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Teaching Sustainable Business Models– A Modeling-Driven Approach

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Abstract

We report on lessons learned from a master-level university course teaching the development of sustainability-oriented business models by emphasizing the modeling perspective. Our approach combines traditional lectures with experiential learning-based elements such as small group exercises, case studies, and in-class reflection to foster students' factual knowledge and practical skills.

Introduction

"The greatest threat to our planet is the belief that someone else will save it."

–Robert Swan (author, conservationist)

New business models enable the old way of doing things to be replaced, and thus open opportunities for better solutions (Magretta, 2002). In pursuing to address one of the most fundamental challenges of today's society, contributing to sustainable development (Brundtland *et al.*, 1987), novel or improved business models play an important role because they have the power to capture "economic value while maintaining or regenerating natural, social, and economic capital" (Schaltegger *et al.*, 2016, p. 6).

In order to boost the development of more sustainable business models, organizations typically face challenges concerning how to arrive at creative ideas and how to translate ideas into specific models (Chesbrough, 2010). Therefore, "structure and guidance to frame and focus thought" (Eppler *et al.*, 2011, p. 1324) are required. Since "visual thinking is indispensable to working with business models" (Osterwalder and Pigneur, 2010, p. 148), it has been determined as the main tool for developing business models (Täuscher and Abdelkafi, 2017). Following this, numerous business model modeling languages (BMMLs) (John *et al.*, 2017) are have been proposed that structure business models through pictorial, mathematical, or symbolic

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forms (Massa *et al.*, 2017)—including the quasi-standard from Osterwalder and Pigneur (2010), the *Business Model Canvas*. Even though those modeling languages are well-applied, they do not necessarily focus on sustainability (Bocken *et al.*, 2015), which is however important to foster the design of more sustainable businesses that, for instance, establish closed-loop production or replace 'fire and forget' models (Lüdeke-Freund *et al.*, 2017). To overcome this, modeling languages and the represented business model components need to be reframed (Breuer *et al.*, 2018) and adapted (Schoormann *et al.*, 2016) to the specific context of sustainability.

In this teaching approach, we build upon the idea of reframing and adapting modeling languages for business models and confront students with a variety of established and (still) evolving languages. We encouraged them to critically examine the languages' suitability during the analysis and development of new business models. In doing this, students reflect on positive and negative aspects of business models by taking into account a model-driven perspective in which they continuously adapt modeling languages to specific use cases. Thereby, the following key challenge is addressed: *How to use modeling languages for enabling students to critically reflect sustainability in business models?*

This paper describes a teaching approach and lessons learned from its multiple iterations in a master-level university course with students from diverse disciplines such as Information Systems, Environmental Preservation, and Organizational Pedagogy. In addition to traditional lecture-styles, the didactic underpinning draws on elements of *experiential learning* (Kolb, 1984) including case discussions, collaborative projects, and presentations of results in the form of pitches. Through alternating phases of traditional lecture styles with input from teachers, working in small groups (reflection-in-action), and discussing results within the entire course (reflection-on-action), this teaching approach seeks to leverage the *learning-by-doing* effect (Schön, 1983). Accordingly, this paper shows that teaching modeling languages supports students in developing, analyzing, and communicating sustainability-oriented aspects of business models. In this spirit, we hope to increase the students' ability and understanding to act more sustainably (e.g., as potential decision-makers in companies or start-ups and consumers) and to complement the landscape of available courses on business models with a sustainability-oriented modeling lens. For lecturers, we provide a course design including tools and formats as well as recommendations for implementing them.

Approach

Educational Objectives and Didactic Approach

The purpose of this teaching approach is to enable students to systematically analyze and improve existing business models in terms of sustainability as well as to develop and implement completely new ideas for more sustainable business models. Therefore, we aim to build *factual* (e.g., specific business cases) and *methodic* (e.g., modeling languages) knowledge. This knowledge is then applied to collaboratively solve realistic problems through representing, analyzing, and discussing sustainability in real-life business model cases (e.g., from domains such as circular economy, fashion, and sharing economy); thereby drawing from experiential learning (Kolb, 1984), for example, by conducting group exercises (i.e., gaining concrete experiences) and in-class reflections.

