

## Arduino Opta PLC Student Training Platform

### Summer 2025 Undergraduate Research Grant - Impact Report

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Institution: University of Idaho - Coeur d'Alene Campus

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### Goals and Outcomes

**Goal:** Develop accessible curriculum for teaching industrial control systems to cybersecurity students without electrical engineering prerequisites.

**Outcomes:** Created complete 4-module Arduino Opta PLC curriculum with student/instructor guides, assessment rubrics, and pre-wired hardware systems. All materials meet university academic standards and are structured for immediate institutional adoption.

### Successes

- **Faculty Validation:** Successful presentation to CS Department with curriculum approval for Fall 2025 pilot deployment
- **Institutional Adoption:** Repository approved for permanent CS Department integration as valuable intellectual property
- **Professional Documentation:** Complete project archive with systematic development logs and reproducible methodology
- **Educational Innovation:** Eliminated electrical prerequisites while maintaining industry-standard IEC 61131-3 programming compliance

### Challenges and Solutions

**Technical Challenges:** Hardware integration complexity and balancing curriculum accessibility with technical rigor. **Solutions:** Implemented systematic testing protocols using digital multimeter validation and iterative faculty review cycles.

**Time Management:** Coordinating research with family responsibilities (family of 7). **Solution:** Structured work scheduling with clear milestone definitions and systematic daily logging.

**Future Improvements:** Earlier stakeholder engagement and extended pilot testing phases would enhance curriculum validation and adoption readiness.

### Recommendations for Future Research

**Phase 2 Extensions:** SCADA integration modules using Ignition Gateway tools and ICS security challenge development. **Assessment Research:** Controlled deployment studies measuring

learning outcomes across multiple institutions. Partnership Development: Academic-industry workforce development collaborations for real-world validation and scaling.

### **Professional Skill Development Reflection**

Project Management: Systematic milestone planning and execution while balancing academic and family responsibilities demonstrated significant growth in independent research capability.

Faculty Collaboration: Regular engagement with multiple advisors improved communication skills and academic relationship management.

Technical Documentation: Comprehensive logging and systematic development tracking enhanced academic writing and research methodology skills.

Presentation Skills: Faculty presentation delivery and institutional reporting requirements strengthened professional communication and public speaking capabilities.

Leadership Development: Independent research execution from conception through institutional validation-built confidence in professional decision-making and strategic thinking.

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Repository: [github.com/tank208/plc-student-demo-platform](https://github.com/tank208/plc-student-demo-platform)

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