

ABSTRAK

Darma, Sang Nyoman Putra (2026), *Pengembangan E-Modul Biologi Interaktif Berbasis Strategi Inquiry Problem Solving (SIPS) Berorientasi Etnosains untuk Meningkatkan Systems Thinking Skills Murid Fase F*. Tesis, Pendidikan IPA, Program Pascasarjana, Universitas Pendidikan Ganesha.

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Kata Kunci: E-Modul Interaktif, SIPS, Etnosains, *Systems Thinking Skills*.

Systems thinking skills merupakan salah satu keterampilan esensial abad ke-21 yang memungkinkan murid menganalisis fenomena secara sistematis melalui pemahaman komponen, hubungan kausalitas, pola, dan prediksi perilaku sistem. Namun, *systems thinking skills* murid Indonesia masih tergolong rendah. Penelitian ini bertujuan untuk mengembangkan e-modul biologi interaktif berbasis Strategi *Inquiry Problem Solving* (SIPS) berorientasi etnosains yang valid, praktis, dan efektif sebagai upaya meningkatkan *systems thinking skills* murid fase F. Penelitian ini merupakan penelitian pengembangan (R&D) menggunakan model ADDIE dengan lima tahapan, yaitu: (1) *analysis*, (2) *design*, (3) *development*, (4) *implementation*, dan (5) *evaluation*. Data yang dikumpulkan berupa data kualitatif dan kuantitatif melalui kuesioner validasi ahli, kuesioner kepraktisan guru dan murid, serta tes *systems thinking skills*. Uji efektivitas dilakukan dengan menggunakan desain *Quasi Experimental*, yaitu *Non-Equivalent Control Group Design* dan dianalisis menggunakan uji ANCOVA. Hasil penelitian menunjukkan bahwa (1) e-modul biologi interaktif berbasis SIPS berorientasi etnosains dikembangkan dengan karakteristik berupa tampilan interaktif berbasis *Lumi Education*, fitur multimedia, umpan balik, navigasi, integrasi permasalahan etnosains Bali, dan aktivitas sesuai sintaks SIPS untuk melatih *systems thinking skills*. (2) E-modul dinyatakan sangat valid berdasarkan validasi ahli materi dengan nilai KVG 1,00, validasi media sebesar 90%, dan validasi bahasa sebesar 98%. (3) E-modul dinyatakan sangat praktis berdasarkan hasil uji kepraktisan guru sebesar 99,27%, uji perorangan sebesar 97,22%, uji kelompok kecil sebesar 96,30%, dan uji kelompok besar sebesar 97,39%. (4) E-modul interaktif dinyatakan efektif dalam meningkatkan *systems thinking skills* murid dengan skor kelompok eksperimen (85,783) lebih tinggi dibandingkan kelompok kontrol (67,417) berdasarkan hasil uji ANCOVA dengan nilai signifikansi $< 0,05$ dan *effect size* sebesar 0,873 (kategori besar). Peningkatan terjadi pada seluruh indikator, terutama kemampuan menganalisis interaksi antar komponen sistem dan memprediksi perilaku sistem. Berdasarkan hasil penelitian dapat disimpulkan bahwa e-modul biologi interaktif berbasis SIPS berorientasi etnosains valid, praktis, dan efektif dalam meningkatkan *systems thinking skills* murid fase F.

ABSTRACT

Darma, Sang Nyoman Putra (2026), Development of Interactive Biology E-Module Based on Inquiry Problem Solving Strategy (SIPS) with an Ethnoscience Orientation to Improve Students' Systems Thinking Skills in Phase F. Thesis, Science Education, Postgraduate Program, Ganesha University of Education.

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Keywords: *Interactive E-Module, SIPS, Ethnoscience, Systems Thinking Skills.*

Systems thinking skills are essential 21st-century skills that enable students to analyze phenomena systematically through understanding components, causal relationships, patterns, and predicting system behavior. However, Indonesian students' systems thinking skills are still relatively low. This study aims to develop an interactive biology e-module based on the Inquiry Problem Solving Strategy (SIPS) with an ethnoscience orientation that is valid, practical, and effective to improve Phase F students' systems thinking skills. This study is a research and development (R&D) study using the ADDIE model with five stages, namely: (1) analysis, (2) design, (3) development, (4) implementation, and (5) evaluation. Data were collected in the form of qualitative and quantitative data through expert validation questionnaires, practicality questionnaires for teachers and students, and systems thinking skills tests. The effectiveness test was conducted using a Quasi Experimental design, namely the Non-Equivalent Control Group Design, and analyzed using the ANCOVA test. The results showed that (1) the SIPS-based interactive biology e-module with an ethnoscience orientation was developed with characteristics including an interactive display based on Lumi Education, multimedia features, feedback, navigation, integration of Balinese ethnoscience problems, and activities based on the SIPS syntax to train systems thinking skills. (2) The e-module was categorized as very valid based on material expert validation with a KVG value of 1.00, media validation of 90%, and language validation of 98%. (3) The e-module was categorized as very practical based on teacher practicality results of 99.27%, individual testing of 97.22%, small group testing of 96.30%, and large group testing of 97.39%. (4) The interactive e-module was effective in improving students' systems thinking skills, with the experimental group's score (85.783) higher than the control group's score (67.417), based on the ANCOVA test results with a significance value < 0.05 and an effect size of 0.873 (large category). Improvements occurred across all indicators, particularly the ability to analyze interactions among system components and predict system behavior. Based on the results, it can be concluded that the SIPS-based interactive biology e-module with an ethnoscience orientation is valid, practical, and effective in improving Phase F students' systems thinking skills.