NuiBot: A Science Assistant Robot for Future-Focused Learning

Integrating Robotics, AI, and Inquiry Science in New Zealand Classrooms

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Executive Summary

New Zealand is at a turning point. The education system faces the dual challenge of lifting student engagement in science and technology while preparing young people for a rapidly changing future of work shaped by artificial intelligence, robotics, and sustainability imperatives (Ministry of Education, 2018; Productivity Commission, 2020). Reports consistently highlight that New Zealand lags behind global peers in STEM participation and performance (NZ Initiative, 2021; OECD, 2020). Without bold interventions, the gap will widen, leaving students underprepared for industries of the future.

NuiBot, developed through the Kōkiri AI Lab in Whanganui, offers a transformative solution. It is a modular, classroom-safe science assistant robot that supports student inquiry, collects and interprets real-time data, and provides feedback through a connected digital platform, GrowHub. Unlike conventional robotics kits, which often stop at abstract coding exercises, NuiBot integrates directly with science learning by assisting in experiments, reducing error, and making invisible processes visible to learners (Bolstad et al., 2012; Royal Society Te Apārangi, 2021).

NuiBot embodies the principles of future-focused education identified in New Zealand research:

- **Personalisation and collaboration** – students programme the robot, design experiments, and work in teams (Bolstad et al., 2012).
- **Authentic, real-world contexts** – sensors monitor variables such as pH, temperature, and light, linking directly to local ecosystems and sustainability issues (Bolstad, 2015; ERO, 2020).
- **Integration across learning areas** – robotics, coding, science, and ecological literacy are combined into one platform, aligned with Te Mātaiaho curriculum refresh (Ministry of Education, 2023).
- **Pathways to future skills** – GrowHub supports scaffolded learning from simple coding to advanced AI projects, feeding into NZQA micro-credentials (NZQA, 2020).

The global literature confirms that educational robotics enhances motivation, collaboration, and problem-solving, particularly when linked to inquiry-based and project-based learning (Eguchi, 2019; Anwar et al., 2019; Barak & Assal, 2023). A recent meta-analysis shows moderate to strong effects on student performance ($g \approx 0.66$) and attitudes ($g \approx 0.50$), with the strongest gains occurring in group, project-based settings over longer durations (Chevalier et al., 2024). Locally, the Education Review Office (2021) has warned that STEM provision in schools is fragmented and uneven, especially in rural areas. NuiBot provides an affordable, scalable, and culturally adaptable tool to bridge this gap.

The vision is clear: every New Zealand classroom equipped with a science assistant robot that makes learning authentic, connects schools into a national and global data-sharing network, and prepares students to thrive in a future of AI, robotics, and sustainability challenges. Backed by evidence from both international research and New Zealand's own policy frameworks, NuiBot represents a world-first opportunity: to combine robotics, inquiry learning, and ecological responsibility into one integrated education and research platform.

The Need

New Zealand's education system faces mounting challenges in engaging students with science and technology while also preparing them for a world increasingly shaped by automation, artificial intelligence, and ecological pressures. Research shows that student engagement in science drops sharply in Years 9–10, with many learners perceiving it as irrelevant to their everyday lives (NZCER, 2020; ERO, 2020). The Education Review Office's national evaluation of STEM education concluded that science teaching in many schools is fragmented, under-resourced, and lacking in authentic, hands-on opportunities (ERO, 2021).

At the same time, New Zealand must lift its competitiveness in the global skills race. The Productivity Commission (2020) warns that the future of work will be defined by digital and technological capability, yet many students currently leave school without the computational thinking, problem-solving, or systems literacy required. The OECD (2020) similarly notes that while New Zealand's education system is equitable, it underperforms in STEM outcomes compared to other OECD countries. Without urgent investment in future-focused learning, New Zealand risks falling behind.

Current approaches to robotics in schools remain limited. While digital technologies and robotics kits are available, their use is often restricted to coding exercises or competitive challenges, with few connections to the science curriculum (Massey University, 2019; Waikato University, 2020). Teachers report barriers such as lack of confidence, insufficient training, and difficulty linking robotics to inquiry learning (University of Auckland, 2018; Ako Aotearoa, 2021). As a result, robotics is treated as an add-on rather than a tool that can transform science education.

