

ABSTRAK

Rudi Purwanto, NIM 8216141007 (2025). Pengembangan Sumber Belajar Berbasis Inkuiri Terintegrasi Laboratorium Virtual untuk Membangun Keterampilan Berpikir Tingkat Tinggi pada Pengajaran Titrasi Asam Basa.

Rendahnya keterlibatan dan pemahaman konseptual mahasiswa dalam pembelajaran titrasi asam basa, dominasi penggunaan media PowerPoint, keterbatasan waktu praktikum untuk analisis kuantitatif, serta minimnya fasilitas laboratorium fisik berdampak pada pencapaian hasil belajar. Tujuan dari penelitian ini adalah mengembangkan sumber belajar berbasis inkuiri yang terintegrasi dengan laboratorium virtual guna membangun keterampilan berpikir tingkat tinggi (Higher Order Thinking Skills/HOTS) mahasiswa pada materi titrasi asam basa. Penelitian menggunakan pendekatan Research and Development (R&D) dengan model ADDIE (Analysis, Design, Development, Implementation, and Evaluation) serta desain kuasi-eksperimen untreated control group (pretest–posttest). Penelitian dilaksanakan di Universitas Negeri Medan pada semester genap Tahun Akademik 2024/2025, melibatkan kelas eksperimen (PSPK A, $n=30$) dan kelas kontrol (PSPK D, $n=28$). Instrumen yang digunakan mencakup wawancara, angket kebutuhan, angket kelayakan BSNP, tes pre-post, rubrik penilaian HOTS, dan angket respons mahasiswa. Data dianalisis secara deskriptif dan inferensial melalui N-Gain, uji t, dan regresi linear. Hasil menunjukkan bahwa media pembelajaran yang dikembangkan memenuhi kriteria “sangat layak” dengan skor validasi rata-rata $3,51 \pm 0,05$. Implementasi menghasilkan skor HOTS rata-rata $74,44 \pm 0,49$, dengan aspek analytical thinking paling menonjol, diikuti evaluation thinking dan creative thinking. Peningkatan kemampuan ditunjukkan oleh N-Gain sebesar $0,52 \pm 0,31$ yang secara signifikan lebih tinggi dibandingkan kelas kontrol ($0,31 \pm 0,28$; $t = 2,741$; $p = 0,008$). Keterampilan HOTS memiliki korelasi sangat kuat terhadap peningkatan hasil belajar ($R^2 = 0,859$). Respons mahasiswa terhadap media sangat positif, tercermin dari skor tinggi pada aspek motivasi, tampilan visual, pengalaman belajar, pemahaman konsep, dan keterlibatan aktif ($3,27 \pm 0,09$).

Kata kunci: Sumber belajar, inkuiri, laboratorium virtual, HOTS, titrasi asam-basa.

ABSTRACT

Rudi Purwanto, NIM 8216141007 (2025). Development of Inquiry-Based Learning Resources Integrated with Virtual Laboratory to Enhance Higher Order Thinking Skills in Acid-Base Titration Instruction

Low student engagement and conceptual understanding in acid-base titration learning, reliance on PowerPoint media, limited practicum time for quantitative analysis, and inadequate physical laboratory facilities have negatively impacted learning outcomes. This study aims to develop an inquiry-based learning resource integrated with a virtual laboratory to foster students' Higher Order Thinking Skills (HOTS) on acid-base titration material. The research employed a Research and Development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), along with a quasi-experimental design using an untreated control group (pretest–posttest). The study was conducted at Universitas Negeri Medan during the even semester of the 2024/2025 academic year, involving an experimental class (PSPK A, $n = 30$) and a control class (PSPK D, $n = 28$). Instruments included interviews, needs assessment questionnaires, BSNP feasibility questionnaires, pre-post tests, HOTS assessment rubrics, and student response questionnaires. Data were analyzed using descriptive and inferential statistics (N-Gain, t-test, and linear regression). Results indicated that the developed learning media met the "highly feasible" criteria, with an average validation score of 3.51 ± 0.05 . Implementation yielded an average HOTS score of 74.44 ± 0.49 , with analytical thinking as the most prominent aspect, followed by evaluation and creative thinking. The N-Gain score of 0.52 ± 0.31 was significantly higher than the control group (0.31 ± 0.28 ; $t = 2.741$; $p = 0.008$). HOTS showed a very strong correlation with learning outcome improvement ($R^2 = 0.859$). Student responses toward the media were highly positive, as reflected in high scores on motivation, visual design, learning experience, conceptual understanding, and active engagement (3.27 ± 0.09).

Keywords: Learning resource, inquiry, virtual laboratory, HOTS, acid-base titration