To meet the overall purpose, the present teaching approach focuses on achieving the following learning outcomes—defined according to *Bloom's taxonomy of educational objectives* (Bloom *et al.*, 1956): students will be able to (1.1, factual) *understand* the origins of sustainable development and theoretical backgrounds taught in the course, (1.2, methodic) *apply* general strategies and patterns for contributing to sustainability, (2.1, factual) *understand* the origins and the concept of business models, (2.2, methodic) *apply* modeling languages taught in the course to *create* and *evaluate* business models, (2.3, factual) *remember* selected use cases of sustainable business models, (3.1, methodic) *evaluate* and *analyze* the suitability of certain modeling languages in representing sustainability-oriented aspects, (3.2, methodic) *apply* and *create* adaptions of modeling languages.

General Course Structure and Overview of Weekly Lecture Sessions

Table 1 gives an overview of the weekly sessions, assignments, and formats employed.

Next, the course structure is described in more detail, particularly highlighting aspects related to the course's modeling focus. To meet the challenge of teaching the topic to an interdisciplinary group, shared knowledge is built at the beginning of the course, for example, by introducing definitions of business models (**Session 2**), selected models of sustainability and strategies for taking sustainable action (**Sessions 3–4**), as well as a practice case, here in the context of the sharing economy provided by a local startup (*Use Case A*, **Session 5**). Since the course focuses on modeling, students were first instructed in the *Business Model Canvas* (Osterwalder and Pigneur, 2010), which was selected due to being relatively easy to learn and well-established in research and practice (**Session 2**). Afterwards, the students were motivated to critically reflect the abilities and limitations of the Business Model Canvas and other available modeling languages for adequately representing and analyzing a business model's economic, ecological, and social sustainability. Additionally, we introduced common customizations for representing sustainability in the original canvas including (Figure 1), for instance, adding new business model components for environmental impacts (see Schoormann *et al.*, 2016 for an overview), and presented the sustainability-oriented *Triple-layered Canvas*

Weekly session		Students will learn/do...	Learning Outcome	Format
01	Introduction	• Introduction and motivation for the course.	–	Lecture
02	Business models	• Common business model definitions. • Business model modeling languages (BMML) and how they can be applied/adapted.	Understand	Lecture; in-class reflection
03-04	Sustainability	• Origin of sustainable development. • Sustainable entrepreneurship. • Theoretical background (e.g., Stakeholder theory).	Understand	Lecture; in-class reflection
05	Use Case A–Introduction	• Introduction to a practical use case.	Remember	In-class discussion
06	Sustainability in business model development	• (Software supported) Customization of BMMLs to incorporate sustainability. • Theoretical/conceptual approaches to foster sustainability in business models (e.g., patterns).	Evaluate; analyze	Lecture; in-class reflection
07	Use Case A–Design	• Group exercise: represent Use Case A's business model with special consideration on sustainability.	Apply; create	Collaborative exercise; in-class reflection
08	Use Case B–Introduction and Ideation	• Basic principles of Design Thinking. • Business model development using Design Thinking.	Apply; create	Collaborative project
09	Use Case B–Design	• Development and visualization of a new (sustainable) business model.	Apply; create	Collaborative project
10-11	Use Case B–Communication	• Presentation and discussion of business models. • Analysis of the business model's (ecological, economic, social) sustainability.	Apply; create	Collaborative project; presentation; in-class reflection
12	Written exam	• Reflection on approaches for considering sustainability in business model development approaches (e.g., in BMMLs).	Evaluate; analyze; apply; create	Individual exam

Table 1: Overview of Course Design

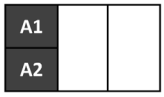
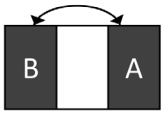
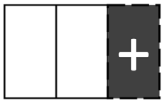
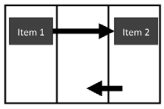
Modifying the content of a component	**Dividing components**	**Modifying the spatial arrangement**	**Adding components**	**Linking elements/ components**
				
e.g., listing 'value creation partners' (anyone who benefits from the business model) instead of customers	*e.g., dividing the value proposition to distinguish between economic, ecological and social value generated*	*e.g., positioning cost structure and revenue streams under ecological and social components to highlight the importance of sustainability-related aspects*	*e.g., adding new components for describing ecological risks and benefits*	*e.g., linking harmful resources with their related ecological risks*

Figure 1: Overview of Customizations and Exemplary Application in a Canvas-based Approach

(Joyce and Paquin, 2016) (**Session 6**). We hereby allowed students to reflect existing approaches as well as design approaches of their own. In doing this, the plurality of different approaches is emphasized and a need for reframing and adapting approaches to a specific context such as sustainability is stressed (Breuer *et al.*, 2018).

