

# Review of: "Development of Education for Sustainable Development Integrated Coastal Conservation Education Kit in Junior High Schools"

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Potential competing interests: No potential competing interests to declare.

The topic and the research problem of research-based learning system design are essential, and the authors have presented a specific case of this design in the context of integrated coastal conservation in a basic education setting. However, the authors need to address a number of issues and justify and rationalize important arguments in the study.

## Language editing

First of all, language editing and tone setting are needed to make the case of the paper stronger. Aside from some structural and writing issues pointed out by other reviewers, the paper can be edited so that it would cater to international audiences by explaining/generalizing some Indonesian-specific contexts. For example, the authors can quickly describe INA-Risk analysis and explain the meaning of some acronyms.

## On introduction

### Abrasion in the ESD curriculum

The concept of abrasion is a niche topic, and part of the paper can discuss how it fits in, or what its role is in a general education for sustainability (ESD) curriculum. This is important since the ESD curriculum is still developing, and advocates are still making the case for an ESD space in the whole education curriculum, in competition with other important subjects students must learn<sup>[1]</sup>. The authors can frame their discussion by answering some questions such as: Is it aligned with an overall ESD agenda in Indonesia? How is ESD (and the abrasion topic) currently structured and taught in the country? Would teaching the topic need significant teaching time, or can it be integrated with other topics? If teaching abrasion in coastal area protection is currently not taught well or not even taught at all, they may include a short literature review on why this is so.

### Abrasion as a priority risk

In the context of disaster risk reduction and climate change adaptation, the researchers can indicate why abrasion is a

hazard that needs to be focused on in school (and through national policy), especially in the Indonesian context. Indonesia has been a focal point of tsunami risk reduction<sup>[2]</sup>, and earthquake risk reduction<sup>[3]</sup>. Again, aside from other educational topics in the natural and environmental sciences, the authors can make a case why beach abrasion is a significant risk that demands increased awareness and responsibility from the Indonesian student populace.

## On methodology

### General research design

The authors have made extensive efforts to structure the methods of their study, using both qualitative and quantitative techniques, under the ADDIE learning system design approach<sup>[4]</sup>. The steps under the ADDIE model are very intricate research methods themselves, so the authors must give more detail on how they systematically conducted their study. *Research and development* is a general topic, and the authors may adapt a more specific research design that is aligned with the ADDIE model, such as design research<sup>[5]</sup>, action research, other learning system design approaches (such as learning taxonomies<sup>[6]</sup>), or the ADDIE model itself. Under the model, various qualitative and quantitative methods were employed, and the research design considerations and assumptions must be detailed, akin to a mixed methods research design approach<sup>[7]</sup>.

Particularly important is the discussion of the material itself. It seems that “Edukit” is an actual/physical media for teaching. This term might be prominent in the Indonesian ESD/science education scene, but maybe not in the international context. This must be cleared up by the authors for an international audience (see my note below on the authors' declarations). Are there guidelines or policy/theory frameworks that guide the development of Edukits?

### Qualitative aspects of the study

The study involves various data gathering and analysis techniques under the ADDIE model, which increases the quality of the study. The study would be more convincing if the authors declare **and justify** the data gathering instruments used in the study. For instance, two sets of questionnaires were used. In the initial interview, how were the questions formed? The authors employed interviews and questionnaires in the analysis and the evaluation phases. The authors can explain what learning/teaching theory was used to describe how students learn the topic, like constructivist or behaviorist paradigms.

Are there questions about how students learn about the topic, such as how students form concepts in abrasion in ESD (constructivist), how students appreciate the topics (attitudes), and how they perform in ESD (school level or national level performance)? Are there questions on how educators (or materials or platforms like EduKit) should be framed to be effective with students (student-centered learning design, project-based work, etc.)? The same interview instrument development guide can be applied to the other questionnaire on the evaluation of the abrasion Edukit material.

The process of actual material development was shown in the paper. The authors also shared the results of the initial interviews. Much more discussion is desired on how the results of the interviews influenced the development of the

material. For instance, the authors reported from their results that innovations are needed since the integration of ESD in the learning system design is not yet done. However, they can explain how the traditional way of teaching the topic is not effective, hence the need for innovation. Were there evidences of low student performance or perception of the topic for the need for innovation? What new learning objectives can be drawn from the interviews and literature reviews that inspired the development of the new material?

### Quantitative aspects of the study

The authors proposed to use specific feasibility criteria to assess the effectiveness of the learning kit. The authors again can justify their choice of criteria to strengthen their case. Readers might immediately ask, why these criteria? There are other more widely used methods to determine effects of interventions such as the Edukits.

For the quantitative part of the study, survey evaluations reported in the study seem to apply descriptive statistics but not inferential statistics. If the average responses to the likert scale questions on the evaluation of the material are reported, the choice of the criteria to say it was “effective” or “good enough” (this is understandable since this is a material development study) must be discussed. Why the use of an absolute product feasibility level criteria? What is its advantage compared to a pilot quasi-experimental test (e.g., employing the material in two classes) or an AB test (distribution of two kinds of materials to two sets of materials)<sup>[8]</sup>? The authors can rationalize and justify their choice to strengthen their case that the material is indeed feasible. Further issues on instrument validity and reliability can be commented upon by the authors?

### Participants and setting

Participants and the setting of the research are needed. A short description is indicated at the end of the methodology section, but much more can be said about the selection of the participants. For qualitative portions of the paper, what is the justification for the *purposeful selection* of the evaluators/teacher experts? For the quantitative parts, are the number of students enough? Are they representative of the population studied (all students? All Indonesian students? All *xth* grade students in the school selected?)<sup>[8]</sup>. Any of these is okay as long as the authors rationalize and justify these choices. A discussion of whether the students were randomly or purposively selected might also be related to the feasibility scores of the study and is crucial to establish the study reliability and validity. The paper appears to be in the context of a pilot study, so the authors can point this out so that it is clear to the reader.

### Discussions and analysis

The authors have provided detailed discussions on the results, but since I had various comments on the introduction and methods of the study, the discussions may be tweaked in order to be aligned with the study framework. For instance, if sustainable development goals are integrated into the material development (or into the whole study itself), a discussion on how SDG goals were contributed to must be related to how the Edukit material was made (e.g., were SDG-related learning system design methodologies employed?)

## Author declarations

In the introduction section, explain the Edukit model (what their main products and services are, advantages over other e-learning platforms, etc.) and how it is an appropriate platform for the students. Since Edukit is a private company, a part of the authors' declaration must be that the use of the platform is an academic choice and the company has no influence (e.g., funding, advice) on the study.

Thank you very much for the opportunity to review your paper.

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