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# Fostering Key Competencies for Sustainability: Development of a Higher Education Teaching Format based on Service Design

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***Abstract***

*Against the background of severe global sustainability challenges, Higher Education Institutions (HEIs) are called to integrate sustainability aspects into research and teaching, hereby supporting the development of sustainability competencies of students (United Nations Educational, Scientific and Cultural Organization, 2017). Within this context, a new teaching format, that applies the Service Design methodology to tackle sustainability-related real-world challenges, was designed and conducted at a German University of Applied Sciences in autumn/winter 2021. The teaching format was evaluated by participating students respective its contribution to the fostering of their sustainability key competencies. This paper describes the developed format and outlines how and why it helped students to develop key competencies. It thereby contributes to a highly relevant and increasingly considered research stream dealing with teaching effectiveness and the impact of pedagogical approaches on sustainability-related competencies (Cebrián, Junyent, & Mulà, 2020).*

***Keywords:*** *Education for Sustainable Development (ESD); Service Design; Design Thinking; Key Competencies; Teaching Effectiveness.*

## 1. Introduction

Higher education institutions (HEIs) are pivotal for preparing their graduates to cope with an increasingly complex and turbulent environment and to develop future decision-makers' competencies to transform our political, social and economic systems towards a sustainable future (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2017). Hence, a growing number of literature is dealing with the effectiveness of different teaching pedagogies and their use within classroom for such a competency development (Redman, Wiek, & Barth, 2021). Within this context, approaches such as active and collaborative learning (Evans, 2019) as well as experiential learning (Lozano, Barreiro-Gen, Lozano, & Sammalisto, 2019; Molderez & Fonseca, 2018) have been highlighted in the past. Recent studies are investigating the potential of Service Design teaching for sustainability education (e.g. Pimpa, 2019; Earle & Leyva-de la Hiz, 2021).

Based on these findings and developments, a new teaching format called "Engaging for Sustainability" was designed, conducted and evaluated in terms of contributing to the development of students' sustainability competencies. This paper aims a) to introduce the designed teaching format in order to showcase the application of Service Design and connected recommended teaching approaches and pedagogies in higher education practice, namely active, collaborative and experiential learning, and b) to assess the potential of this teaching format to enhance sustainability key competencies based on students' self-assessment.

## 2. Developing and Fostering Sustainability Key Competencies by Service Design

In line with the call for HEIs to enable the acquisition of competencies related to sustainability (UNESCO, 2017), a growing stream of literature addressing questions concerning these competencies can be observed (Lozano et al., 2019). Key competencies in sustainability can be defined as "functionally linked complex[es] of knowledge, skills, and attitudes that enable successful task performance and problem solving" (Wiek, Withycombe, & Redman, 2011, p. 204 based on Spady, 1994 and Baartman, Bastiaens, Kirschner, & Van der Vleuten, 2007). The UNESCO (2017) identifies eight key competencies for sustainability. Table 1 depicts those key competencies and presents definitions for them.

Service Design can be conceptualized as a service-specific application of Design Thinking and design methodologies to immaterial products, i.e. services (Clatworthy, 2017). Design Thinking refers to a human-centred 'open' problem solving process for complex, multifaceted problems, so-called 'wicked problems' (Buchanan, 1992). Service Design targets on designing services and balances the needs of the customer with the needs of the business, aiming to create seamless and quality service experiences (Miller, 2015). It is

increasingly perceived as a catalyst for innovation in national policy, regional development and business and may contribute to social innovation (Yang & Sung, 2016) and sustainable business model innovation (Prendeville & Bocken, 2017).

**Table 1. Key competencies for sustainability**

| Key competency | Definition (from Rieckmann, 2018) |
|---|---|
| Systems thinking competency | "The ability to recognize and understand relationships, to analyse complex systems, to perceive the ways in which systems are embedded within different domains and different scales, and to deal with uncertainty" (p. 44). |
| Anticipatory competency | "The ability to understand and evaluate multiple futures – possible, probable and desirable – and to create one's own visions for the future, to apply the precautionary principle, to assess the consequences of actions, and to deal with risks and changes" (p. 44). |
| Normative competency | "The ability to understand and reflect on the norms and values that underlie one's actions and to negotiate sustainability values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions" (p. 44). |
| Strategic competency | "The ability to collectively develop and implement innovative actions that further sustainability at the local level and further afield" (p. 44). |
| Collaboration competency | "The ability to learn from others; understand and respect the needs, perspectives and actions of others (empathy); understand, relate to and be sensitive to others (empathic leadership), deal with conflicts in a group; and facilitate collaborative and participatory problem-solving" (p. 44). |
| Critical thinking competency | "The ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse" (p. 44). |
| Self-awareness competency | "The ability to reflect on one's own role in the local community and (global) society, continually evaluate and further motivate one's actions, and deal with one's feelings and desires" (p. 45). |
| Integrated problem-solving competency | "The overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution that promote sustainable development - integrating the above-mentioned competencies" (p. 45). |

Source: Rieckmann (2018).