International evidence shows that robotics can powerfully enhance learning when integrated into inquiry-based and project-based contexts. Eguchi (2019) and Anwar et al. (2019) found that educational robotics improves problem-solving, teamwork, and

STEM motivation. A meta-analysis by Chevalier et al. (2024) concluded that robotics has moderate-to-strong impacts on both academic performance and attitudes, especially when students work in collaborative, inquiry-driven settings. However, these findings have yet to be systematically applied in New Zealand classrooms.

The need is therefore twofold:

1. **Educational engagement** – to re-ignite curiosity and provide authentic science learning that connects students with real-world systems (Bolstad, 2015; Royal Society Te Apārangi, 2021).
2. **Future skills** – to ensure students graduate with the digital, ecological, and problem-solving competencies required for New Zealand to remain globally competitive (Ministry of Education, 2018; National AI Strategy, MBIE, 2021).

NuiBot directly addresses this dual need by serving as a science assistant robot that makes inquiry learning tangible, reduces teacher barriers, and provides a pathway to computational, ecological, and systems literacy. It transforms robotics from a coding exercise into a tool for authentic science, preparing learners not just for the classroom, but for the challenges and opportunities of the 21st century.

Concept and Vision

NuiBot is designed to transform how science is taught and learned in New Zealand. At its heart, it is a science assistant robot: a classroom partner that helps teachers and students conduct experiments, collect and interpret data, and reflect on results. By doing so, it bridges the gap between theory and practice, turning abstract concepts into authentic, lived experiences.

Unlike conventional robotics kits, which focus narrowly on coding, NuiBot is built to integrate directly with science inquiries. Equipped with modular probes, a robotic arm, and a camera head, it can measure variables such as temperature, humidity, or pH, and then act on that data—feeding fish, adjusting lights, or opening valves. Through GrowHub, its connected online platform, all data is logged, visualised, and interpreted. Students see immediate cause and effect, while teachers access dashboards that align experiments with learning outcomes.

The vision aligns with the principles of Te Mātaiaho: The New Zealand Curriculum Refresh, which emphasises sustainability, systems thinking, and integrated, future-focused learning (Ministry of Education, 2023). NuiBot embodies these priorities by combining robotics, AI, and ecology into one coherent platform. It also connects to

NZQA’s micro-credentials framework, giving students pathways to recognised skills in coding, AI, and systems design (NZQA, 2020).

Globally, the literature stresses that effective robotics education requires authentic, inquiry-based contexts (Eguchi, 2019; Anwar et al., 2019). Local evidence also highlights that New Zealand students engage most strongly when learning is contextualised within real-world challenges (Bolstad, 2015; NZCER, 2020). NuiBot is uniquely positioned to deliver on this by supporting inquiries across multiple domains: from environmental monitoring and aquaponics, to physics experiments and engineering design trials.

The vision is expansive:

- **For students** – NuiBot offers a scaffolded journey, from programming simple movements to designing complex, AI-driven experiments, fostering creativity, problem-solving, and systems literacy.
- **For teachers** – it provides a classroom-ready assistant that reduces workload and aligns directly with curriculum frameworks.
- **For schools** – it becomes a visible symbol of commitment to innovation and future-focused learning.
- **For New Zealand** – NuiBot represents a world-first: a homegrown educational robot that integrates AI, robotics, and ecology into one learning ecosystem, positioning the country as a global leader in EdTech innovation (Callaghan Innovation, 2022; MBIE, 2021).

Ultimately, NuiBot is more than a machine. It is a vision for the future of learning: where every classroom has a science assistant that helps students ask questions, test ideas, and connect with the wider world. Through GrowHub, NuiBot will connect classrooms across Aotearoa—and eventually internationally—creating a living network of student-driven research and innovation.

