Validity and Effectiveness of STEAM-Based Food Microbiology Electronic Booklet to Improve Critical Thinking Skills of Biology Students

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Sections Info

ABSTRACT

Objective: This research and development aims to determine the validity and effectiveness of STEAM-based food microbiology electronic booklets based on the assessment of validators and the results of student critical thinking skills tests. **Method:** This research is an R&D study using the ADDIE development model. The developed product was tested on students using the One Group Pretest-Posttest research design. The validity test was carried out by giving a questionnaire to the validator, and the effectiveness test was carried out by giving a test in the form of 20 fill-in questions to 15 Biology students. **Results:** The results of this study are that STEAM-based electronic booklets are very feasible to use as teaching materials and learning media and are effective in teaching food microbiology because they can improve students' critical thinking skills. This study is recommended to carry out STEAM-based electronic booklet development innovations in other food microbiology materials. **Novelty:** The novelty of this study lies in the research variables, which focus on the validity and effectiveness of food microbiology electronic booklets integrated with the STEAM approach to obtain teaching materials that encourage students to be active in learning activities.

INTRODUCTION

Food microbiology is one of the elective courses in the Biology Study Program at Medan State University. Food microbiology is a branch of microbiology that discusses microorganisms' beneficial and harmful roles (Hasruddin & Husna, 2022). The findings of problems in learning food microbiology from the questionnaire distribution students are as follows: 1) The learning process is passive, and students are only given assignments. 2) Learning resources and learning media used are PowerPoint slides that contain only concepts. 3) Information obtained only uses books containing concepts with lengthy explanations, and evaluation questions are only short fill-in questions. 4) The preliminary test results showed that the learner's critical thinking skills were still low, with an average score of 63.6.

All microbiology studies are closely related to everyday life, so critical thinking skills and abilities are needed. Critical thinking is a high-level thinking skill that requires pupils to use their knowledge levels to analyze, evaluate, and create (Permana et al., 2019). Critical thinking skills are concerned with determining answers, planning tactics, scientific procedures, and solving problems to obtain answers (Bustami et al., 2019; Zulfaneti et al., 2018). Currently, many studies have revealed that the critical thinking skills of pupils in Indonesia are comparatively low; this is supported by research results from the Program for International Student Assessment (PISA) (Magdalena et al., 2020). For this reason, it is necessary to make systematic efforts to improve these critical thinking skills especially (Wati & Anggraini, 2019).

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