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What are the Common Knowledge & Competencies for Education for Sustainable Development and for Engineering Education for Sustainable Development?

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Different interpretations of "sustainable development" in the educational context raise problematic issues for the integration of ESD in Engineering Education. To some extent, the interpretation of ESD depends on the context and it is set out from real practical problems. It is also claimed that its principles should not only be integrated in the curriculum but be also part of the vision of the educational system.

Core theories define and characterize ESD as: (i) rooted in postmodernism; (ii) social, constructivist and transformative; (iii) contextual, experimental and collaborative; (iv) process oriented and empowering; (v) problem solving, critical thinking and creative; etc. The characteristics and definition of ESD move from an epistemological perspective to a curriculum construction perspective.

Broadly there is an alignment between the ESD core theories and the EESD literature, however these reports don't have a clear interpretation of competencies and how can be frame into practice (e.g. learning approaches). One of the main challenges regarding to EESD is to move from broad interpretations of its principles and descriptive examples for more common conceptual framework.

This paper aims to present a qualification framework based on the analysis of education for sustainable development (ESD) theories and engineering education for sustainable development (EESD) and bring together common understanding of the concepts and principles used in their discourses. The research question underlying this study was: if there is a common qualification framework (knowledge and competencies) in education for sustainable development (ESD) and in engineering education for sustainable development (EESD)?

1. METHODOLOGY

The *Declaration of Barcelona,The Global Engineer, and Engineering for Sustainable Development: Guiding Principles* were analysed through content analysis.

The literature review presented three main common points of ESD and EESD: i) sustainable development main themes; ii) learning approach, and iii) learning objectives. The units for analysis were cluster according to these three main common points (named criteria), which also addressed three dimensions of curriculum (*Table 1*).

Table 1. Category and units of analysis

Sustainable development aspects as content	
• Environment	• Society
• Human Rights	• Product responsibility
• Labour practices and decent work	• Economic
General learning objectives	
• Critical thinking	• Creativity and innovative
• Systems thinking	• (Become) Agent of change
• Collaboration and communication	• Ethics
• Lifelong learning	
Learning approach characteristics	
• Active and independent learners Contextual learning	• Interdisciplinary to transdisciplinary
• Experimental learning	• Holistic
• Democratic and participatory	• Integrative

The sustainable development indicators are based on the Global Report Initiatives (GRI), which main goal is to *"communicate clearly and openly about sustainability"*, and is defined as *"a globally shared framework of concepts, consistent language, and metrics required"* for reporting sustainability at an organizational level. The general learning objectives and the learning approach characteristics were based on ESD core theories.

2. REFLECTIONS

In general, the documents analysed enclosure aspects of the three dimensions of sustainable development and argue for them with examples of engineering practices, stressing the central role of engineering and the alignment of the discipline specific knowledge with others disciplines aiming a responsible and conscience action. Also the competences needed to achieve sustainable actions are common to the three documents, and are aligned with ESD core theories as well as the characteristics of the learning approach. This study provided an instrument for meta-analysis in three interconnected axis for EESD: i) sustainable development themes/ aspects to address; ii) general learning objectives (competences and skills); iii) characteristics of the learning approach. This framework encloses a conceptual dimension and methodological framework. The conceptual dimension is related with the common understanding between different types of literature in relation with EESD qualification framework. Methodologically, the framework can be used as an instrument for analysis and change. ∎