Design Principles

NuiBot has been developed with careful attention to the principles that make educational robots effective, safe, and engaging. Safety and accessibility come first. Research on human–robot interaction stresses the importance of features such as guarded movements, torque limits, and clear override controls so that teachers and students can trust the technology (International Journal of Human-Computer Studies, 2022). For this reason, NuiBot uses torque-limited motors and soft gripping mechanisms that prevent accidental injury. It includes an emergency stop button that immediately halts movement while still recording data, and all of its components are modular and low-voltage so they can be handled safely by students. These choices ensure that NuiBot can be used confidently in any classroom, including those without specialist science laboratories.

Another core principle is modularity and customisation. Studies have shown that modular systems keep students engaged for longer because they allow projects to grow beyond simple activities (Anwar et al., 2019; Chevalier et al., 2024). NuiBot has been designed as a plug-and-play platform. Probes for temperature, pH, oxygen, and light can be added or swapped with ease. The robotic arm can be fitted with different tools to suit the needs of an experiment, and the GrowHub platform offers coding environments that range from simple drag-and-drop to advanced ROS2 integration. This means the robot can evolve alongside the learner, from introductory use in Year 7 to advanced makerspace projects in senior secondary school.

Engagement also depends on how approachable the robot feels. Research in social robotics shows that friendly, human-like features help students interact more readily and see robots as collaborators (International Journal of Social Robotics, 2025). NuiBot includes a camera head with LED “eyes” that can signal when it is ready, processing, or observing. While this is a simple feature, it builds relational trust and makes the robot feel less like a machine and more like a partner in the inquiry process (Eguchi, 2019).

The design also supports scaffolded learning pathways. Effective robotics education requires a gradual increase in complexity so that students move smoothly from simple control to complex systems thinking (Bolstad et al., 2012; NZCER, 2020). NuiBot is integrated with the GrowHub platform to support this progression. At the first level, students can explore basic movements and data collection. At the next level, they can use the robot to support experiments such as comparing light levels or feeding regimes. As they advance, they can integrate dashboards for collaborative analysis, and finally they can design their own extensions and innovation projects using AI and fabrication tools. This mirrors international best practice in inquiry-based robotics (Eguchi, 2019; Anwar et al., 2019) and aligns closely with Te Mātaiaho’s emphasis on progressions of learning.

Cultural responsiveness is another guiding principle. New Zealand research shows that Māori and Pasifika students are more engaged when learning tools reflect cultural values such as kaitiakitanga, or guardianship of the environment, and whanaungatanga, or collaboration (AUT, 2021; Waikato University, 2019). NuiBot projects can include ecological monitoring tasks that are tied to local environments, and the robot can be programmed with bilingual prompts in te reo Māori. This ensures inclusivity and embeds cultural relevance directly into its design.

Finally, NuiBot has been designed to connect directly to curriculum outcomes. Its activities map onto Te Mātaiaho's strands of Understanding the Natural World, Designing and Developing Digital Outcomes, and Computational Thinking (Ministry of Education, 2023). By aligning its design with curriculum frameworks, NuiBot ensures that teachers can adopt it with confidence, knowing that every activity contributes to recognised learning goals.

Technical Architecture

NuiBot has been designed as a safe, adaptable, and classroom-ready robot that combines modern robotics with the practical needs of teachers and students. Its technical architecture brings together mechanical design, electronics, sensors, software, and online connectivity in a way that makes science experiments engaging and reliable.

The mechanical design is built around a compact mobile base with omni wheels that allow smooth movement in classroom spaces. This mobility lets NuiBot position itself precisely without blocking learners' access to equipment. On top of the base is a six-joint robotic arm capable of gripping, pressing, rotating, and lifting objects. To ensure safety, the arm uses torque-limited motors and lightweight materials. Studies in human–robot interaction highlight the importance of compliant movement and safe design for classroom environments (Frontiers in Robotics and AI, 2022). Different grippers and tools can be swapped depending on the task, providing versatility for a wide range of experiments.

The electronic system combines microcontrollers for simple tasks with a more powerful onboard computer for complex processing. Microcontrollers such as Arduino or ESP32 handle real-time sensor integration and quick responses, while single-board computers like Jetson modules or Raspberry Pi 5 support vision recognition and AI-based analysis. To protect both users and components, NuiBot uses low-voltage circuits with protective fuses and grounding, which are recognised best practices in robotics education (IEEE Robotics and Automation Magazine, 2020).

