

Systematic Derivation of Learning Objectives for Fostering the Development of Sustainability Competences in the Education of Industrial Engineering and Management Students

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Abstract

In recent times, the private and public sectors are facing the challenges of sustainable development (SD), especially since the adoption of the Agenda 2030 for Sustainable Development and its 17 Sustainable Development Goals. In this context, higher education institutions (HEIs) with one of their core activity, namely education, have a significant economic, environmental, and societal impact. Especially in today's knowledge society a workforce, capable of shaping and adapting to the green and digital transition, is needed. Two significant higher education outcomes are 1) students' knowledge, skills, and competences, and 2) their employability. Therefore, HEIs have the responsibility to deliver "employable" graduates, i.e., to educate them thoroughly and equip them with a set of 21st-century skills and competences. Extensive research on the impact of sustainability competence on employability has already shown that improved sustainability competences of students enhance their employability. Literature also shows that there is a worrying deficit of sustainability literacy in undergraduate students in general. Consequently, extensive adaptation and incorporating sustainability competences into IEM curricula in HEIs are still lacking. The transition towards SD demands a variety of complex and trans disciplinary adaptations in IEM education based on evidence-based competence profiles. For these reasons, sustainability fundamentals should be part of the future IEM graduate's life, because they play a critical role since IEM graduates foster social and economic development through innovation and technology applications. Thus, there is a need to improve and respectively realign IEM education by holistically incorporating SD principles, methods, and tools. In this paper, a methodological approach for the derivation of learning objectives to foster the development of sustainability competences of IEM students is

presented. Learning objectives are research-based, i.e., items that incorporate sustainability competences, and are derived from a systematic literature review. These items, i.e., sustainability aspects will be implemented, tested, and finally evaluated in a business economics course design for IEM students at HEIs. This approach allows a feedback loop for both the content and the differentiation of the methods used before the full implementation into the HEI structures. Thus, professionalization efforts such as usability, utility, or feasibility are to be ensured. In the context of course conceptualization, both subject matter experts concerning sustainability content and didactics experts will work together trans disciplinary to ensure quality offerings in terms of content and structure. The basic principles of didactics and methodology in adult education, such as constructive alignment, participant-centeredness, and case reference are considered. At the beginning of the course, using the before-mentioned items students will self-assess their level of sustainability competences based on a quantitative online questionnaire. At the end of the course, students will repeat the questionnaire to reveal any differences or changes that may have occurred. Furthermore, they will have the opportunity to reflect on their self-assessments and to comment on what has changed, what has improved, and what was helpful. This way, a set of items will be tested, subsequently evaluated, and validated, and if necessary adaptations will be implemented into the course design.

Keywords

Learning Objectives, Sustainability Competences, Industrial Engineering and Management, Engineering Education.

Biographies

Amila Omazic is a research and teaching assistant at the Institute of Business Economics and Industrial Sociology at Graz University of Technology (TU Graz). Before starting her academic career, she studied business economics at the University of Graz. Ms. Omazic teaches several bachelor and master courses in business economics for industrial engineering and management (IEM) students at TU Graz, e. g. accounting and balancing, financial management, business economics, business and financial statement analysis. Additionally, she has been teaching investment analysis at the Institute for Economic Promotion of the Austrian Economic Chambers. Additionally, she is supporting the European Professors of Industrial Engineering and Management (EPIEM) network, concerning organizing of the scientific events and proceedings. She is doing her Ph.D. in the field of sustainability management at higher education institutions at TU Graz, focusing on development and implementation of sustainability strategy, sustainability education, fostering the development of sustainability competence, sustainability assessment and reporting. She was also involved in the internal project at TU Graz concerning the development and implementation of the sustainability strategy and is actively involved in the sustainability reporting of the TU Graz, since 2019. Furthermore, she acted as alternate member of the sustainability board of TU Graz and a member of a Working Group Sustainability Strategy in the Alliance of Sustainable Universities in Austria. As a part of an in-house training programme for teaching “The Teaching Academy” at the TU Graz Ms. Omazic is finishing the Teaching Expert Module.

Corina Pacher is an Education Project Manager at the Life Long Learning Department at Graz University of Technology. She is mainly responsible for the project management of European projects, support in the development and expansion of CVET offers, and development of didactic concepts. She studied pedagogical and educational science at the University of Klagenfurt (Austria) with a specialization on social and inclusive education (master’s degree) and on professional education (master’s degree). Currently, Ms. Pacher is conducting her PhD in the field of profiling competence profiles for European Industrial Engineering and Management (IEM) curricula. During and after her studies, she gained work experience, e.g., as Head of educational programs and in different social public service enterprises as a social education worker. Currently, she is mainly focusing on raising the awareness for engineering education 4.0 by connecting research, education, and society.

Bernd Markus Zunkis in his role as an Associate Professor the Deputy Head of the Institute of Business Economics and Industrial Sociology as well as the Head of the Industrial Marketing, Purchasing and Supply Management working group at Graz University of Technology (TU Graz). Furthermore, he is the Dean of Studies of the Faculty of Mechanical Engineering and Economic Sciences at TU Graz and in this function, he is responsible for the Mechanical Engineering and Business Economics Master and PhD programmes. His current research interests are in the field of “Attractiveness, Trust and Power in Industrial Relationships”, “Industrial Customer Preference”, “Personality and Motivation of Purchasing Professionals”, “Sustainable Supply Chains” as well as “Lower Tier Supplier Risk Management”. Besides, he is chairing the European Professors of Industrial Engineering and

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Manuel Woschank received a Ph.D. in Management Sciences with summa cum laude from the University of Latvia and the Habilitation in Industrial Management from the Montanuniversitaet Leoben. He is currently Deputy Head of the Chair of Industrial Logistics at the Montanuniversitaet Leoben and an Adjunct Associate Professor at the Faculty of Business, Management, and Economics at the University of Latvia. He was a visiting scholar at the Technical University of Kosice and the Chiang Mai University. His research interests include the areas of production planning and control, logistics 4.0 concepts and technologies, behavioral decision-making, and engineering education.