ABSTRACT—Robots offer an excellent tool for teaching engineering concepts that can be employed in teaching and demonstrating a variety of individual subjects, practical exercises, lab classes and project work. Hands-on experience encourages students and increases motivation. Besides learning engineering concepts, students can develop valuable skills such as creativity, teamwork, designing and problem solving. To effectively use robots in higher education, a number of challenges have to be met: (i) appropriate hardware platforms as well as software frameworks are required, (ii) didactic concepts have to be integrated and (iii) ways have to be found to share materials and knowledge to allow teachers from different subjects to easily set up courses.

Within the MoRob (Modular Educational Robotic Toolbox) project, we focussed on these issues and how to integrate them into a framework for educational robotics. The goal of this paper is to present the effectiveness of our efforts in meeting the challenges associated with using robots in higher education. Initially we used Lego and ER1 platforms for introductory undergraduate teaching. An extensive evaluation examined the efficiency of robotics systems and curricula. It proved the success of these project-based and experimental classes. However, shortcomings of the platforms became apparent which do not allow using them in more advanced engineering courses. To get a more suitable robot platform for education, we designed a new kit that combines advantages of the systems we utilized before. Here, modular components can be combined to build flexible platforms tailored to teaching and research. The platform has been evaluated in a number of student projects and shown to be effective.