Pengembangan Model *Virtual Higher Order Thinking Skills Laboratory* untuk Meningkatkan Keterampilan Berpikir Kritis dan Pemecahan Masalah Secara Kreatif Mahasiswa Calon Guru Fisika

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Abstrak

Penelitian ini dilatarbelakangi oleh adanya kebutuhan pembekalan keterampilan berpikir tingkat tinggi melalui kegiatan praktikum fisika untuk konsep-konsep abstrak dan mikroskopis. Penelitian ini bertujuan mengembangkan model *virtual higher order thinking skills laboratory* (Virtual HOTS Lab) untuk meningkatkan keterampilan berpikir kritis (KBK) dan keterampilan pemecahan masalah secara kreatif (KPMK) mahasiswa. Penelitian ini menggunakan metode *research and development* dengan model ADDIE (*analysis, design, develop, implementation,* and *evaluation*). Subjek implementasi model Virtual HOTS Lab berjumlah 37 mahasiswa calon guru fisika pada salah satu LPTK di Bengkulu. Instrumen utama yang digunakan berupa lembar tes keterampilan berpikir kritis dan pemecahan masalah secara kreatif. Model Virtual HOTS Lab yang telah berhasil dikembangkan terdiri dari dua fase lab, yaitu fase pra-lab dan fase aktivitas lab. Fase pra-lab terdiri dari tahap persiapan, konteks masalah, pernyataan masalah, rumusan masalah, pertanyaan pra-prediksi, prediksi kelompok, dan penentuan ide. Sedangkan fase aktivitas lab terdiri dari tahap eksplorasi (fungsi alat, pertanyaan prosedur, langkah-langkah praktikum, tabel data, pengumpulan data, analisis data), eksplanasi, dan kesimpulan. Berdasarkan hasil analisis data diperoleh bahwa: (1) implementasi model Virtual HOTS Lab dalam praktikum efek fotolistrik, pembentukan laser, dan lampu lucutan gas dapat meningkatkan skor KBK dan KPMK mahasiswa dengan kategori *N-gain* tinggi, (2) implementasi model Virtual HOTS Lab berpengaruh kuat terhadap peningkatan KBK dan KPMK mahasiswa, dan (3) efektivitas implementasi model Virtual HOTS Lab dalam meningkatkan KBK dan KPMK mahasiswa secara berurutan berada pada kategori tinggi dan sedang. Disimpulkan bahwa pengembangan dan implementasi model Virtual HOTS Lab dapat meningkatkan KBK dan KPMK mahasiswa calon guru fisika.

Kata Kunci: *Model Virtual HOTS Lab, Berpikir kritis, Pemecahan masalah secara kreatif, Ukuran dampak dan efektivitas implementasi model Virtual HOTS Lab*

The Development of Virtual Higher Order Thinking Skills Laboratory Model to Improve Pre-service Physics Teachers' Critical Thinking and Creative Problem Solving Skills

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Abstract

This research is motivated by the need for debriefing higher-order thinking skills through physics experiment activities for abstract and microscopic concepts. This study aims to develop a virtual higher order thinking laboratory model (Virtual HOTS Lab model) to improve students'critical thinking and creative problem solving skills (CTS and CPSS). This study uses research and development method with ADDIE (analysis, design, develop, implementation, and evaluation) model. The subjects involved in the implementation of the Virtual HOTS Lab model were 37 pre-service physics teachers at one of the universities in Bengkulu. The main instrument used are test of critical thinking and creative problem solving skills. The Virtual HOTS Lab model that has been successfully developed consists of two lab phases, namely the pre-lab phase and the lab activity phase. The pre-lab phase consists of the preparation stage, problems context, problem statement, problems formulation, pre-prediction question, group prediction, and idea determination. Mean while, the lab activity phase consists of the exploration stage (function of the equipment, procedure questions, practical steps, data tables, data collection, data analysis), explanations, and conclusions. Based on the results of data analysis it was found that: (1) the Virtual HOTS Lab model in the photoelectric effect experiment, laser formation, and gas discharge lamp can improve the score of the CTS and CPSS with the high N-gain category, (2) the Virtual HOTS Lab model has a strong influence on the increase in the CTS and CPSS of students, and (3) the effectiveness of the implementation of the Virtual HOTS Lab model in improving the CTS and CPSS of students is in the high and medium categories. It can be concluded that the development and implementation of the Virtual HOTS Lab model can improve the CTS and CPSS of pre-service physics teacher.

Keywords: Virtual HOTS Lab model, Critical thinking, Creative problem solving, Effectiveness and effect size of the Virtual HOTS Lab model implementation