This methodic knowledge of applying and adapting modeling languages for business models and their sustainability-oriented aspects was employed in two group assignments. For the first assignment (**Session 7**), the students modeled *Use Case A* with the Business Model Canvas and integrated various aspects of sustainability using customizations introduced in previous sessions, such as adding new components for ecological and social costs. Students thereby applied their knowledge of business model modeling, and practiced critical thinking by selecting appropriate customizations. Figure 2 illustrates the consolidated and anonymized sharing business model as well as selected customizations, particularly in the form of additional canvas components (displayed here using a custom software prototype developed in our department).

Students then spent three weeks working on a *problem-based group* assignment to develop and pitch their own business model (*Use Case B*; resulting in three online platforms for sharing tools, appliances, or services, as well as an online agency equipping temporary workers with the knowledge to become multiplicators for ecological sustainability) (**Sessions 8–11**). Here, modeling business models served two purposes. First, each group applied a variety of sustainability-oriented customizations to collect suggestions of how to implement their business idea not only to generate financial success, but also act environmentally and socially conscious and assess the potential business model's impact. Simultaneously, the students were empowered to make informed choices of suitable approaches including, but not limited to, the previously practiced modeling languages and customizations, and presented their methodical approach to their peers. Therefore, students are enabled to more easily navigate the variety of available approaches and extend them where necessary to design sustainability-conscious business models. Second, each group used the visualized model in their presentations to pitch their business idea. The visualization thereby becomes a *boundary object* (Star and Griesemer, 1989) for communicating the idea to peers and lecturers, allowing for a structured discussion and collaborative assessment of the business model and its potential impacts.

Since not all students are comfortable with teaching styles that require them to take responsibility for their own learning individually or in groups with their peers (Hoveskog *et al.*, 2018) and at times show reluctance to work collaboratively or participate in open

