

A NEW TOOL TO EMPOWER CITIZEN SCIENTISTS AND STUDENTS IN WATER QUALITY RESEARCH

GaiaXus

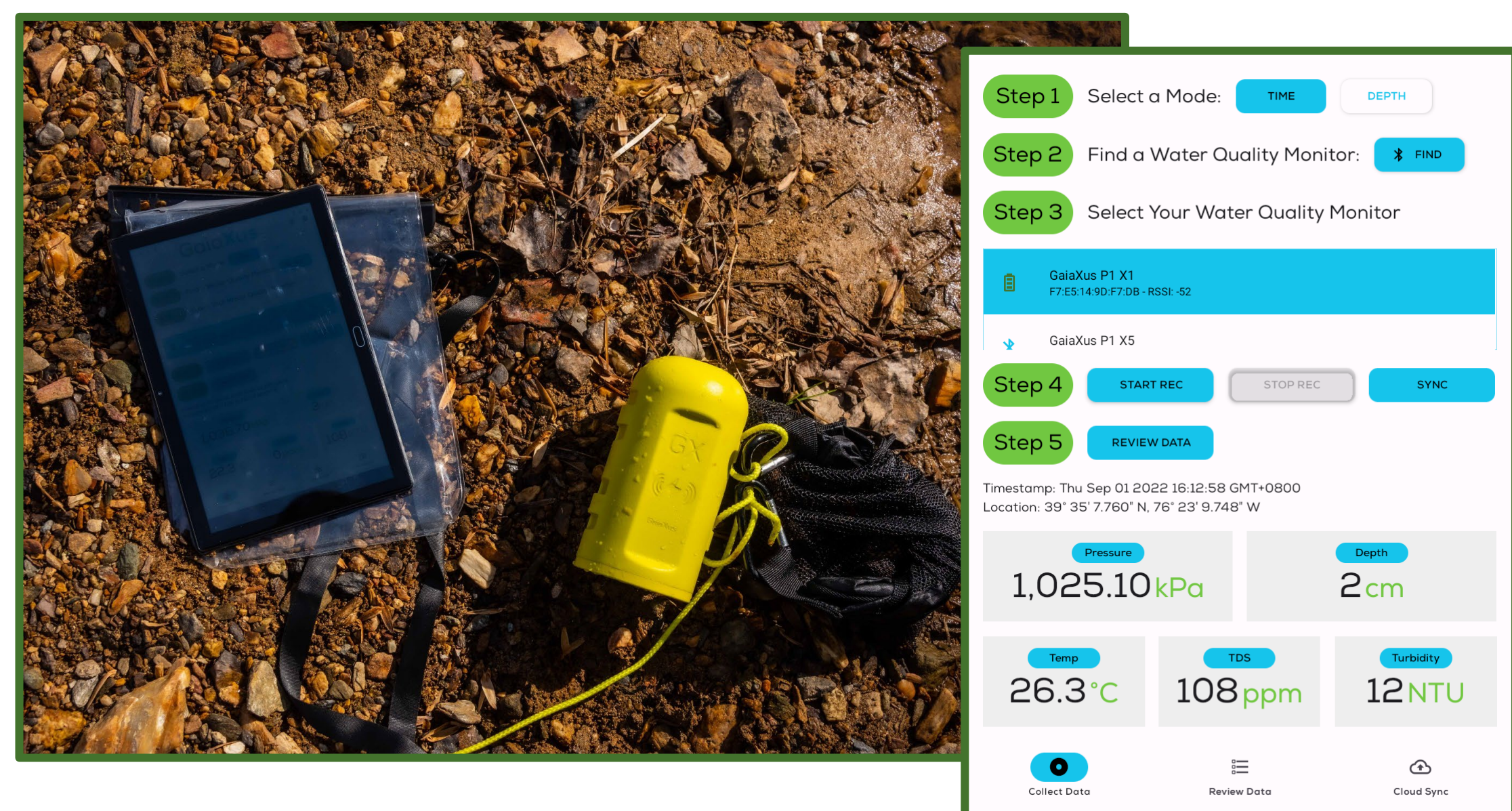
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Introduction

Citizen science and environmental STEM education engage non-specialist participants in collaborative scientific research with limited access to costly monitoring equipment. This approach, striving for a more profound understanding of real-world science and fostering environmental conservation in local communities, can be hindered by inaccurate or labor-intensive methods, diminishing user engagement and impeding STEM progress, further isolating environmental science from the wider community.

Methods

We developed a cost-effective, accurate environmental water quality monitoring system featuring a cylindrical housing with sensors for water temperature, salinity, pressure, turbidity, and spectral optical clarity. This data is transmitted to a dedicated mobile app for visualization, contextualization, and secure transfer to our cloud platform, enabling data analytics, sharing, and GIS display.