The robot carries a modular sensor suite that makes it useful across many areas of science. Probes can measure water chemistry, such as pH, dissolved oxygen, and conductivity, which are essential in environmental and ecological studies. Other sensors measure temperature, humidity, and light intensity, which are important for physics and environmental inquiries. A dual-lens camera system provides object recognition and visual data capture. Research has shown that reliable sensors and proper calibration are key for building trust in data during classroom experiments (MDPI

Sensors, 2021). To support this, GrowHub provides built-in calibration routines and alerts when results appear to drift.

Connectivity is another vital element. NuiBot streams live data to GrowHub using wireless networks, allowing students and teachers to monitor experiments in real time. It also connects via USB-C for secure charging and direct classroom integration. Recognising that many rural schools in New Zealand experience unreliable internet access, NuiBot also has an offline mode that stores data locally until it can be uploaded later (Ministry of Education, 2020).

The software architecture is layered to match the skills of learners. At the entry level, students can use simple programming tools that allow them to drag and drop commands, making it easy to move the robot or record a reading. More advanced learners can use Python or ROS2 to design complex behaviours, while the onboard computer can run artificial intelligence tasks such as recognising patterns in data. GrowHub ties all these layers together by offering a web-based platform where tasks are programmed, data is logged, and results are visualised. Research in educational robotics confirms that scaffolded programming environments support accessibility while still allowing progression to advanced levels (Anwar et al., 2019; Chevalier et al., 2024).

Finally, the design includes human–robot interaction features that make NuiBot approachable and engaging. The camera "head" has LED "eyes" that can signal attention or readiness. International studies show that simple anthropomorphic cues increase learner engagement and willingness to interact with robots (International Journal of Social Robotics, 2025). Combined with GrowHub's plain-language feedback and easy-to-read dashboards, these features encourage students to treat NuiBot as a partner in inquiry.

Control and Functionality

NuiBot has been developed to act as a genuine classroom assistant rather than a simple programmable toy. Its control system and core functions have been shaped to support inquiry learning, allowing students to design and run experiments, gather results, and reflect on findings. The design of these functions has been influenced by both international research into educational robotics and the practical realities of teaching science in New Zealand.

Students can interact with NuiBot through programming environments that match their stage of learning. For beginners, drag-and-drop coding tools allow them to make the robot move or take a sensor reading without needing prior technical skills. As learners progress, they can move into text-based coding using Python or more complex robotics operating systems such as ROS2. Research has shown that scaffolding control systems in this way supports accessibility for new learners while also enabling progression to advanced technical skills (Anwar et al., 2019; Chevalier et al., 2024).

Beyond coding, NuiBot is designed to perform meaningful actions in science contexts. Its robotic arm can press buttons to start pumps, grip and turn dials, lift covers on tanks, or release feed pellets into aquaponics systems. At the same time, it collects readings from its modular probes, such as water temperature, pH, oxygen levels, humidity, and light intensity. The combination of physical action and environmental sensing allows students to set up controlled comparisons and explore cause-and-effect relationships in a way that feels real and immediate. Inquiry-based studies consistently show that hands-on robotics linked to experiments enhances motivation and learning outcomes (Eguchi, 2019; Pedaste et al., 2020).

Artificial intelligence adds another layer of functionality. NuiBot does not just report raw numbers but can analyse patterns and highlight anomalies. If oxygen levels in a tank are dropping, it can notify students through the GrowHub platform and suggest increasing aeration. If sensor results seem inconsistent, it can recommend recalibration. This design reflects emerging work in intelligent tutoring robots, where natural-language explanations and feedback loops increase student understanding (Woolf et al., 2019; International Journal of Social Robotics, 2025).

