Engineering education aims at providing students with sufficient disciplinary knowledge of science and engineering principles in order for them to become successful engineers. However, to fulfill their roles as professional engineers, students also need to develop personal and interpersonal skills, as well as professional skills, in order to implement and apply their theoretical and technical knowledge in a real context. CDIO constitutes a comprehensive approach to engineering education in which these additional skills represent fundamental principles besides the predominant technical knowledge. The implementation of professional skills as well as personal and interpersonal skills in engineering teaching must be done, however, without reducing the existing curriculum of technical disciplines and still allow for the continuous acquisition of new technical knowledge. The general purpose of this study is to discuss how to facilitate the teaching of professional skills in engineering education in parallel with the technical disciplines. The objective is to test and evaluate extensive role play simulation in which the students interact with professional engineers in a realistic, industrial context. The underlying argument for this approach is to establish a realistic learning environment that will foster the learning of professional skills. The role play simulation has been applied and reviewed in two engineering courses, i.e. at Lund University in Sweden and at the Technical University of Denmark. Course evaluations, a questionnaire, and discussions with students confirm a genuinely positive attitude towards the role play simulation. The students engage in the role play and express an increased understanding of the requirements and the implicit rules of real-life engineering. The interaction between students and the professional engineers act as a prime mover for the students to perform their best, which in turn strengthens the learning of the technical content. The study concludes that role play with participation of representatives from the industry can facilitate the teaching of professional skills in engineering education.