

Chapter 16

STEAM Education for Empowering Halal Industry: Enhancing Compliance and Practices

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ABSTRACT

The halal industry is rapidly expanding. Integrating STEAM education into the halal industry presents transformative opportunities. This chapter explores how STEAM education can enhance halal compliance through interdisciplinary learning with practical application. Leveraging scientific principles, technological advancements, engineering solutions, artistic communication, and mathematical precision can ensure rigorous adherence to halal compliance. Thus, the chapter highlights practical applications and discusses challenges and opportunities in integrating STEAM into halal industrial practices. It addresses the importance of halal compliance, current issues, and opportunity. Practical applications illustrate enhancing halal research and fostering educational collaborations. Strategic recommendations focus on developing interdisciplinary curricula, fostering collaboration, and supporting research and development. Future directions include curriculum development for STEAM integration in halal education to enhance halal integrity and promote innovation within the halal industry.

DOI: 10.4018/979-8-3693-7408-5.ch016

INTRODUCTION

STEAM (Science, Technology, Engineering, Arts, and Mathematics) education aims to integrate science, technology, engineering, arts, and mathematics into a unified learning experience through an integrated pedagogical approach. STEAM attempts to bridge the gap between sciences and humanities by allowing innovation through thinking outside the box in applying creative solutions to technical problems and includes emphasizing the role of creativity, analytic reasoning, and cooperative efforts together with technical skills (Wanasek, 2024). The STEAM educational philosophy unites science and the humanities, providing a platform for students to think in an innovative manner by offering creative solutions to challenging technical problems. STEAM education emphasizes experiential learning and project-based learning, fostering a practical application of knowledge to find interdisciplinary solutions (Bertrand & Namukasa, 2020). This will prepare the student to face life's challenges with the required skills and knowledge from all spheres of life. Adaptability is another important feature in today's job market, where things are changing at a very rapid pace. STEAM learning may sharpen students' adaptive and innovative thinking skills by integrating scientific principles into human-centered design, allowing them to make informed decisions to solve problems from a holistic perspective.

Halal compliance denotes a rigorous commitment to Islamic laws and guidelines governing the production, preparation, and consumption of various products and services (Rahman & Razimi, 2023). The term "halal" pertains to that which is allowed according to Islamic law, whereas anything that is prohibited or not permissible is classified as "haram". Halal compliance extends beyond the realm of food; it encompasses pharmaceuticals, cosmetics, fashion, finance, and various other sectors. Products should not contain any haram components, such as pork, alcohol, or animal meat that has not undergone proper slaughtering, among the considerations. Halal compliance also includes assertions about the sanitation of production facilities. The necessity of Halal compliance extends beyond Muslim-majority nations, thereby establishing its significance in the contemporary global marketing landscape (Rahman, 2024a).

STEAM education holds significant promise for improving halal compliance verification processes across various sectors. The utilization of scientific reasoning, advanced technology, and engineering was highlighted to facilitate the processes of verification, certification, and production within the halal industry (Fadzlillah et al., 2021; Norhayati et al., 2022). The processes of verification engage scientific methodologies concerning ingredients and products, permitting physical examinations within laboratory settings, including the analysis of DNA structures to ascertain the absence of non-halal components in the halal products (Rahman et al., 2023; Rahman et al., 2015). Technological advancements such as blockchain, may facilitate

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