GrowHub provides the central interface where all these controls and functions come together. Students log into the platform to design experiments, upload their code, and watch the robot carry out tasks. Teachers can monitor class progress, see results across groups, and intervene when guidance is needed. This form of orchestration has been highlighted as essential in classroom robotics, where teacher dashboards can make the difference between novelty use and sustained learning integration (British Journal of Educational Technology, 2023; Education and Information Technologies, 2022).

The control system also reflects New Zealand's educational context. Teachers often report limited confidence in using robotics, citing time pressures and lack of training as barriers (University of Auckland, 2018; Ako Aotearoa, 2021). NuiBot addresses this with pre-configured routines for common experiments, a user-friendly interface, and clear step-by-step prompts in GrowHub. This reduces the preparation required for lessons while still leaving space for open inquiry.

By combining scaffolded coding environments, meaningful physical actions, intelligent feedback, and a shared online platform, NuiBot provides control and functionality that are practical, engaging, and pedagogically aligned. It transforms robotics into a partner for inquiry, helping students and teachers work together to explore science in ways that are authentic, replicable, and future-focused.

Applications in Education

NuiBot has been designed first and foremost as a classroom tool for science and STEM education. Its applications extend across year levels, curriculum strands, and teaching contexts, offering a consistent platform that can evolve with learners as they progress. By linking robotics with authentic inquiry, it helps address long-standing gaps in how science is taught in New Zealand schools.

One of the most significant challenges identified by the Education Review Office (2021) is that science learning is often fragmented and lacks hands-on opportunities. Students may learn scientific theory but rarely experience it in action. NuiBot directly addresses this by enabling students to run real experiments, gather reliable data, and see cause-and-effect relationships unfold in front of them. This brings science alive and supports inquiry-based learning, which is widely recognised as a best practice for increasing engagement (Pedaste et al., 2020; Bolstad, 2015).

For younger students at Years 7–8, NuiBot can be introduced as a way of collecting simple environmental data such as temperature or light. At this stage, drag-and-drop coding interfaces keep activities accessible while still providing a sense of agency and discovery. As learners move into Years 9–10, where engagement in science typically drops (NZCER, 2020), NuiBot becomes a powerful tool for rekindling curiosity. Students can design and test experiments, such as investigating the effect of light spectra on plant growth or comparing different feeding regimes in aquaponics. These activities link directly to the “Understanding the Natural World” strand of Te Mātaiaho (Ministry of Education, 2023).

At senior secondary level and in makerspaces, NuiBot supports advanced STEM pathways. Students can extend the robot with new sensors, write more complex code, and integrate it into design and innovation projects. This supports the “Computational Thinking” and “Designing Digital Outcomes” areas of the digital technologies curriculum (Ministry of Education, 2017). GrowHub ensures that each step is scaffolded, so that learners transition smoothly from beginner to advanced coding without losing sight of the scientific purpose behind their work.

Another important application is the link to NZQA’s micro-credentials framework, which allows students to gain recognition for discrete skills such as coding, robotics integration, or data analysis (NZQA, 2020). With NuiBot and GrowHub, students can build portfolios of work that demonstrate competence in both technical and scientific inquiry. This not only motivates learners but also strengthens pathways into tertiary study and employment.

The international literature reinforces the value of this approach. Studies consistently show that robotics enhances collaboration, problem-solving, and STEM engagement when tied to project-based or inquiry learning (Eguchi, 2019; Chevalier et al., 2024). For teachers, having a ready-made platform like NuiBot reduces the preparation burden and makes it easier to link robotics directly to curriculum outcomes. This is critical in New Zealand, where research highlights that teachers often lack confidence in using robotics effectively (University of Auckland, 2018; Ako Aotearoa, 2021).

By embedding robotics into everyday science education rather than treating it as an optional add-on, NuiBot makes inquiry accessible, engaging, and future-focused. It offers a tool that can raise achievement, strengthen curriculum delivery, and prepare students with the skills needed to thrive in a world increasingly shaped by technology and sustainability challenges.

Applications in Research and Community

While NuiBot is designed primarily as a classroom assistant, its potential extends into research and community contexts. By combining robotics with modular sensing and AI-supported feedback, it provides a low-cost, reliable platform for data collection and experimental support. This makes it a valuable tool not only for schools but also for researchers, conservation groups, and communities seeking to build resilience.

