### **Critical Analysis**

The Arduino Water Quality Monitoring Device project, though motivated by commendable intentions, reveals significant flaws upon thorough examination.

#### **Impact and Value Proposition**

This project addresses a crucial global issue: access to clean drinking water. It aligns with key United Nations Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being) and SDG 6 (Clean Water and Sanitation), underscoring its social relevance. However, the value it promises relies heavily on the technical reliability and usability of the device, both of which faced substantial challenges during development.

#### **Assumptions and Their Implications**

The project was built on several unvalidated core assumptions—namely, sensor reliability, system affordability, ease of implementation, and user accessibility. The team incorrectly assumed that:

* Sensors would perform correctly out of the box.
* The system would be low-cost and scalable.
* Users would easily interpret the data or utilise APIs.

These assumptions proved to be flawed, particularly when confronted with technical difficulties and user experience challenges. Acknowledging these weaknesses late in the process critically hindered progress.

#### **Bias and Perspective**

The team recognised their personal biases, especially the misconception that if the product served their needs, it would naturally benefit others. This lack of early external validation from actual end-users severely limited the system's relevance and effectiveness across varied demographics.

#### **Design Limitations**

The device is fundamentally flawed due to a lack of inclusive features. It fails to accommodate visually impaired users and the elderly, relying heavily on screen-based outputs and Wi-Fi connectivity. These poor design choices restrict its applicability in the very communities it aims to serve, particularly rural, low-income, or low-tech areas.

#### **Project Feasibility**

A critical insight was the team's realisation of their insufficient technical capacity to deliver the envisioned solution. Despite the conceptual strength of the idea, execution faltered due to issues such as sensor incompatibility, inadequate Arduino experience, and an unclear implementation plan from the outset.

#### **Learning and Reflection**

The team's ability to recognise these shortcomings and reflect on their process is commendable, yet it underscores important lessons:

* Early technical validation is non-negotiable.
* Inclusive, user-centred design is essential.
* Overreliance on unverified online tutorials must be avoided.
* Designs must be scalable while considering local constraints.

This critical analysis makes it clear that while the idea is socially impactful, successful execution demands grounding in validated assumptions, inclusive design, and adequate technical support.