Daniel Sogbey

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Research Interests

Human-AI interaction and cognitive systems, with emphasis on reasoning support, cognitive engagement and the effects of AI on human thinking and decision-making.
My research focuses on how AI systems influence the way people think, learn and solve problems. As AI tools become more capable of generating answers instantly, I am interested in understanding how these systems can support human reasoning without reducing independent thinking or deeper understanding. I design and study interactive AI systems that keep people actively involved in the reasoning process through structured interaction, reflection and guided problem solving. My work explores how AI can help people think more carefully, question assumptions and strengthen understanding rather than simply providing answers.
My work sits at the intersection of human-centered AI, learning sciences and interaction design, with current projects exploring AI-guided reasoning systems, cognitive engagement and structured human-AI collaboration.

Education

University of Cape Coast, Ghana Bachelor of Education in Science (Physics Major), First Class Honours (GPA: 3.6/4.0) Nov 2022

My undergraduate training combined rigorous study in physics with a strong foundation in pedagogy, curriculum design and science education research. My coursework and field experience emphasized pedagogical content knowledge, instructional design and the development of effective teaching strategies for complex scientific concepts.

Publications and Scholarly Work

Sogbey, D. (2026). *AI-Guided Scaffolding for Conceptual Understanding in Electric Circuits: A Controlled Pilot Study* . **Preprint**.
Designed and conducted a controlled experimental study evaluating a structured, step-based tutoring system for physics education. Developed a mobile system that enforces sequential reasoning. Analyzed pre/post-test data (n=10), observing over 2× improvement in learning gains compared to traditional approaches.

Sogbey, D. (2025). *Integrating Engineering Design to Enhance Conceptual Understanding in Ghanaian Senior High and Technical Education* . **Study (Preprint)**.
Examines engineering design as an instructional approach for improving conceptual understanding. Focuses on inquiry, iterative problem solving and implementation challenges in real classroom settings.

Sogbey, D. (2025). *IoT-Based Energy Monitoring and Adaptive Load Control: A Proof of Concept Using ESP8266 and Simulated Devices* . **Systems Study (Preprint)**.
Designed and implemented an IoT-based system for real-time monitoring and adaptive control, demonstrating integration of embedded systems and data-driven decision-making.

Research Experience

Structured Reasoning Tutor Study 2026
Designed and evaluated a step-based tutoring system for electric circuits. Conducted controlled study with pre/post-test design, analyzing learning gains and engagement patterns.

Interactive Circuit Simulation System (Ongoing) 2026
Developing an event-driven circuit simulation environment where learners construct systems, generate predictions and compare outcomes. Investigates how interaction and prediction influence conceptual understanding and misconception correction.

Engineering Design in Science Education Study 2025
Explored design-based learning as a mechanism for improving conceptual understanding in STEM classrooms, focusing on inquiry and iterative reasoning.

Research Systems

Structured Reasoning Tutor: Mobile system supporting step-based problem solving and guided reasoning (Flutter, Go backend)
Circuit Simulation Environment: Web-based system for interactive circuit construction, prediction and simulation (JavaScript, event-driven architecture)
Interaction Logging Pipeline: Data collection system capturing user actions, predictions and reasoning for analysis of learning behavior

Teaching Experience

Teaching Assistant, University of Cape Coast Nov 2022 – Aug 2023
Supported undergraduate instruction in physics education courses. Led tutorials focused on conceptual understanding and problem solving and contributed to assessment and feedback.

Mathematics Tutor (Field Experience), Ziope SHS Oct – Nov 2021
Taught core mathematics topics using interactive, student-centered approaches to improve engagement and problem-solving skills.

Physics Tutor, Express Remedial College Jun – Aug 2019
Prepared students for WAEC examinations, focusing on electricity and electronics concepts.

Professional Experience

Mobile Product Engineer, Hubtel Ltd Sep 2023 – Present
Design and develop real-time, interaction-driven systems that adapt to user behavior and operational context in high-frequency environments.

- Designed an adaptive location-tracking system with dynamic update intervals based on rider velocity and network conditions, reducing battery consumption by 40% while maintaining real-time accuracy.
- Architected a multi-channel notification system (WebSockets, Firebase Cloud Messaging, API polling) for real-time order dispatch, increasing rider order acceptance rates by 35%.
- Built a multimodal feedback system (voice and image capture) integrated with backend services, improving issue reporting quality by 60% and reducing resolution time by 30%.

This work informs my research interest in adaptive systems, particularly how real-time interaction data can be used to guide decision-making, personalize system behavior and support responsive user-centered environments.

Research-Related Technical Skills

Systems for Research: Interaction logging, data pipelines, analysis-ready datasets
Research Methods: Experimental design, pre/post-test evaluation, qualitative analysis
Learning Design: Inquiry-based learning, conceptual assessment, design-based approaches
Tools: LaTeX, GitHub, ResearchGate

Technical Skills

Programming: Python, SQL (PostgreSQL), Go, Dart
AI Systems: LLM integration, prompt design for structured reasoning, evaluation of interactive systems
Backend Systems: REST APIs, database design, real-time data systems
Frontend/Mobile: Flutter, JavaScript, interactive system design

Leadership and Activities

Organized student engagement initiatives through Campus Crusade for Christ International. Participated in team-based activities including competitive football.

Test Scores

GRE: 164 Verbal, 161 Quantitative, 3.5 AWA