One of the most pressing research needs in New Zealand relates to biodiversity monitoring and environmental change. Studies highlight that citizen science projects have strong potential to engage students and communities in ecological stewardship, but often lack consistent tools for data collection (NZASE, 2020; Royal Society Te Apārangi, 2019). NuiBot can fill this gap by serving as a replicable research assistant that reduces human error in tasks such as recording water chemistry, feeding cycles in aquaponics, or repositioning biodiversity light traps. Because all data flows into GrowHub, results from multiple sites can be standardised and compared across schools, communities, and research institutions.

The literature also shows that research outcomes are strengthened when technology reduces repetitive labour and increases consistency. Automation in ecological research is typically costly, but platforms like NuiBot demonstrate how affordable robotics can be adapted for citizen science and community projects (Sensors, 2021; Callaghan Innovation, 2022). By carrying out tasks such as adjusting valves, logging readings at set intervals, or alerting users when anomalies occur, NuiBot helps produce reliable datasets that can inform local and national decision-making.

In community settings, NuiBot also acts as a visible demonstration of how artificial intelligence and robotics can support rather than replace human effort. For rural schools and community groups, access to scientific equipment can be limited (University of Canterbury, 2022). By offering a mobile, modular platform, NuiBot provides a way for communities to run their own inquiries into water quality, soil health, or local energy systems. This supports the principle of kaitiakitanga—guardianship of the environment—while building local capability (Waikato University, 2019).

For universities and research organisations, NuiBot offers a platform for replicable, small-scale experiments. Consistency across multiple units means trials can be compared across different sites, an issue that has limited collaboration in the past (Chevalier et al., 2024). By providing affordable, standardised hardware and a shared data environment, NuiBot helps create a distributed research network that links schools with tertiary institutions and community organisations.

Internationally, there is growing recognition that integrating robotics with learning analytics can support both education and research outcomes (International Journal of Social Robotics, 2025; Journal of Learning Analytics, 2022). GrowHub ensures that community and research applications benefit from the same infrastructure as classrooms, allowing results to be shared, analysed, and stored over time. This builds a living database of ecological and experimental data that can be used for both local projects and national monitoring efforts.

In this way, NuiBot strengthens not only teaching and learning but also research and community engagement. It becomes a bridge between education and applied science, showing students and citizens that robotics and AI can play a role in tackling real-world challenges while building the skills and knowledge New Zealand needs to remain resilient and globally competitive.

Impact, Scale, and Pathway

The impact of NuiBot extends beyond the novelty of introducing a robot into the classroom. It lies in the way it transforms science learning, strengthens teacher practice, connects communities, and positions New Zealand as a leader in future-focused education.

For students, NuiBot improves engagement by making science visible and interactive. International evidence shows that robotics programmes consistently enhance motivation, collaboration, and problem-solving when tied to inquiry learning (Eguchi, 2019; Chevalier et al., 2024). Local studies also highlight that Year 9 and 10 are critical points where student interest in science declines (NZCER, 2020). By providing an authentic partner for experiments, NuiBot can help reverse this decline, showing students that science is relevant and empowering.

For teachers, NuiBot reduces barriers that have limited the integration of robotics in New Zealand classrooms. Research shows that teachers often lack the confidence and time to align robotics with curriculum outcomes (University of Auckland, 2018; Ako Aotearoa, 2021). NuiBot addresses this with pre-configured routines, curriculum-linked lesson plans, and GrowHub dashboards that streamline orchestration. This ensures that robotics is not an add-on but a core tool for inquiry-based science, directly aligned with Te Mātaiaho's vision for integrated, future-focused learning (Ministry of Education, 2023).

For schools, NuiBot provides a visible symbol of innovation. It allows institutions to demonstrate their commitment to preparing students for a future shaped by artificial intelligence and ecological challenges. By linking to NZQA micro-credentials, it also creates clear pathways from school into tertiary study and employment, contributing to the pipeline of digital and sustainability skills needed in the workforce (NZQA, 2020; Productivity Commission, 2020).

