


# Chapter 6


## A Step Beyond in Industrial Chemistry Education: Digitalization and Sustainability

**Billur Köfter**

 <https://orcid.org/0000-0002-5518-4703>


*Hacettepe University, Turkey*

**Canan Koçak Altundağ**

 <https://orcid.org/0009-0006-2844-473X>

*Hacettepe University, Turkey*

**Ayşem Seda Yücel**

 <https://orcid.org/0000-0002-7654-582X>

*Hacettepe University, Turkey*

### ABSTRACT

*Today's digital transformation makes the integration of digital technologies into education essential for equipping students with 21st-century skills. Digital leaders must strategically use technology to manage educational processes in an efficient and innovative way. The industrial chemistry course in higher education aims to teach both the theoretical knowledge of industrial processes and their real-world applications. Digital technologies offer great potential in achieving these goals. In this context, a digitally supported system design is proposed. This digital system will provide students with the opportunity to experience industrial production and quality control processes in a virtual environment, while developing their skills in data collection, analysis, and decision-making, thus allowing them to learn the stages of industrial processes in greater depth. For example, the process of cleaning wool in*

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*the textile industry has been digitized and simulated using a SCADA-based system.*

## **INTRODUCTION**

Technology is a conscious and dynamic process that enhances the capacity to perform tasks by using tools, objects, and systems to transform the environment (McKirahan & Cheney, 2016). Its primary goals include solving problems, eliminating diseases, developing new energy sources, and improving the overall well-being of human life. Moreover, technological advancements play a strategic role in meeting the evolving needs of societies (Johnson & Wetmore, 2021). The continuous evolution of technology has had significant impacts on making life more efficient, creating new opportunities, and offering innovative solutions to existing problems. Especially in recent years, the integration of technology into social structures has accelerated access to information, transformed business processes, and opened new opportunities on a global scale (Andri, 2017; Frank, Mendes, Ayala & Ghezzi, 2019; Ghobakhloo, 2020).

In this context, technological developments have become not only a means of enhancing individual and institutional capacities but also a critical tool for achieving global development goals (Imaz & Sheinbaum, 2017; Jones, Wynn, Hillier, & Comfort, 2017; Vinuesa, Azizpour, Leite, Balaam, Dignum, Domisch, & Fuso Nerini, 2020). The integration of digital technologies into the education and industry sectors promotes quality education, supports innovative production processes, and contributes to climate action, thus strengthening the vision of a fairer and more sustainable future. In this regard, the Sustainable Development Goals (SDGs), adopted in 2015 by 193 member states of the United Nations and set to be achieved by 2030, provide a comprehensive global roadmap aimed at reducing poverty, protecting the planet, and ensuring peace and prosperity for all people. Built upon the Millennium Development Goals, the SDGs address critical contemporary issues such as climate change, inequality, and sustainability, aiming to tackle the root causes of development challenges. This comprehensive approach is based on the principle of leaving no one behind and envisions a transformation carried out in an inclusive manner (United Nations, 2015; United Nations Development Programme, 2016).

Digitalization refers to the use of digital technologies to transform business models and create value. This process accelerates data collection and storage, offering sectoral innovation and flexible working methods. Digitalization aims not only to eliminate paper-based processes but also to create sustainability and new opportunities in the business world, making significant contributions to enhancing the productivity of societies (Bhatnagar, 2017; Parida, 2018; Gigauri & Martín-Cervantes, 2023).

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