When using Service Design in sustainability-related teaching, students are in the role of designers that actively and collaboratively search for solutions for real-life problems brought in by companies or other organizations. Hereby, teaching inherently builds on learning approaches that have been identified as effective for sustainability-related teaching, such as active, collaborative (Evans, 2019) and experiential learning (Lozano et al., 2019; Molderez & Fonseca, 2018). Furthermore, certain characteristics of the Service Design process are

nourishing selected competencies of the described UNESCO framework: For example, by following the so-called Double Diamond Process (Design Council, 2020), students explore a wide problem space, which allows delving into multifaceted problems. Students recognize that sustainability-related design challenges involve and affect diverse stakeholders and that their proposed solutions need to consider different subsystems and fit into existing ecosystems. Service Design – especially when used for solving 'wicked problems' (Morelli, de Götzen, & Simeone, 2021) – therefore potentially enhances the systems thinking competency as defined by the UNESCO (2017). By giving students space for experimenting with new and innovative ideas, going through multiple iterations of understanding a human need, and transforming this understanding into new ideas and evaluating the ideas (through prototyping) with the users (Clatworthy, 2017), Service Design possibly also fosters he strategic as well as integrated problem-solving competency. Service Design teams are ideally multi-disciplinary teams composed of experts in different domains and with different demographics, backgrounds and experiences. It is pivotal for Service Design to foster empathy and collaboration among the team members and with users and stakeholders, e.g. by means of interviews, observations and immersions (Miller, 2015) such that a positive impact on collaboration competency is probable.

## 3. Case Example: Teaching Format "Engaging for Sustainability"

### *3.1. Teaching format description*

The teaching format "Engaging for Sustainability", taught at a faculty for cooperative business administration studies at a German University of Applied Sciences, is linking two originally separated modules – one focusing on sustainability aspects, the other on Service Design – with the specific intent to facilitate "education for sustainability" and reach the following objectives: increase business students' awareness of issues related to sustainability; foster the development of students' (key) competencies related to sustainability and equip them with creative problem-solving techniques to tackle 'wicked problems'; as well as encourage students to turn theory into practice and behave in a more sustainable manner.

To accomplish those objectives, the format is divided into three parts that are supplementing each other and are partly conducted parallel. In the first part students work in teams of four to five persons on real-life sustainability-related challenges brought in by project partners. Each project aims at solving a sustainability challenge by collaboratively applying the different techniques of Service Design. The project work is facilitated by a lecturer with long experience in Service Design and other creativity and innovation methods. 40 hours in presence teaching and approximately 110 hours of self-study are allocated to this part which mainly aims at developing collaboration, strategic, integrated problem-solving, systems thinking and – to a minor part – anticipatory competency. The project work is framed by the

second part of the course, which consists of theoretical inputs and group discussions on the topic of sustainability. Students get acquainted with basic concepts such as sustainability and the Sustainable Development Goals (SDGs), responsibility, ethics and social entrepreneurship and explore selected sustainability issues and their implications. This part should mainly enhance the awareness for (interconnected) sustainability issues, and an understanding of the responsibility of different actors for solving them. The third part consists of reflection tasks and discussions. Students are asked to question their own behavior and attitudes, and their role for contributing to a sustainable development. They are motivated to contextualize their project work in relation to the grand sustainability challenges and stakeholder needs and evaluate the impact of their work on the SDGs. The second and the third part of the course aim more on developing students' self-awareness, critical thinking and normative competency. These parts are guided by a lecturer of the field of management and sustainability and encompass 20 lecture hours and approximately 10 hours of self-study.

