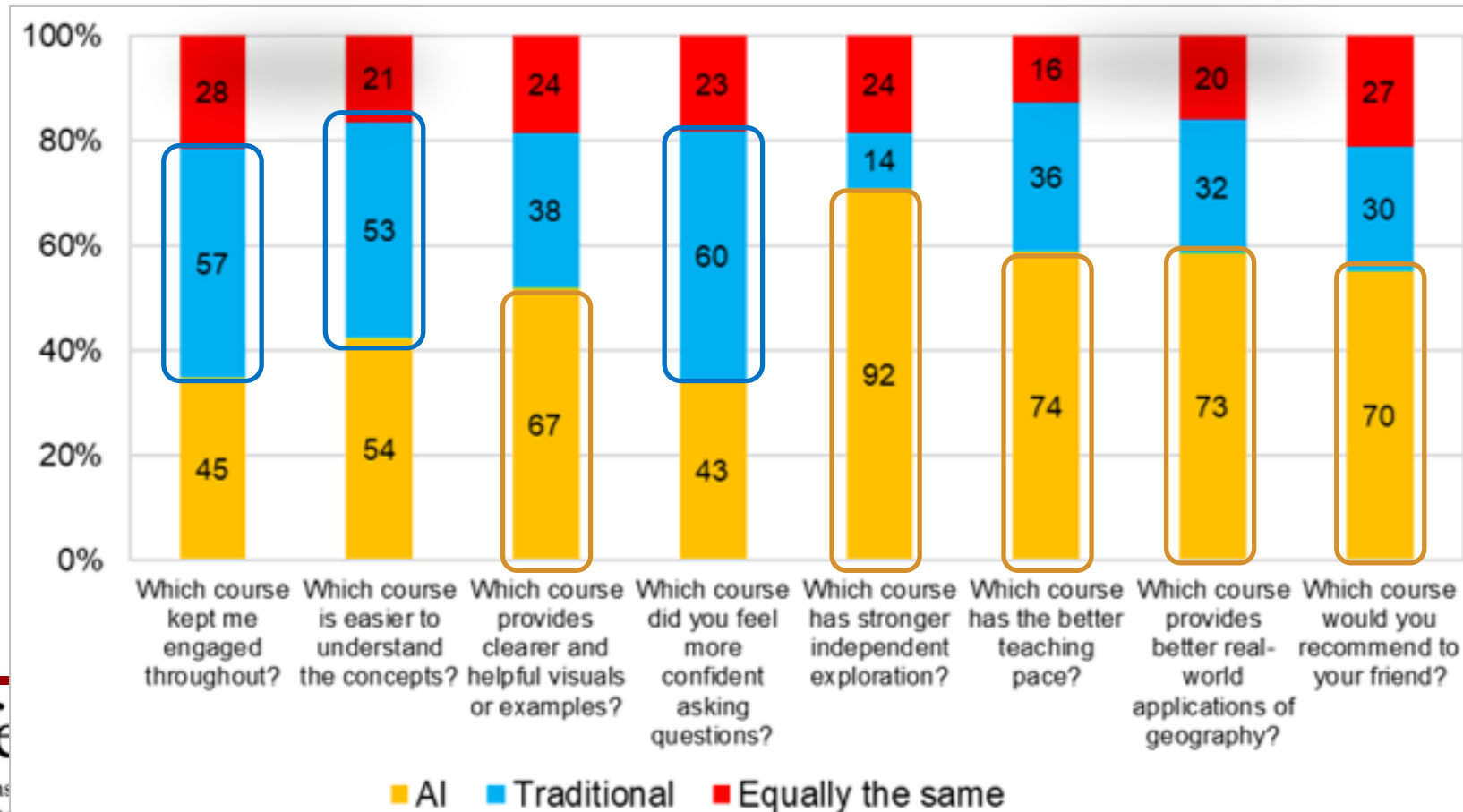


ROUND
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Results: Learning Experiences