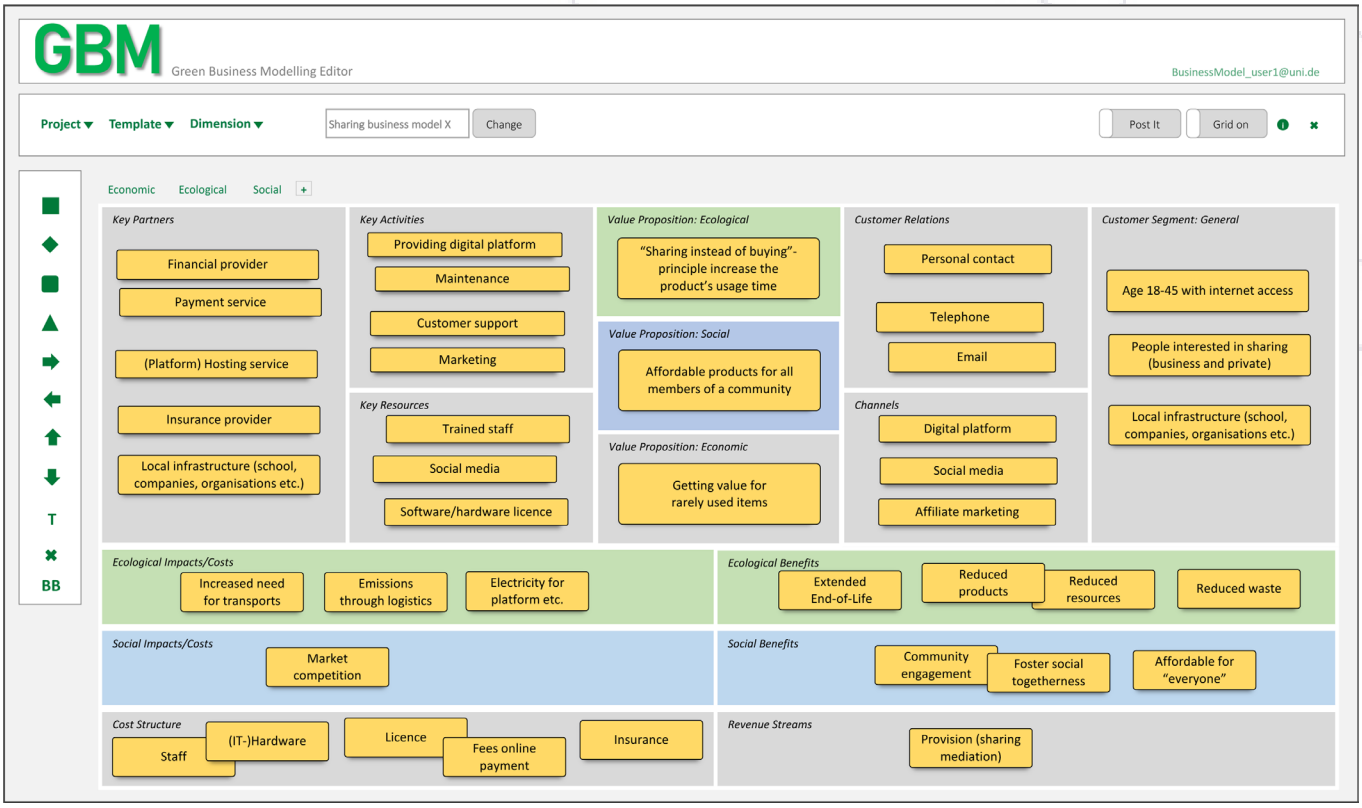


Figure 2: Demonstration of the Practical Use Case for Sharing Business Models

in-class discussions, we selected an individually written exam for the course assessment. In this exam, students applied their knowledge to create and represent another business model, and to critically discuss, select, and implement (modeling) languages for disclosing sustainability-relevant aspects (**Session 12**).

Key Insights

In order to verify the usefulness of the presented course, we (1) analyzed a standardized questionnaire given out by the university's quality management allowing to obtain data using open and closed questions (e.g., regarding the course environment and the students' effort to pass the course). The questionnaire was completed by fifteen students in the last iteration. Moreover, we (2) conducted a focus group, a "moderated discussion among six to twelve people who discuss a topic" (Tremblay *et al.*, 2010, p. 600). For this, we carried out a voluntary, 90-minute workshop with nine students that participated in the course, transcribed the verbal protocols recorded, and carved out observations with two researchers.

In performing this evaluation, we were able to observe general changes of awareness for sustainability-related issues, including tentative changes in behavior through participating in the course (e.g., "*I try to buy products that have less packaging*"; "*I started to look where [the water brand I drink] actually comes from*"; "*I have joined some second-hand apps.*").

Referring to the modeling-driven focus, four main observations emerged that should be taken into account by lectures intending to adapt or design a similar course (Table 2).

(1) Modeling language customizations. Most importantly, we found that modeling languages and component-based customizations for sustainability taught in the lectures were recognized as helpful for considering more than only financial aspects of a business model (e.g., "*[...] the established canvas can be adapted like by adding new blocks for ecological and social impacts, which leverages the consideration of further aspects.*"). Students also emphasized that visualizing the business models helped them to systematically compare and integrate different perspectives of sustainability

(e.g., "*The goal of modeling was to not only consider the economic but also the social and ecological perspective [which helps to] deliberately analyze trade-offs*.") as well as to consider the manifold sustainability-related stakeholders and perspectives on a business model (e.g., "*I was encouraged to critically reflect things like by using modeling languages for business models and their sustainability-oriented customizations. These foster me to consider not only economic goals but also ecological and social ones [...]*"). However, some students criticized that the in-class discussions of the project presentations (Session 11) should have a stronger focus on discussing and comparing the modeling customizations used by each group. This highlights that teachers need to provide students with various opportunities for applying and practicing their methodical knowledge throughout the entire course, for example, by preparing guiding questions for the project presentations (e.g., "*Apply and justify suitable customizations for modeling and analyzing a given business model regarding its sustainability*").

(2) Collaborative modeling. Efforts towards sustainability force different stakeholders to collaborate to reach a variety of often conflicting goals. Equally, diverse points of view are beneficial when tackling multi-perspective challenges of sustainability. Our observations underline the importance of allowing the students to work collaboratively on case studies (e.g., "*It was beneficial to work intensively in small groups. [...] we had to consider many stakeholders, and this helped reflecting about them*."). To facilitate this, students need to be equipped with both abilities for and experience of solving (practical) problems in heterogeneous teams. Lecturers therefore need to provide an environment that fosters students to communicate and debate their different perspectives, experiences, and beliefs, for example, by conducting team building exercises, establishing constructive conversational rules, and encouraging peer feedback.

(3) Real use cases. We have observed that students often struggle with applying knowledge to real-world problems which is, however, necessary to translate knowledge into action (e.g., "*We have learnt how to model [sustainability solutions], but have seldomly tested feasibility [in real life].*"). Consequently, students should be taught about real-life problems early on, for instance, by inviting external organizations and industry partners to report on their business models, and students should be enabled to apply modeling languages to real use cases. Doing this, they build problem-solving skills, are motivated, and assess the usefulness of modeling languages in different practical scenarios.