The water quality monitor is battery operated and communicates via Bluetooth to its companion app. The device is submersible to 10m, can be left for 24h and has 4 acquisition modes to fulfill multiple roles in citizen science and environmental education



Results

We rigorously assessed initial prototypes in three IRB-based studies, three international conferences, and numerous demonstrations and pilot projects involving students from Grades 5-12, community college, and undergraduate levels. Over 170 participants applied the system in diverse applications.

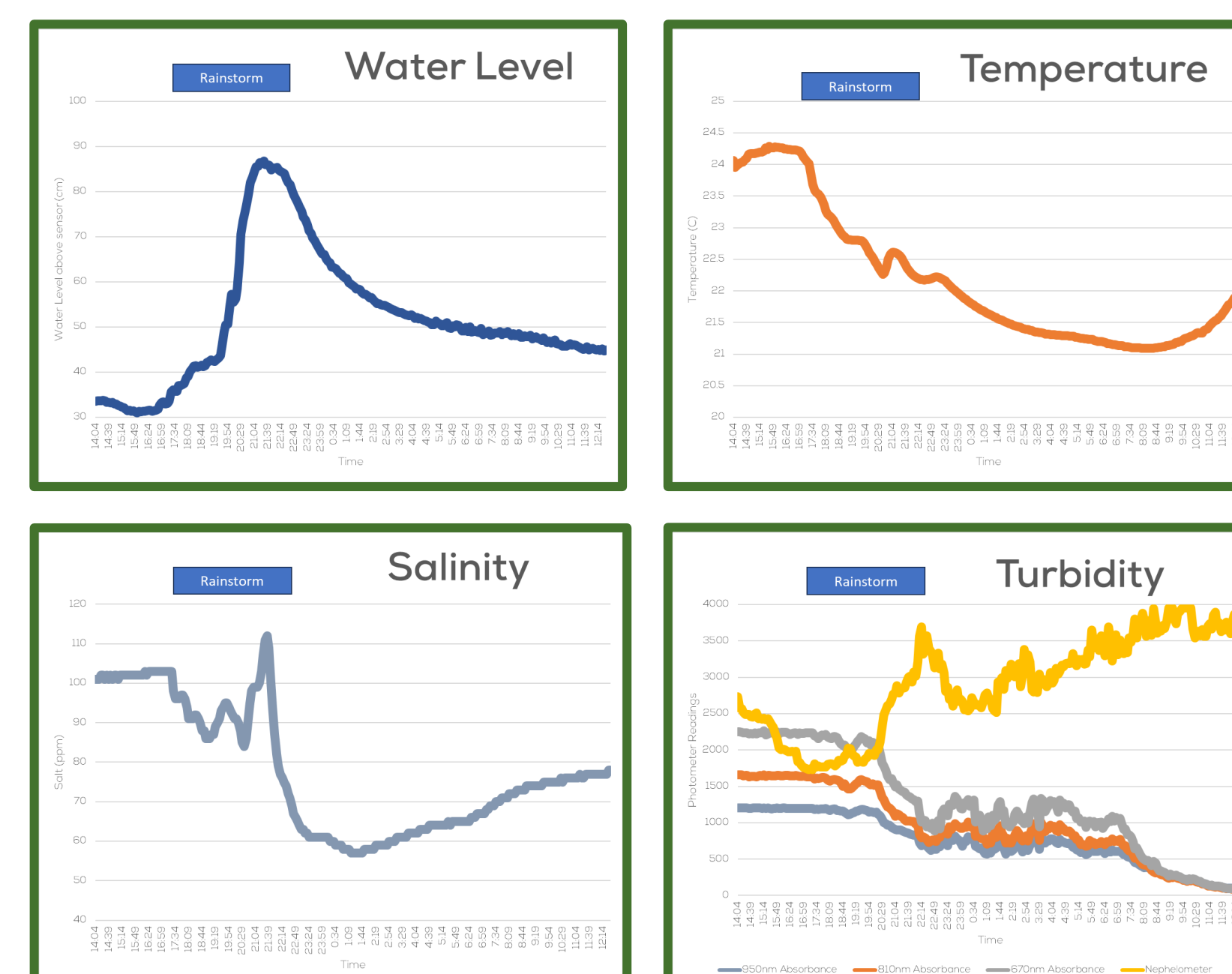
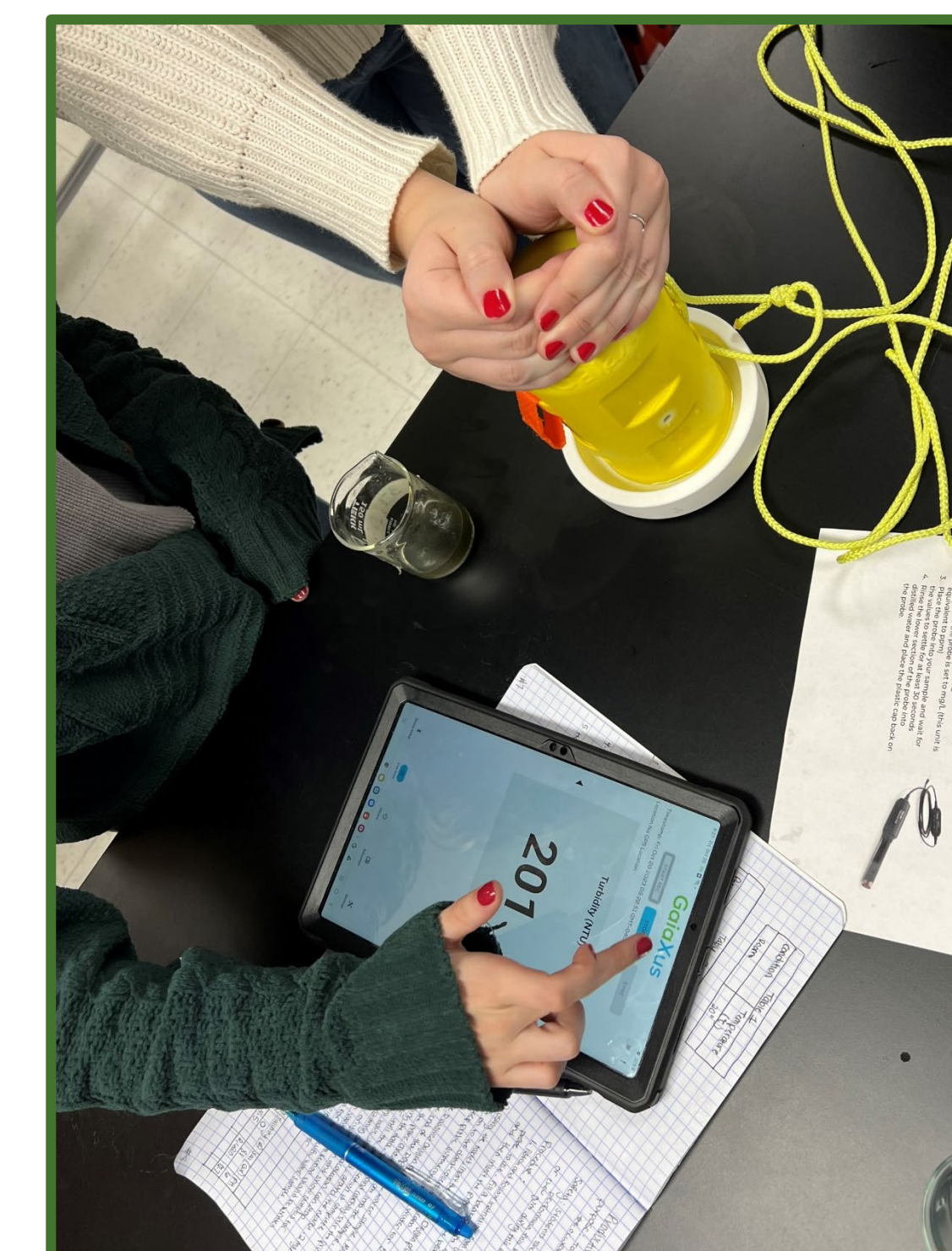
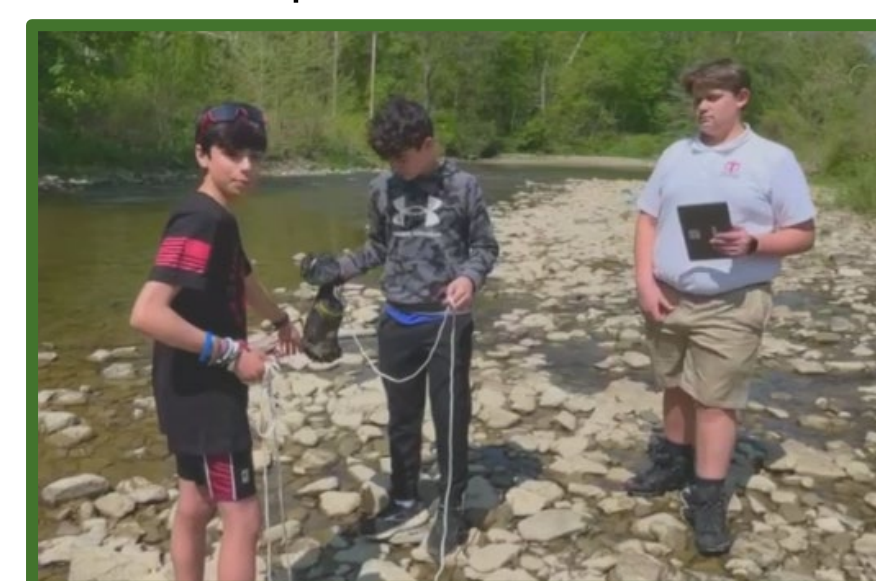


