

The CDIO Standard for Sustainable Development

Characterization

A program that identifies the ability to contribute to a sustainable development as a key competence of its graduates. The program is rich with sustainability learning experiences, developing the knowledge, skills and attitudes required to address sustainability challenges.

Description

- The program emphasizes environmental, social and economic sustainability in the adoption of the CDIO principles as the context for engineering education (Standard 1).
- Sustainability related knowledge, skills and attitudes, are explicitly addressed in program goals and learning outcomes (Standard 2).
- Aspects of sustainable development are integrated in several mutually supporting disciplinary courses and projects, possibly in combination with specific sustainability courses (Standard 3).
- Concepts of sustainability, potentials and limitations of science and technology and related roles and responsibilities of engineers, are established at an early stage of the education (Standard 4).
- Design-implement experiences provide students with opportunities to apply and contextualize sustainability knowledge, skills and attitudes, both in the development of new technology and in the reuse, redesign, recycling, retirement, etc., of existing technology (Standard 5).
- Physical and digital learning environments enable interdisciplinary and transdisciplinary collaborative learning and interaction with various external stakeholders (Standard 6).
- Sustainability learning experiences are integrated with the learning of disciplinary knowledge, personal and interpersonal skills, and product, process, system and service building skills (Standard 7).
- Active experiential and transformative learning activities develop students' key competences for sustainability (Standard 8).
- Enhancement of faculty competences for sustainability and related teaching competences is actively promoted (Standard 9 & 10).
- Approaches appropriate for assessing sustainability related learning outcomes are implemented (Standard 11).
- The integration of sustainable development is evaluated by students, faculty, industry, and societal stakeholders, and in relation to relevant UN and other frameworks (Standard 12).

Rubric

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| <p>0 – There are no sustainable development learning experiences in the program.</p> <p>1 – Minor sustainable development learning experiences are implemented in at least one course and needs and opportunities for extended integration of sustainable development have been identified.</p> <p>2 – At least two sustainable development learning experiences, where at least one is substantial, are implemented and there is a plan for extended integration of sustainable development.</p> <p>3 – There are explicit program goals and intended learning outcomes considering knowledge as well as skills related to environmental, social, and economic aspects of sustainability, and students learning towards these goals and outcomes are supported by at least four sustainable development learning experiences, where at least two are substantial, including an introduction early in the program.</p> <p>4 – The integration of sustainable development is pervasive, well adapted to the program context, promoting progression of knowledge, skills, attitudes, and key competencies for sustainability, and there is documented evidence that students have achieved the related intended learning outcomes.</p> <p>5 – Sustainable development is fully integrated in accordance with the description in the optional CDIO standard for sustainable development.</p> |
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Definitions

Minor vs. substantial learning experiences

- A minor sustainable development (SD) learning experience is typically a small SD related module, and related learning outcomes and assessment, integrated in a core engineering course or in a program introductory course, corresponding to about one ECTS credit (a few days workload).
- A substantial SD learning experience can either be a course that is more or less completely dedicated to SD, or extensive integration of SD in a core engineering course in terms of several intended learning outcomes and related learning activities and assessment, corresponding to several ECTS credits.

Knowledge, skills, and key competencies for sustainability

- The rubric level 3 requires substantial SD learning experiences that, in addition to developing students' SD knowledge, also develop students' SD skills, i.e., abilities to apply and operationalize their SD knowledge in engineering work; evaluate environmental, social and economic impacts; and take action for sustainable development based on such evaluations for example in engineering decision making and engineering design.
- The rubric level 4 further requires development of students' key competencies for sustainability, for example systems-thinking, critical-thinking, normative competency, and abilities to communicate and collaborate across disciplinary and cultural borders. These competencies are clusters of individual dispositions comprising knowledge, skills, motives, and attitudes, that within the Education for Sustainable Development (ESD) domain are considered necessary for coping with the increasingly diverse and interconnected world and for contributing to sustainable development (e.g., Wiek et al 2016, UNESCO 2017, Rosén et al 2019, Brundiers et al 2021).

References

- Malmqvist, J., Edström, K., & Rosén, A. (2020). CDIO Standards 3.0–Updates to the Core CDIO Standards. In *Proceedings of the 16th International CDIO Conference* (Vol. 1, pp. 60-76).
- Malmqvist, J., Edström, K., Rosén, A., Hugo, R., & Campbell, D. (2020). Optional CDIO Standards: Sustainable Development, Simulation-Based Mathematics, Engineering Entrepreneurship, Internationalisation & Mobility. In *Proceedings of the 16th International CDIO Conference* (Vol. 1, pp. 48-59).
- Rosén, A., Hermansson-Järvenpää, H., Finnveden, G., & Edström, K. (2021). Experiences from Applying the CDIO Standard for Sustainable Development in Institution-Wide Program Evaluations. In *Proceedings of the 17th International CDIO Conference* (pp.63-74).