This paper describes three educational electronic boards (agriculture, environmental monitoring, aquaculture) built around mBlock visual programming and tested with first-year university students in Huancavelica, Peru. The work has things going for it. The hardware and software development is documented from functional requirements all the way to PCB fabrication, which is more thorough than what most papers in this space bother to do. The problems the students work on (soil moisture for spinach farming, water turbidity in drinking sources, air quality tied to hillside burning) are real local issues, not contrived exercises. And the decision to write the programming blocks in Spanish addresses a language barrier that the literature acknowledges but few projects actually tackle.

The trouble is that the paper says more than it can back up. The abstract uses the word "validation" and claims the prototype "strengthens initial research competencies." What the paper actually shows is that the boards turn on, the sensors talk to mBlock, and students used the system in a classroom. That is verification, not validation. It is a feasibility demo, not evidence of learning. There is no pre-post test, no rubric, no survey, no comparison group. Nothing measured whether any competency changed. The whole manuscript needs to either produce that evidence or adjust its claims to match what was actually demonstrated.

Major Issues

1. **Overclaimed educational outcomes.** [Critical]

   The paper keeps saying the prototype "strengthens initial research competencies" and supports computational thinking (Abstract, Section 5), but no instrument measured either of those things. There is no pre-post assessment, no rubric, no survey, and no comparison condition. The classroom section documents activity, not learning. If outcome data exist, they need to be in the paper. If not, every claim about competencies and learning needs to be pulled back to what the evidence can support: functional hardware verification and classroom feasibility.

2. **"Validation" means something specific, and this paper uses it wrong.** [Critical]

   The paper calls its testing "validation" throughout, including the title. What it did was verification (does the hardware work as built?) and demonstration (can students use it in a classroom?). Validation asks whether the artifact does what it was meant to do, and that question goes unanswered. The title, the abstract, and the Section 4 heading all need to be fixed. This is not about word choice. It changes how the study is understood.

3. **Missing DSR evaluation.**

   The paper says it follows Design Science Research, but DSR has an evaluation phase that is not optional. The artifact needs to be measured against defined criteria. The paper skips that and substitutes functional testing. Either the DSR cycle needs to be completed with criteria, instruments, and results, or the study should drop the DSR label and present itself as what it is: artifact design with functional verification, evaluation pending.

4. **No sensor performance data.**

   This was submitted to *Electronics*. Readers will expect accuracy specs, calibration method, measurement range, sampling rate, latency, something. Table 4 reports "successful acquisition" and "stable readings". That tells us the sensor didn't crash, not whether its readings mean anything. The MQ135 sensor in particular has known problems with cross-sensitivity and drift that need to be acknowledged, especially since the classroom activities tie it to respiratory health.

5. **Health claims with no epidemiological backing.**

   The classroom activities link sensor measurements to childhood pneumonia and acute diarrheal diseases. Those are serious claims. The paper has no epidemiological evidence for them, no

validated exposure assessment, and no indication that the sensors were calibrated well enough to support them anyway. A disclaimer is needed stating that these are educational scenarios, not verified findings. The paper should also say whether the communities named (Daniel Hernández, Pampas–Tayacaja) were consulted or received any of the data.

6. **Relationship to prior work is unclear.**

   The first author appears on at least five of the cited references about very similar topics [8, 10, 11, 26, 31]. The manuscript never explains how these boards and extensions differ from those earlier publications. Are these the same boards? Iterations? Something new? Without that, it is hard to judge the contribution. A paragraph or a short comparison table would fix this.

Additional Issues

1. **Literature review reads like a list, not an argument.** Sections 2.1 through 2.4 walk through the relevant areas but rarely engage with what they mean. Several STEM definitions get cited without the paper picking one. Validation frameworks are discussed but the paper never places itself among them. Each subsection could use a short synthesis paragraph that connects the review to the choices made in the study.

2. **Competency framework missing.** The paper talks about competencies and computational thinking but never cites a framework for either. If the claims are going to stay, adopt something specific (Brennan & Resnick, ISTE, OECD) and show how the prototype maps to it.

3. **No description of the participants.** We know they were first-year students in heterogeneous groups of five. We do not know how many, what they were studying, whether they had programmed before, how they were selected, or anything about gender or age. Those details matter for understanding what the classroom results mean and for whom.

4. **Only successful tests are reported.** All the functional tests in Table 4 came back fine. Across three boards, multiple sensor types, and varied conditions, not a single failure or anomaly is mentioned. That is unusual. Report the failures too, and give some reliability numbers (success rate over N trials, for instance).

5. **Journal fit is a question.** The electronics contribution here is integration work: standard microcontrollers, off-the-shelf sensors, standard protocols on a custom PCB. That may not be enough for this journal's readership. Either bring in comparative technical benchmarks (power, latency, accuracy against reference instruments) or consider a venue where the educational contribution carries more weight.

6. **Why custom PCBs?** The paper never explains why it was necessary to design and fabricate custom boards instead of using a standard Arduino with sensor breakout modules. If there is a reason, state it (cost, durability, reduced wiring for novice users). If not, it is worth discussing the trade-off.

7. **Generalizing from a single cohort.** The classroom work happened with one group at one university. The title and conclusions talk about "first-year university students" as a category. A limitations paragraph should address what might depend on the Huancavelica context and what might transfer.

8. **A few missing references.** Weintrop & Wilensky (2017) on block-to-text transitions, Brennan & Resnick (2012) on computational thinking frameworks, and Spinelle et al. (2017) on low-cost sensor calibration would all strengthen the relevant sections.

9. **Minor corrections.** The DOI placeholder runs through the whole manuscript. The abstract has "aimed to design and validated" where it should be "validate." Reference [47] looks incomplete. The STEM integration model used is never stated. The Waterfall model choice is not justified. A bill of materials with costs would help. The consent section could clarify whether participation was opt-in or opt-out.

Summary

The hardware is solid, the software works, and the classroom activities are well thought out. I think the underlying project has real value, especially for educators working in similar contexts. But the manuscript in its current form reaches past its evidence at almost every turn, from the title down to the conclusion. The fix is not minor. The language needs recalibration throughout, the evaluation gap needs to be addressed (either with data or by bounding the claims), and the sensor characterization needs to be reported or its absence needs to be owned in a limitations section. I am recommending major revision because I think the gap is closable and the artifact underneath is worth the effort.
