

ABSTRAK

Sitohang, Rina Agustini (2025), *Pengembangan Buku Ajar Elektronik Berbasis Tantangan Terintegrasi Design Thinking Untuk Meningkatkan Keterampilan Argumentasi Ilmiah dan Literasi Sains Pada Pembelajaran Biologi SMA*. Tesis, Pendidikan IPA, Program Pascasarjana, Universitas Pendidikan Ganesha. 2026

Rendahnya keterampilan argumentasi ilmiah dan literasi sains dipengaruhi oleh pembelajaran yang masih berpusat pada guru serta keterbatasan sumber belajar yang belum mendukung pengembangan argumentasi ilmiah dan literasi sains secara aktif dan kontekstual. Penelitian ini bertujuan mendeskripsikan karakteristik, validitas, kepraktisan, dan efektivitas buku ajar elektronik berbasis tantangan terintegrasi *design thinking* untuk meningkatkan keterampilan argumentasi ilmiah dan literasi sains pada pembelajaran biologi SMA.

Penelitian ini merupakan penelitian pengembangan dengan menggunakan model 4D (*Define, Design, Develop, Disseminate*) dengan subjek penelitian lima orang guru dan 60 peserta didik yang terbagi dalam kelas eksperimen dan kelas kontrol masing-masing 30 orang. Sumber data diperoleh dari guru dan peserta didik. Teknik pengumpulan data meliputi angket kebutuhan peserta didik dan guru, angket validasi ahli, angket kepraktisan, angket respon pengguna produk dan tes keterampilan argumentasi ilmiah serta literasi sains. Instrumen penelitian telah melalui uji validasi ahli materi, bahasa, dan kegrafikaan. Analisis data dilakukan secara deskriptif dan MANCOVA untuk menguji efektivitas produk yang dikembangkan.

Hasil penelitian menunjukkan bahwa buku ajar elektronik yang dikembangkan memiliki kategori sangat valid berdasarkan validasi materi memperoleh KVG 1,00, validasi bahasa memperoleh sebesar 92,16, dan validasi kegrafikaan sebesar 86,2. Uji kepraktisan oleh guru dan peserta didik masing-masing memperoleh skor 88 dan 90 dengan kategori sangat praktis. Hasil uji MANCOVA menunjukkan terdapat perbedaan signifikan terhadap keterampilan argumentasi ilmiah dan literasi sains secara simultan ($\text{sig} = 0,002$) dengan nilai *effect size* dengan *partial eta squared* sebesar 0,206 termasuk kategori besar. Temuan tersebut menunjukkan bahwa buku ajar elektronik berbasis tantangan terintegrasi *design thinking* memberikan perbedaan hasil keterampilan argumentasi ilmiah dan literasi sains peserta didik secara simultan.

Kata-kata kunci: *buku ajar elektronik; design thinking; keterampilan argumentasi ilmiah; literasi sains; pembelajaran berbasis tantangan*.

ABSTRACT

Sitohang, Rina Agustini (2025), *Development of a challenge-based electronic textbook integrated with design thinking to improve scientific argumentation skills and science literacy in high school biology learning*. Thesis, Science Education, Postgraduate Program, Ganesha University of Education. 2026

This thesis has been approved and reviewed by Advisor I: Prof. Dr. I Wayan Redhana, M.Sc., and Advisor II: Dr. Putu Artawan, S.Pd., M.Sc.

Low scientific argumentation skills and scientific literacy remain a significant issue in biology learning. This condition is influenced by teacher-centered instruction and the limited availability of learning resources that do not adequately support the development of scientific argumentation and scientific literacy in an active and contextual manner. This study aimed to describe the characteristics, validity, practicality, and effectiveness of a challenge-based electronic textbook integrated with design thinking to improve students' scientific argumentation skills and scientific literacy in senior high school biology learning.

This research employed a research and development design using the 4D model (Define, Design, Develop, Disseminate). The participants consisted of five biology teachers and 60 students, who were divided into an experimental class and a control class, each consisting of 30 students. The data were collected from teachers and students through needs analysis questionnaires, expert validation questionnaires, practicality questionnaires, user response questionnaires, and tests of scientific argumentation skills and scientific literacy. The research instruments were validated by experts in content, language, and graphics. The data were analyzed using descriptive statistics and MANCOVA to examine the effectiveness of the developed product.

The results showed that the developed electronic textbook was highly valid based on content validity (KVG = 1.00), language validity (92.16), and graphic validity (86.2). The practicality results indicated that the textbook was rated as very practical by teachers (88) and students (90). The MANCOVA results revealed a significant difference in students' scientific argumentation skills and scientific literacy simultaneously ($p = 0.002$), with a partial eta squared value of 0.206, which is categorized to high effect size. Therefore, the developed electronic textbook was valid, practical, and effective in improving students' scientific argumentation skills and scientific literacy simultaneously.

Keywords: *challenge-based learning; design thinking; electronic textbook; scientific argumentation; scientific literacy.*