### *3.2. Student evaluation*

#### *3.2.1. Methodology*

The teaching format was conducted between October and December 2021 at a German University of Applied Sciences. Participating students were asked to complete an online questionnaire after the last session of the teaching format has taken place representing a reflection on their learning process as well as abilities and competencies gathered throughout the teaching format participation. Overall, 26 students completed the questionnaire. Of those, four students needed to be taken out of the data analysis due to quality reasons (i.e. finishing the survey within less than ten minutes). The remaining 22 students were on average 23 years old; eight of them were aged 20 years or younger, ten students were aged between 21 and 25 years and four students were aged above 25. The majority of students was female (i.e. 15 female and seven male students) and almost all students (except three) already had work experience. In one part of the questionnaire students were presented with definitions of the eight key competencies for sustainability and asked to assess respective each competency how strong the teaching format participation contributed to its fostering for them personally using a 5-point Likert scale (ranging from "not at all" to "extremely"). In order to stimulate a thorough reflection and evaluation of the teaching format contribution, students were additionally asked to describe where they had opportunity/opportunities to practice and apply the competency in question throughout their teaching format participation (within or out of the classroom). The definitions provided to the students were developed based on the above introduced definitions presented in Rieckmann (2018), taking other works such as Wiek et al. (2011) and especially results from expert interviews conducted by the authors into consideration. The expert interviews were completed in 2021 with the general goal to develop a comprehensive and sound questionnaire for the student evaluation.

### *3.2.2. First Results*

The analysis in this paper focuses on the question how strong the participation in the teaching format contributed to the fostering of the sustainability key competencies assessed by the students themselves (see above). First results are presented in Table 2.

**Table 2. First empirical results**

| Competency | Average | Median | Frequency (number of students) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1[a] | 2[b] | 3[c] | 4[d] | 5[e] |
| Systems Thinking Competency | 2.95 | 3 | 0 | 6 | 11 | 5 | 0 |
| Anticipatory Competency | 3.05 | 3 | 0 | 5 | 11 | 6 | 0 |
| Normative Competency | 3.18 | 3 | 0 | 5 | 9 | 7 | 1 |
| Strategic Competency | 3.32 | 3 | 0 | 5 | 7 | 8 | 2 |
| Collaboration Competency | 3.09 | 3 | 1 | 4 | 9 | 8 | 0 |
| Critical Thinking Competency | 2.91 | 3 | 0 | 7 | 10 | 5 | 0 |
| Self-Awareness Competency | 3.14 | 3 | 1 | 4 | 10 | 5 | 2 |
| Integrated Problem-Solving Competency | 3.05 | 3 | 0 | 5 | 11 | 6 | 0 |

[a] not at all, [b] slightly, [c] moderately, [d] very, [e] extremely

Source: Own analysis.

Students indicated on average a moderate contribution of their participation in the teaching format to the enhancement of all sustainability key competencies, which is underlined by the given median values (i.e. for all competencies a median value of 3). There were only two statements that attending the teaching format does not at all contributed to a key competency: one time in the case of the collaboration competency and one time in the case of the self-awareness competency. Overall, this suggests that the teaching format in general has a moderate but positive impact on all key competencies. Comparing the frequencies of statements respective the strength of the impact of the teaching format on the single sustainability competencies, some differences can be detected: A very high or extremely high impact of the teaching format was indicated by ten students for the strategic competency and by eight students for the normative and collaboration competency. Only five students believe that there was a high impact on the critical thinking and systems thinking competency and only six reported this impact for the integrated problem-solving and anticipatory competency.

## 4. Discussion and conclusion

The present paper aimed at discussing the impact of a teaching format that employs the Service Design methodology for solving sustainability-related real-life problems on the development of eight key competencies needed by "...individuals... to contribute to societal transformation towards sustainability" (Rieckmann, 2018, p. 42). The results of a students' self-assessment indicate - in overall terms - a moderate, but positive impact of the teaching format on all eight sustainability key competencies. This might be explained with characteristics of the Service Design process and its inherent use of active, collaborative and experiential learning approaches. Further investigation on potential drivers of competency development is necessary in order to further improve the effectiveness of the teaching format especially for those competencies for which the impact of the teaching format was less strongly evaluated. An important limitation of the presented study is the subjective nature of the empirical assessment of the teaching format's contribution to the sustainability key competencies: students evaluated by themselves whether taking part in the teaching format has contributed to foster their competencies. Although this approach yields important and interesting insights, it should be complemented by more objective evaluations (e.g. analysis of exam performance) to gain a comprehensive picture in terms of competency development.

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