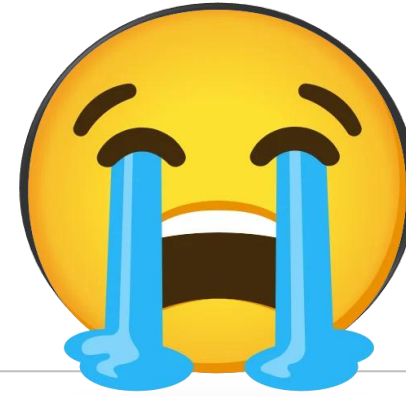
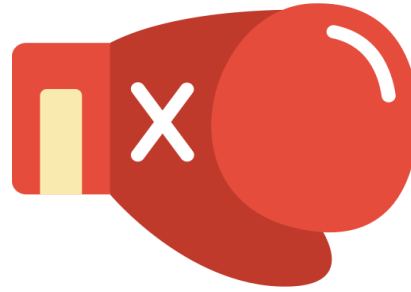


Traditional teaching keeps students more engaged and more confident to ask questions

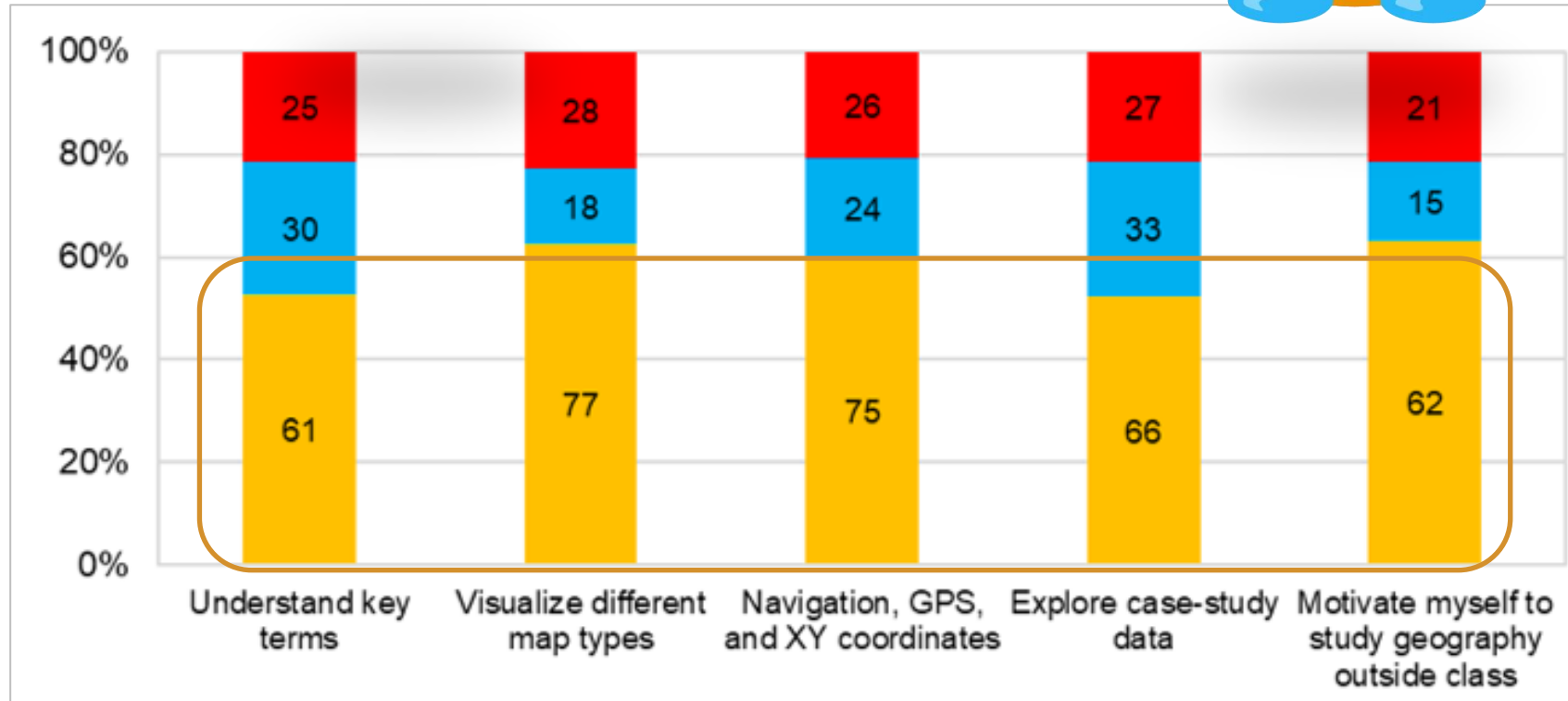




Results: Teaching Tasks

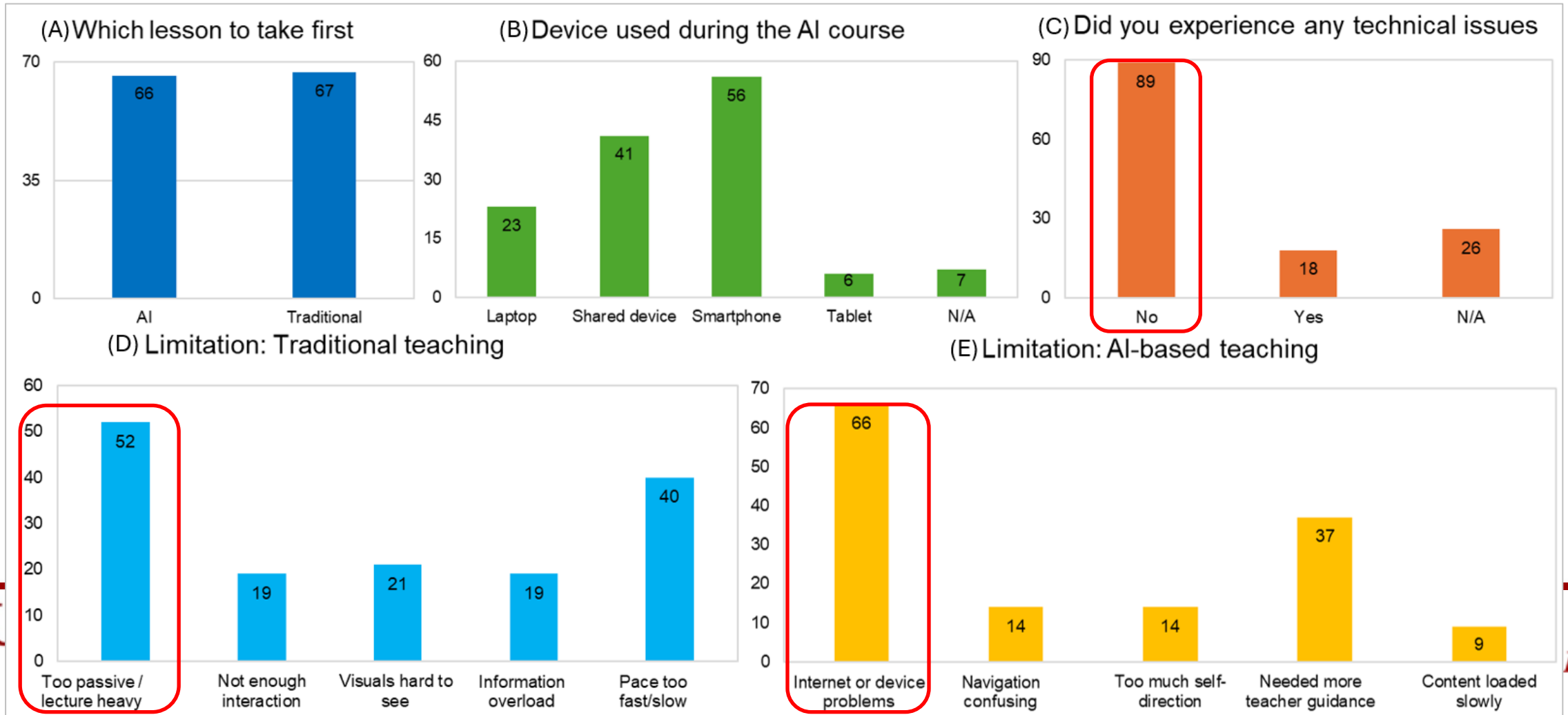


AI performs better in all teaching tasks



Results: Learning Experiences

- Limitation: Traditional teaching (too passive) VS AI teaching (technical issues)
- Advantages: Traditional teaching (more engaged) VS AI teaching (clearer visuals, maps, and self-guided)



Key Takeaways

- Traditional slightly better for knowledge gains
- AI better for:
 - ✓ Visuals
 - ✓ Exploration
 - ✓ Self-paced study
- Strong consensus: [Blended approach works best](#)



Future directions

- Integrate AI into national curriculum
- Teacher training & professional development with AI mentors
- Localized, culturally relevant AI modules
- Offline and low-cost solutions to address digital divide

**Signed a MoU with
the Government,
Presidential Office,
and Zanzibar Public
Health Institute**



Future directions

AI 4 Edu Africa website (www.ai4eduafrica.org)

AI4EduAfrica is a collaborative initiative exploring how Generative AI can support equitable, scalable, and locally grounded education in Tanzania. This demonstration website was created to showcase sample student learning modules, teacher-facing resources, fieldwork documentation, and recent project activities connected to our broader partnership efforts.



