LOW-COST LABORATORY (LCL) SISTEM SCADA TEKNIK ELEKTRO UNTUK MENINGKATKAN HIGHER ORDER THINKING SKILLS (HOTS) PADA RANAH BERFIKIR KREATIF

DISERTASI

Diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar
Doktor Pendidikan Teknologi dan Kejuruan

Oleh

SETYO SUPRATNO
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PROGRAM STUDI PENDIDIKAN TEKNOLOGI DAN KEJURUAN
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UNIVERSITAS PENDIDIKAN INDONESIA
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HALAMAN PENGESAHAN DISERTASI

SETYO SUPRATNO

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disetujui dan disahkan oleh panitia disertasi

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HALAMAN PERNYATAAN KEASLIAN DISERTASI DAN PERNYATAAN BEBAS PLAGIARISME

Dengan ini saya menyatakan bahwa disertasi dengan judul "*Low-Cost Laboratory* (LCL) sistem SCADA teknik elektro untuk meningkatkan *Higher Order Thinking Skills* (HOTS) pada ranah berfikir kreatif" ini beserta seluruh isi adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila dikemudian hari ditemukan ada pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

Bekasi, 30 Januari 2023

SETYO SUPRATNO

HALAMAN UCAPAN TERIMA KASIH

بِسْمِ اللهِ الرَّحْمٰنِ الرَّحِيْمِ

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Setyo Supratno: Low-Cost Laboratory (LCL) Sistem SCADA Teknik Elektro Untuk Meningkatkan Higher Order Thinking Skills (HOTS) Pada Ranah Berfikir Kreatif

Penelitian ini bertujuan untuk mendisain LCL sistem SCADA dengan mengadopsi 4D (*Define, Design, Develop dan Disseminate*). Beberapa faktor yang menjadi pertimbangan dalam mewujudkan LCL sistem SCADA adalah kondisi laboratorium yang kurang memadahi, anggaran pengadaan peralatan laboratorium yang jauh dari cukup, dan CPMK, sub-CPMK dari lulusan yang kurang bersaing dalam dunia Industri.

Serangkaian kegiatan 4D mewujudkan LCL sistem SCADA bermuara pada realisasi perangkat pembelajaran praktikum dalam pemenuhan peralatan laboratorium. LCL sistem SCADA yang dihasilkan sebagai kebaruan telah diuji baik dari sesi elektronik, mekanik dan *software.* Kemudian LCL sistem SCADA juga dilengkapi dengan petunjuk praktikum verifikatif dan HOT-Lab untuk meningkatkan HOTS pada ranah berfikir kreatif. Sebelum digunakan kedua petunjuk praktikum tersebut diuji dan divalidasi untuk kelayakan sebagai pendukung praktikum. Kegiatan pembelajaran terbagi menjadi dua, 1) Kelas Kontrol menggunakan petunjuk praktikum verifikatif dan, 2) Kelas Eksperimen menggunakan petunjuk praktikum *Higher Order Thinking-Laboratory* (HOT-Lab) berbasis *Creative Problem Solving* (CPS)

Kegiatan pembelajaran praktikum Verifikatif hanya bersifat pembuktian dan memverikasi, sedangakan HOT-Lab berbasis CPS terdiri dari kegiatan yang berlandaskan pada 1) *real world problems*, 2) *understand the challenge, 3) experimental questions, 4) do the challenge, 5) generate ideas, 6) prepare for practicum, 7) running practicum, 8) communicating practicum, 9) report practical results, 10) conclude practical results, 11) presentation, dan 12) evaluation.*

Metode yang dipakai dalam penelitian ini adalah metode eksperimen dengan desain Non-Equivalent Group Design. Teknik analisis data menggunakan Uji t dengan uji parsial untuk menguji bagaimana pengaruh masing-masing variabel bebas terhadap variabel terikat. Terbagi menjadi kelas Kontrol dan Eksperimen dengan terlebih dahulu mendapatkan *pre-test* untuk mengetahui kondisi awal kemampuan HOTS pada ranah berfikir kreatif. Kemudiam, *post-test* untuk mengetahui kondisi akhir pada Kelas Kontrol setelah menjalani kegiatan pembelajaran berbasis praktikum Verifikatif dan Kelas Eksperimen setelah menjalani kegiatan pembelajaran HOT-Lab berbasis CPS

Hasil akhir kegiatan pembelajaran kedua kelas tersebut menunjukkan telah terjadi peningkatan HOTS pada ranah berfikir kreatif pada Kelas Eksperimen dan tidak terjadi peningkatan HOTS pada ranah berfikir kreatif untuk Kelas Kontrol.

Kata Kunci: LCL, Sistem SCADA, HOTS, Berfikir Kreatif, HOT-Lab, CPS

ABSTRACT

Setyo Supratno: *SCADA Low-Cost Laboratory (LCL) Of Electrical Engineering to Improve Higher Order Thinking Skills (HOTS) in Creative Thinking*

This study aims to design an LCL SCADA system by adopting 4D (Define, Design, Develop and Disseminate). Several factors were taken into consideration in realizing the LCL SCADA system, namely laboratory conditions that were not sufficient, the budget for procuring laboratory equipment which was far from sufficient, and CPMK, sub-CPMK from graduates who were less competitive in the industrial world.

A series of 4D activities to realize the LCL SCADA system leads to the realization of practicum learning tools in fulfilling laboratory equipment. The LCL SCADA system produced as a novelty has been tested from both electronic, mechanical and software sessions. Then the LCL SCADA system is also equipped with verification practicum instructions and HOT-Lab to improve HOTS in the realm of creative thinking. Before being used the two practicum instructions were tested and validated for feasibility as a practicum support. Learning activities are divided into two, 1) Control Class using verification practicum instructions and, 2) Experiment Class using Higher Order Thinking-Laboratory (HOT-Lab) based on Creative Problem Solving (CPS) instructions.

Verification practicum learning activities are only proving and verifying, while the CPS-based HOT-Lab consists of activities based on 1) real world problems, 2) understand the challenge, 3) experimental questions, 4) do the challenge, 5) generate ideas, 6) prepare for practicum, 7) running practicum, 8) communicating practicum, 9) report practical results, 10) conclude practical results, 11) presentation, and 12) evaluation.

The method used in this study is an experimental method with a Non-Equivalent Group Design. The data analysis technique uses the t test with a partial test to test how each independent variable influences the dependent variable. Divided into Control and Experiment classes by first getting a pre-test to find out the initial conditions of HOTS ability in the realm of creative thinking. Then, post-test to find out the final conditions in the Control Class after undergoing Verification practicum-based learning activities and Experimental Class after undergoing CPS-based HOT-Lab learning activities

The final results of the learning activities of the two classes showed that there had been an increase in HOTS in the realm of creative thinking in the Experiment Class and there was no increase in HOTS in the realm of creative thinking for the Control Class.

Keywords: LCL, SCADA System, PLC, HOTS, Creative Thinking, HOT-Lab, CPS

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