

CHAPTER V

CLOSING

5.1. Conclusion

Based on the research results and discussions conducted, it can be concluded that:

1. The Batak cultural context-based physics problem-solving skills test instrument for temperature and heat was successfully developed using the 4D model (Define, Design, Develop, and Disseminate) systematically, resulting in a product suitable for use.
2. Based on the results of expert validation and empirical validity and reliability tests, the developed instrument was declared highly valid and reliable with an average validity value of 86.43% and a reliability of 0.933 in small groups and 0.853 in large groups. In addition, analysis of student abilities based on Polya indicators showed that problem-solving skills were in the good to very good category, with the highest achievement at the stage of understanding the problem and planning a solution, while the stage of implementing the plan and reviewing the results still needed improvement.
3. Students' responses to the instrument showed a very good category, namely 96.5% in the small group and 81.32% in the large group, which means that students considered the questions interesting, easy to understand, and motivated them to think critically in the context of Batak culture.

5.2. Suggestions

Based on the research results, the researchers suggest the following:

1. For future researchers, it is recommended to develop similar instruments for other physics materials and expand the scope of trials to schools with different student characteristics to obtain a more comprehensive picture of the instrument's effectiveness.

2. The Batak cultural context–based physics problem-solving test instrument developed in this study is primarily designed for the senior high school level. As a result, its direct application in undergraduate courses may require further refinement, particularly in terms of conceptual depth, analytical complexity, and mathematical treatment, to better align with higher education learning outcomes. Moreover, the use of artificial intelligence as a tool for modifying existing questions should be approached with caution, as it may weaken the authenticity of the cultural context. Ideally, problem development should originate from genuine cultural phenomena, such as traditional Batak musical instruments, where physics concepts, such as sound waves, frequency, resonance, and intensity are explored and analyzed based on the cultural object itself. Through this approach, cultural context functions as the core foundation of the problem rather than as an element added to previously established physics questions.
3. Further instrument development is recommended to emphasize the appropriateness of the problem context to problem-solving, critical thinking, and creative thinking skills, so that the questions not only measure procedural abilities but also encourage students to explore various alternative solutions and reflect on the results obtained.