Demo Courses

Explore sample online learning modules designed to support local students through interactive, curriculum-aligned content.

Teacher Hub

Browse blog-style resources that introduce teaching tools, classroom ideas, and practical supports for educators.

Fieldwork Portfolio

View photos and videos from summer fieldwork, classroom engagement, and community-based project activities.

Events

See recent workshops, training sessions, and project activities that support collaboration and

Demo Courses

All programs

Geography

Chemistry

Biology

Math



Foundations of Geography and
Environmental Stewardship (Form
I–IV)

1 Participant

Free

[View Details](#)



Foundations of Chemistry and
Everyday Applications (Form I–
IV)

Free

[View Details](#)



Foundations of Biology and Life
Science Skills (Form I–IV)

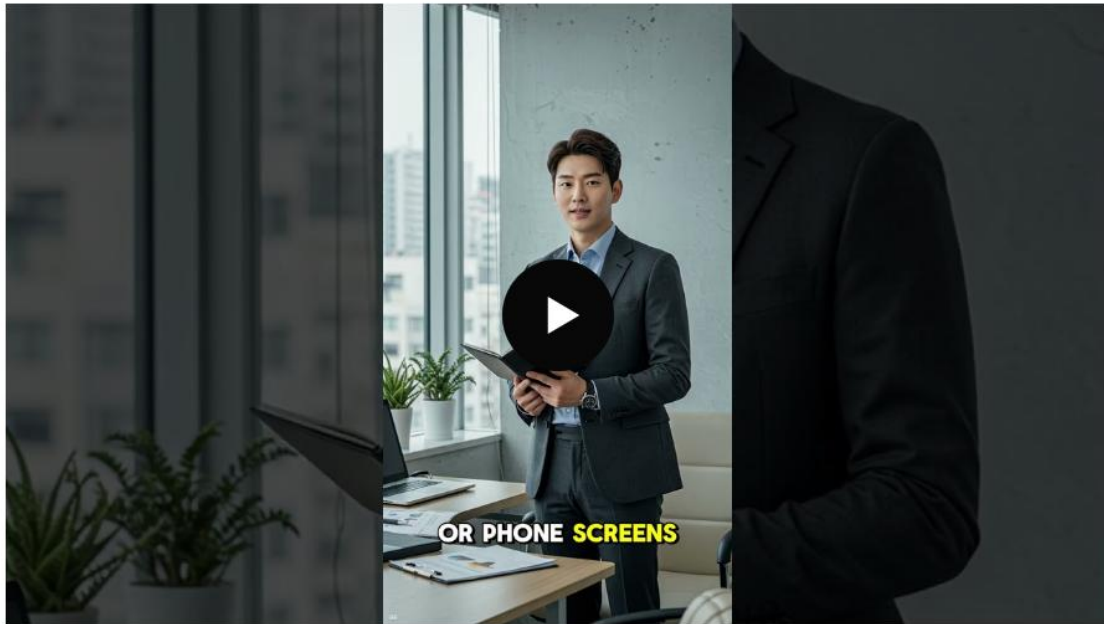
Free

[View Details](#)



Provide AI training to local teachers

Teacher Hub



Geospatial Foundations for Zanzibar's Adult Learners: A Summer 2025 Case Study in AI Education

Misingi ya Jiografia kwa Watu Wazima wa Zanzibar ♦ Section 1: Fundamental Geospatial Concepts ♦ Misingi ya Dhana za Jiografia ya Kijiografia Video 1: Earth Basics - Where Ar...

Gemini Gems: Custom AI Agents



Personalized Tutors

Create custom "Gems" equipped with specific instructions to act as specialized tutors. Design a "Writing Coach Gem" or a "Python Debugger Gem" tailored to your exact assignment rubrics. Share specific Gems with your students through Google Classroom for targeted, scalable support that is available 24/7, effectively providing every student with a personal mentor.

Revolutionizing Pedagogy: Inside the AI-Powered Classroom

Today, we are exploring how the traditional "information transmission" model is evolving into a dynamic system of AI-assisted mentorship. This featured video dives into the...



Acknowledgement: Thanks for Women in GIS for providing 'Grants for Geospatial Work' to support this research.

Welcome any comments/questions

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