At the community level, NuiBot strengthens engagement with local ecosystems and science initiatives. Citizen science projects in New Zealand often suffer from inconsistent data collection and limited tools (NZASE, 2020). NuiBot, with its integrated sensors and GrowHub platform, provides standardised data that can be shared across schools and research institutions. This fosters collaboration and strengthens community capacity for kaitiakitanga and environmental stewardship (Waikato University, 2019).

The pathway to scale is clear. The first stage is prototyping and piloting within the Kōkiri AI Lab and Whanganui Intermediate School, generating early evidence of impact. The second stage is regional rollout across selected schools, supported by professional development and community workshops. The third stage is national scaling, with GrowHub connecting classrooms into a shared data and learning ecosystem. Finally, NuiBot has export potential, aligning with Callaghan Innovation's identification of AI and robotics edtech as a growth opportunity for New Zealand (Callaghan Innovation, 2022).

In terms of national impact, NuiBot contributes to several strategic priorities. It strengthens science and digital engagement at school level, aligns with the National AI Strategy's call for responsible AI education (MBIE, 2021), and contributes to workforce readiness for the future of work (OECD, 2020; World Economic Forum, 2023). It also positions New Zealand as a leader in combining AI, robotics, and ecology in education—a distinctive contribution on the global stage.

Next Steps and Call to Action

NuiBot is ready to move from design to delivery. The concept has been shaped by international evidence, New Zealand curriculum needs, and strong community demand for hands-on, future-focused science education. What is needed now is targeted investment to take the project through prototyping, pilot testing, and national scaling.

The first step is prototyping and classroom pilots. These will be carried out at the Kōkiri AI Lab and Whanganui Intermediate School, where early versions of NuiBot can be tested with students and teachers. This stage will generate essential data on usability, engagement, and learning outcomes. It reflects best practice in design-based research for educational technology, which emphasises iterative refinement in real classrooms (Barab & Squire, 2004; Pedaste et al., 2020).

The second step is regional rollout. A cluster of schools in the Whanganui and wider Horizons region will be equipped with classroom-ready robots, supported by professional development for teachers and community build workshops. This stage addresses well-documented barriers around teacher confidence and capability (University of Auckland, 2018; Ako Aotearoa, 2021) and ensures that teachers feel supported to use the technology effectively.

The third step is national scaling. Once refined, NuiBot can be introduced to schools across Aotearoa, supported by an online training hub and integrated with the GrowHub platform. At this stage, classrooms will not only run their own inquiries but also connect into a shared network, building a national database of experiments and ecological monitoring projects. This approach aligns with New Zealand's commitment to digital equity and future-focused curriculum reform (Ministry of Education, 2023; ERO, 2021).

The final stage is global export. Callaghan Innovation (2022) has identified AI and robotics education as one of New Zealand's strongest opportunities for international growth. NuiBot represents a world-first model of a science assistant robot integrated into a national learning platform. With refinement and scaling, it has the potential to be marketed to schools and research institutions internationally, positioning New Zealand as a leader in combining education, robotics, and sustainability.

To achieve this, we are seeking investment of $200,000 over an initial 12 to 18 months. This funding will cover hardware development, GrowHub integration, classroom pilots, teacher training, and evaluation. Regenpreneur Ltd and local partners will provide co-funding and in-kind contributions, ensuring shared commitment and long-term sustainability.

By supporting NuiBot, funders are not simply backing a robot. They are investing in a new model of learning where students see science come alive, where teachers have the tools to deliver authentic inquiry, and where New Zealand positions itself at the forefront of global education innovation. This project answers urgent calls for STEM capability (Productivity Commission, 2020; OECD, 2020), supports the National AI Strategy (MBIE, 2021), and delivers directly on the vision of Te Mātaiaho for integrated, future-focused education (Ministry of Education, 2023).

The opportunity is now. With your support, NuiBot can move from vision to reality—bringing a science assistant into every classroom, strengthening community engagement, and showing the world how Aotearoa leads when technology and ecology are brought together for learning and resilience.

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