(4) Interdisciplinary groups. Due to the interdisciplinary composition of the course, some students may struggle at first with the modeling lens (the degree of

Observation	Lessons learned and exemplary recommendations
(1) Modeling language customizations	Introduce and compare a variety of modeling approaches for business models. Reflect on the capability of available approaches to contribute to sustainability (e.g., customizations). Encourage the adaptation and extension of existing and development of novel modeling approaches to account for sustainability aspects.
(2) Collaborative modeling	Provide the students with a structure, environment, and discussion culture to communicate and debate different perspectives, experiences, and beliefs. Conduct exercises in small groups. Implement team building exercises, peer feedback, and conversational rules.
(3) Real use cases	Introduce real-life problems early on, for instance, by inviting external organizations and industry partners to report on their business models. Enable students to apply methods, (software) tools, and best practices to real cases (e.g., from industry partner).
(4) Interdisciplinary groups	Identify and close gaps in fundamental knowledge and skills required in the early stages of the course. Provide introductory lectures or additional tutorials.

Table 2: Summary of Observations and Preliminary Recommendations

the course's prerequisites was perceived as rather high) or miss the link between the factual and methodic knowledge (e.g., "*with an isolation [of the modeling languages] from the model content, it becomes clear that the goal is not to develop an innovative business model, but to use the methods and discuss why we did what*"). Closing gaps in basic skills required for the course through introductory sessions (see Sessions 1–4) therefore is necessary. Modeling languages should be chosen considering common languages, suitability for the context, and with the group composition in mind. They need to be introduced in appropriate detail.

Discussion and Conclusion

In this article, we have reported on a teaching approach that builds upon experiential learning and takes into account the modeling aspect of business models in particular. Thereby, we aimed at empowering students to reflect on sustainability in business models (i.e., factual knowledge) as well as on the modeling languages themselves (i.e., methodic knowledge). We complement available courses, both with and without emphasis on sustainability (e.g., Bitetti, 2019; Karlusch *et al.*, 2018; Szopinski, 2019), by primarily applying a modeling lens on business models.

Although our insights are anchored in a specific field of application, namely a master-level university course taught face-to-face in a classroom, we believe that the course design is applicable also to other settings, which we will justify in the following. First, the course primarily targets Information Systems students who usually are already experienced in the use of modeling languages (e.g., for business processes). However, since the course is part of a university-wide certificate–*Education and Sustainability*–we also gained experience with teaching students from other programs such as Environmental Preservation and Organizational Pedagogy. We argue that our course design sufficiently takes interdisciplinary groups into account by closing knowledge gaps and selecting modeling approaches that are easy to comprehend even without previous experience, and thus is transferable to other group compositions in higher education. Second, the course is geared towards master-level students who are usually practiced with critical reflection and analysis. Nevertheless, we believe that by focusing on factual knowledge and case study modeling (e.g., modeling and analyzing multiple case studies) and/or adding guided tutorial sessions, the course could also be adapted towards the needs of bachelor-level students. Third, our course is not necessarily restricted to an in-classroom setting. Due to the existence of supporting software tools (see Szopinski *et al.*, 2019) which allow for spatially and temporally independent modeling, our course can also be applied in a hybrid or entirely virtual setting. Finally, the group size in the past fluctuated between 22 and 46 participants, which is comparable to other courses at this university. In line with large-scale courses with a similar theme (e.g., Szopinski, 2019), we believe that the course can be scaled up and down without any or with only slight adaptions to the design (e.g., a different exam setting or using peer feedback). However, the group size must allow for collaborative work in small groups (e.g., 3-6 students), and scaling up can lead to an increased workload for academic staff.

Even though we present a promising teaching approach, our study is not free of limitations. The selection of modeling languages applied within our course was based on individual decisions, and thus has restrictions. Furthermore, due to the time limitation of our course, further research is demanded that, for example, explores whether the course addresses the *value-action gap* (Kollmuss and Agyeman, 2002), or how specific tools, didactic methods, or content covered relate to theories such as *self-efficacy* (i.e., the expectation of a person that they are able to successfully perform an action; Bandura, 1977).

Overall, this article describes the design of a particularly modeling-driven course on analyzing sustainability in existing models, as well as developing more sustainable ones. Thereby we aim at complementing the emerging landscape of courses on business models. We hope that by highlighting observations from evaluating one iteration of the course design (2019), discussing positive outcomes, challenges, and recommendations, and discussing transferability, our experiences will aid lecturers interested in developing or adapting courses of their own.

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