In 5th grade, place-based learning has substantially benefitted from the GaiaXus system as students were able to discover relationships between salinity, temperature, pressure (~depth) and water clarity hands-on, in a single device.

Teachers valued the tight integration with their lesson plans and reported increased self-motivation and critical, scientific thinking

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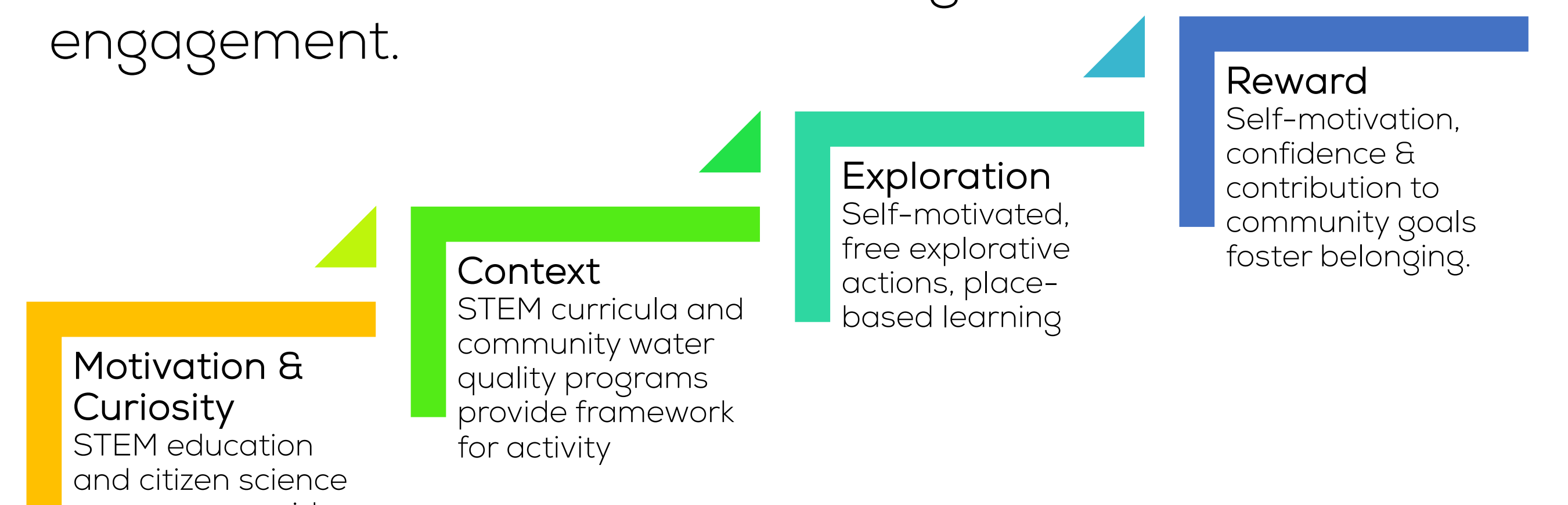
8-12th grade students experienced the versatility of the system by utilizing the device both in the field and in the classroom. Students valued the interactive mode of data acquisition and analysis



Community-based research encompasses academia, citizen science, and education. In this project, a probe submerged in a Maryland creek during a heavy rainstorm was later retrieved for hydrological analysis. Noted were the sudden increase in turbidity, fall in temperature optical clarity and salinity as rainwater surged through the narrow creek bed.

Discussion

Student and citizen scientist engagement in environmental science hinges on three key factors: motivation, community and scientific context, and technology. The GaiaXus probe demonstrates the safe and effective operation of a modern, accurate system by students of various age groups and grades, providing contextual and meaningful data within their curriculum. Moreover, the system's adaptability in classrooms, academic settings, and community exploration enhances curiosity, motivates STEM involvement, and encourages environmental engagement.



About GaiaXus

GaiaXus is a Maryland-based start-up company with advanced prototypes ready for community piloting and engagement.

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Acknowledgements

