This is the second round of review of the revised manuscript "Design, Implementation and Functional Verification of an Educational Prototype with a Visual Programming Interface for Contextualized STEM Activities."

The revision is genuinely responsive, and I want to acknowledge that first. The "validation" language has been systematically replaced by "functional verification," in the title, the abstract, Section 4, and the conclusions. Educational claims have been pulled back to what the evidence supports, and Section 4 now explicitly states that no learning outcomes were measured. The Design Science Research label has been downgraded to a conceptual reference, which is the right call for what this paper actually is. The unsupported health claims tied to sensor readings have been removed from the activities, and an ethics statement and informed consent statement have been added. The manuscript is now structured around a clear engineering workflow (hardware design, PCB fabrication, software extensions, integrated verification), and Table 2 is honest about the fact that quantitative CO_2 and gas concentrations require calibration. This is real progress: the paper no longer overclaims, and its scope is defensible.

My difficulty is that the revision fixes the *framing* of the evidence, but not the *evidence* itself. The three central questions from the first round — is the system reliable, is this distinct from the authors' own prior work, and what exactly happened in the classroom — are still answered only qualitatively. Two of the issues raised in round one (self-citations, quantitative verification data) were acknowledged in the response letter but not actually resolved in the manuscript. I am therefore recommending major revision.

Major Issues

1. **The self-citation problem is acknowledged but not fixed.** [Critical]

   The response letter explains that the manuscript now "explicitly distinguishes" this work from the prior publications, and the Introduction and Discussion do contain such statements. But the underlying problem I raised remains, and it has actually become more visible. All five first-author references are still in the list ([8], [10], [11], [26], [31]) — five out of sixty-five references, all on the same topic, all by the same author. No citation was removed, no comparison table was added, and the manuscript still does not tell the reader whether the boards described here are the same boards reported in [10] and [11], iterations of them, or a new development. A paragraph asserting novelty is not the same as evidence of novelty.

   Worse, the reference list has concrete defects that will not survive production and that undercut the citation case:

   - Reference [8] and reference [11] are the *same paper*. Both cite "Promoting Sustainable Research Competence through a Problem-Solving Method and a STEM Educational Kit," Sustainability 17(16):7381, 2025. It is cited twice under two different entries.
   - References [61] and [65] are two editions of the same standard, ISO/IEC 15288 (2002 and 2008), cited as separate references.
   - The author lists of [8], [10], and [11] are mangled by a metadata export ("R. Yuri, M. Rivas, P. José" are not author names; the actual co-authors of the Sustainability paper are not reflected). Reference [1] begins with a stray "]" and reference [54] reads "evista de Educación Superior."

   Required: consolidate the duplicate entries, clean the malformed author lists, reduce the self-citation count to the essential core (one or two), and add the comparison table I requested in round one — prior work vs. this work, board by board — so that the novelty claim can be judged rather than asserted.

2. **Functional verification is still entirely qualitative.** [Critical]

   Round one asked for reliability numbers: success rates over N trials, failure logs, measured values. The revision adds the word "verification" everywhere but not a single quantitative result anywhere. Table 5 still reports outcomes such as "Successful sensor initialization, real-time acquisition of soil-moisture measurements, and visualization in mBlock." That sentence could have been written before any test was run. Across three boards, five sensors, firmware uploads, continuity checks, and classroom sessions, the manuscript reports not one failure, anomaly, or retest. That is unusual for real hardware, and it is not credible as a complete engineering record.

   Required: report the verification as a test campaign. Number of trials per board, number of test sessions, pass/fail counts, a representative sample of measured values (voltages, soil-moisture percentages, turbidity NTU, MQ135 readings) with the conditions under which they were taken, and a subsection that honestly describes the failures or anomalies encountered and how they were resolved. This is what makes a verification report publishable in a journal like *Electronics*.

3. **The classroom section still has no participant data and no outcomes.**

   Round one asked for a description of the participants. The revised Section 4 still tells us only that they were "first-year university students enrolled in engineering-related programs" organized into "heterogeneous groups of five." No number of students, no number of groups, no composition by program, no prior programming experience, no selection procedure, no sessions count. And there is still nothing that could be called a result: the section describes activities and ends with qualitative statements about successful interaction.

