Apprentice Training in Robotics Through Tutorial-Based and Practical Learning with PrograBlock

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The Swiss industry faces a shortage of qualified workers and must boost competitiveness. As robotics becomes essential, this work explores how to train apprentices to use cobots effectively. Using PrograBlock, a block-based programming tool developed by the start-up Auto-Mate Robotics, tutorials and a hands-on workshop were developed to support fast learning and the practical implementation of robotic tasks.

Context

Auto-Mate Robotics, a start-up from the BFH, aims to simplify robot use and make robotics accessible to technicians without an engineering background. To support this goal, they developed PrograBlock, a block-based software that lowers learning barriers by removing complex syntax found in traditional programming environments.
However, operators still need to understand programming and robotic concepts to program tasks successfully. It is therefore essential to develop tutorials that help them acquire the necessary skills. This study identifies key factors in robotics training and examines how these principles can be applied to both PrograBlock and robotics education more broadly.

Approach

A systematic literature review provided insights into educational methods and tools that support effective learning in vocational training. The findings show that learner-centered design, problem-oriented training, and the use of technology that supports learning are key factors in the training process. To make robotics accessible to all workers, it is essential to offer a course adapted to the users' needs. This study investigates how effectively apprentices can learn robotics and gain new skills when these principles are applied. A one-day workshop was designed to upskill technicians, focusing on key robotics competencies.

In the morning, theoretical sessions with guided exercises introduced students to fundamental programming concepts. Although the course was prepared for in-person delivery, it was designed with flexibility to support future blended or fully online formats. Indeed, for Auto-Mate Robotics, scalability of the training solution was a key consideration.

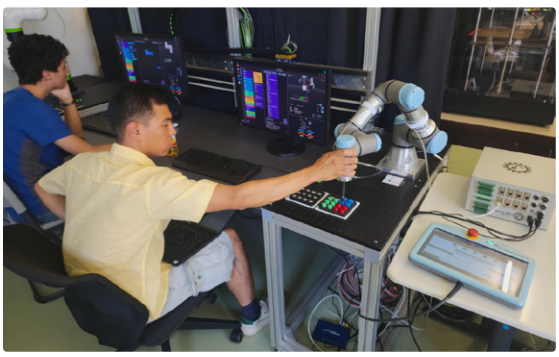
In the afternoon, hands-on activities were conducted using a collaborative robot cell. Students implemented a pick-and-place task step by step. The session followed a top-down pedagogical approach, emphasizing task execution to make theoretical concepts more tangible.
Participants were students from a technical vocational school, enrolled in diverse apprenticeship, including production technician and electronics technician. Their varied backgrounds offered a representative sample of potential end-users.

Results

Although time constraints limited learning opportunities, all students implemented robotic tasks using PrograBlock by the end of the workshop. Ability was strongly influenced by their prior knowledge and level of motivation. The practical session was more engaging and positively received by the students.

Differences in prior knowledge between students with mechanical backgrounds and those with experience in electronics or ICT highlight the need to adapt the course content and teaching methods. Tailoring the training to these distinct profiles would lead to more effective learning outcomes. A flexible learning path would be beneficial.

More time would be needed to fully cover all topics and allow for extended practice. This would reinforce knowledge retention and help students understand when and how to apply concepts in robotic applications.



Electronics apprentice programming a pick-and-place task with a cobot.

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