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An Approach to Using Arduino in University Practicals

Continuously improving students' experience of the practical component in formal education is crucial to developing a strong understanding of theoretical concepts whilst staying relevant to technologies used in industry and post-graduate studies. Previous work, within the Nelson Mandela University Physics Department, has shown that innovative practicals can improve and add another dimension to all educational environments. The focus of this paper is the adaptation and modernization of a 2nd-year practical programme to incorporate an Arduino-based environment. The ease of access to Arduino components and software allows students to interact with a wider range of sensors and components. The affordability of the Arduino kits allows one kit to be assigned to a pair of students, thus enhancing student engagement with the practical. Further advantages of this adapted practical programme include the ability to improve student understanding of electrical diagrams, coding, sensor sensitivities and report writing skills.

The programme is run as three structured practical sessions where the students are introduced, under supervision, to Arduino technology including the Arduino UNO, LED's, push buttons, an LCD, a temperature and humidity sensor and the software, Arduino IDE. Students are then required to complete a 'Coding Challenge' which requires them to build an Arduino-based system to solve a supplied scenario. The 'Coding Challenge' uses the knowledge covered in the practical sessions and as well as requiring independent learning skills to incorporate a component not covered in the structured sessions. Finally, students are required to demonstrate their systems and write a comprehensive report.

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