   The authors may legitimately claim that this was a field demonstration, not an evaluation — and I accept that framing. But a field demonstration still needs a basic experimental record: how many groups ran the turbidity activity, over how many sessions, how many sensor readings were acquired, whether any system incident occurred, and what the students' physical models actually measured. As written, Section 4 reads as a project narrative. It should either be reported with data or explicitly shortened to a feasibility demonstration with a limitations paragraph (single cohort, single university, Huancavelica context, no generalization claimed).

4. **Scoping out sensor characterization is acceptable; not owning its consequences is not.**

   The response correctly notes that metrological characterization was never the objective, and Table 2 now flags that quantitative concentrations require calibration. That is an acceptable repositioning. But the paper then draws interpretive weight from sensor readings anyway: the smoke-burning activity relies on MQ135 responses, and the turbidity activity compares water samples in NTU. The MQ135 is known for cross-sensitivity and drift, and the capacitive moisture sensor is not calibrated against a reference. The paper must state, in a limitations paragraph, that all readings reported in Section 4 are indicative only and cannot be interpreted quantitatively. This is a paragraph, not a study. It should also be stated that the round-one suggested references (e.g., Spinelle et al. 2017 on low-cost sensor calibration) were not incorporated.

5. **The engineering novelty is still asserted rather than demonstrated.**

   The Introduction now claims as its contribution "the complete engineering process, from prototype design and implementation to functional verification." The process description is genuinely complete, and I credit the authors for documenting it. But the novelty case still rests on the integration argument, with no comparative element: no benchmark against a standard Arduino with breakout modules (which the first round asked for), no quantitative comparison

of cost, assembly time, reliability, or classroom robustness, and no head-to-head with the authors' own earlier boards. The section on why dedicated PCBs were necessary (Section 3.2.3) is improved, but the cost and trade-off analysis is still absent. Either add the comparative data or temper the contribution claims accordingly.

Additional Issues

1. **The role of ChatGPT in the classroom is now prominent and unexamined.** Students used ChatGPT to organize information in the problem-understanding and design stages, with the text asserting the outputs were "contrasted with scientific publications." How was that verification actually done? Who checked it, and by what procedure? Given that the paper is careful about scientific rigor elsewhere, the AI-assisted steps of the student workflow deserve one paragraph of method and, ideally, an acknowledgment of AI use in the activity design itself.

2. **The V-model citation is technically wrong.** The manuscript cites ISO/IEC 15288 (refs [61], [65]) as the source of the V-model. ISO 15288 is a system life-cycle standard and does not define the V-model. The authors should either cite a proper V-model reference (e.g., ISO/IEC 24748 or the classical V-model literature) or drop the label. Relatedly, the choice of the Waterfall model for the software development is still not justified against alternatives.

3. **Figure 8 still carries "public-health implications."** The authors removed health claims from the activities, which was the right response to round one. But the caption and text of the cause-and-effect diagram still mention "public-health implications" of water turbidity. Even framed as literature-based, this reintroduces the sensitivity the authors otherwise removed. Reframe to "environmental and drinking-water quality implications."

4. **The literature review is improved but still list-like.** The gap paragraphs added at the end of Sections 2.2–2.4 are a real improvement. However, the review still mostly inventories studies without argument: several STEM definitions are cited without the paper committing to one, and the verification frameworks discussed are never used to position the authors' own verification protocol. A short synthesis paragraph connecting the review to the design choices in Section 3 would close this.

5. **The consent statement is one line.** "Informed consent was obtained from all individual participants included in the study." Round one asked whether participation was opt-in or opt-out; that is still unaddressed. One sentence would fix it.

6. **Minor corrections carried over from round one.** The DOI placeholder (10.3390/xxxxx) still appears on every page, including all figure and table footers. There is still no bill of materials or cost estimate. The abstract, title, and conclusions are now consistent with the verification framing — good — but the manuscript would benefit from one final language pass, since several sentences still read as template prose ("the proposed prototype provides a stable and functional technological platform...").

Summary

The authors have done what round one asked on the two fronts that matter most for the paper's integrity: the claims now match the evidence, and the scope is honestly bounded. That is not a small thing, and the manuscript is materially better for it. But the revision did not address the two questions that determine whether this paper works as a contribution to *Electronics*: does the system demonstrably work (quantitative verification data), and is it distinct from the authors' own extensive

prior work on the same topic (which now includes duplicate and malformed citations that actively damage the case). The classroom section additionally remains a narrative without participant data. These are closable gaps, and the artifact underneath is worth the effort, but they require real work in the manuscript, not just in the response letter. I recommend major revision.
