Teaching Case Study

Growing into the Future – Furniture that Evolves through Childhood

Redesigning for Adaptability: A Circular Design Approach to Multifunctionality and Extended Use

Proposal Sheet

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Content

Abbreviations

TCS	Teaching Case Study

1 General Information

Activity Sector	Product development, multifunctionality, adaptability		
Keywords	Redesign, Life Cycle Assessment (LCA); Circular Economy (CE); Impact assessment; R-strategies		
Author(s) / Institution / Country	Christina Koch Pedersen, UCN, Aalborg (Denmark) Bent Rosenkilde, UCN, Aalborg (Denmark)		
Public	Initial and alternative education ☐ Beginners ☒ Intermediaries ☐ Experts	Continuing education ☐ Beginners ☒ Intermediaries ☐ Experts	
Domain(s)	☐ CSR ☐ Economics ☒ Entrepreneurship ☐ Finance ☐ HRM ☐ Information Systems ☐ Law ☐ Marketing ☐ Political Sciences ☒ Strategy ☐ Supply chain & logistics	☒ Arts, Architecture, Design, Ergonomics ☐ Education Sciences ☐ Geography & Urban Planning ☐ Information & Communication Sciences ☐ Literature & Language Sciences ☐ Medical Sciences ☐ Physical Activities & Sport Sciences ☐ Psychology, Sociology, Philosophy, Demography	☐ Biology & Neurosciences ☐ Chemistry, Biochemistry ☐ Earth & Universe Sciences ☐ Electrical, Electronics ☐ Energetics ☐ Mathematics & Computer Science ☐ Mechanical Engineering ☐ Physics ☒ Processes
UN SDG	☒ 9 Industry, Innovation, and Infrastructure ☒ 12 Responsible consumption and production ☒ 13 Climate Action		
Place in the Circular Economy Model	☒ Raw materials ☒ Sustainable design ☒ Production ☐ Distribution ☒ Consumption Reuse Repair ☐ Collection ☒ Waste management ☐ Residual waste		

2 Abstract

TinyTimber, a small Danish company that designs and manufactures wooden furniture for children, has been guided by a strong commitment to sustainability. Now, the company is ready to take the next step in that journey. They want to explore how their furniture can grow with the child, rather than be outgrown and how to extend the lifespan of their products.

To support this goal, a new product development project has been launched, focusing on redesigning one of their best-selling items. The goal is to reimagine it in a way that extends its lifespan, making it more adaptable, durable, and sustainable.

The students are part of this new development project team, redesigning the chosen product. The task is structured into four main steps:

1. Redesigning the chosen product. The redesign should explore how the product can grow with the child, thereby enhancing its circularity and reducing its overall environmental impact.
2. Analysing the environmental impact of both the original product and the proposed redesign. This includes conducting a Life Cycle Assessment (LCA) that focuses exclusively on Co2e.
3. Analyse and evaluate the level of circularity in the original design and the proposed redesign. This includes assessing the recyclability and recoverability of materials, as well as the potential for reuse, repair, refurbishment, remanufacturing, and repurposing of components or the product.
4. Summarising the knowledge, insights and key learnings in a report and presentation to the management.

3 Pedagogic goals & prerequisites

Considering the product and redesign perspective, the overall learning objectives within environmental sustainability for the case are as follows.

The students will be able to:

- Understand the principles of environmental sustainability and circular economy in the context of product lifecycle and product development.
- Apply circular design strategies to extend product lifespan and improve adaptability.
- Conduct a Life Cycle Assessment (LCA) to evaluate and compare the environmental impact of different design solutions.
- Analyse and assess product circularity, including reuse, repairability, and recyclability.
- Integrate sustainability considerations into product development processes and business models, ensuring technical feasibility and economic viability.
- Communicate design concepts, environmental analyses, and strategic recommendations effectively to stakeholders.

Moreover, the case supports a wide range of learning opportunities across fields such as product design, materials selection, manufacturing, supply chain, and business strategy. However, these learning potentials and objectives embedded in the Teaching Case Study are not formally described here. Hence, it is up to teachers to take advantage of these opportunities.

4 Sustainability Goals

This Teaching Case Study (TCS) focuses on two key aspects of environmental sustainability: environmental impact and circularity, with an emphasis on how these can be influenced through adaptive product design during the product development phase.

For environmental impact, the focus is on conducting a (simplified) Life Cycle Assessment (LCA), specifically measuring CO_2e emissions to compare the original product with the redesigned version. The case applies a simplified cradle-to-gate LCA, focusing on CO_2e emissions.

For circularity, the emphasis is on designing products that can adapt to changing user needs, thereby extending their lifespan and reducing resource consumption. This includes exploring modularity, repairability, and reuse, drawing from the principles of the Circular Economy (CE) and the R-strategies framework.

5 Case Description

Year of the problematic	2025	
Duration for students	Preparation: 2 hours Implementation: 3-4 days	
Languages	☒English	☐ Other: ……
Use case	☒ In class	☒ Examination TCS
Category	☐ C1: Case written in collaboration with a company which has given its consent for using its internal sources such as the company name, figures, photos, videos, and so on. Join the agreement sheet. ☐ C2: Case based on real company information and with the acceptance of the company to use its data, but names or figures (of company and persons) are modified to keep them confidential. Join the agreement sheet. ☐ C3: Case written using external public sources (annual report, websites, brochures, newspapers, …) where names or verbatims of the protagonists are used. Join the agreement sheet. ☐ C4: Case based on real company using public information without the agreement of the company (generally, the names (company and persons) are changed to anonymous ones. Impossibility to make the link between the TCS and the company. ☒ C5: Imaginary case based on teacher's experience who collected information from several companies in order to write a case study with a fictive integrative company. It can also be a compilation of different situations of several periods put together at the same time to form a pedagogic tool.	
Number of pages: Statement / Annex		5 / 5
Number of pages: Teachers' notes:		15
Diffusion licence		See cover page

6 Case Pack Components

6.1 General Documentation

Table 6.1: General TCS documents

Document name	Description	File name	# pages
Proposal Sheet	Teaching Case Study Description. This file can be published to inform potentially interested persons about the Teaching Case Study.	SCABEE TCS Design for Adaptability (2025) - Proposal Sheet.pdf	7

6.2 Student's Documentation

Table 6.2: Documents for students (to be shared when TCS is applied)

Document name	Description	File name	# pages
Case scenario	The document for students includes the mission and all necessary information.	SCABEE TCS Design for Adaptability (2025) - Base Scenario.pdf	15
3D models and technical drawing	Folder with Inventor models of the product and the components	3D models and technical drawings	22 files

6.3 Teacher's documentations

Table 6.3: Documents for teachers (not to be shared with students)

Document name	Description	File name	# pages
Teacher's note	The document is for teachers to guide the students through the Teaching Case Study (this file).	SCABEE TCS Design for Adaptability (2025) - Teacher's Note.pdf	15
Introduction to TCS	Presentation of the case	SCABEE TCS Design for Adaptability (2025) - Introduction to TCS.ppt	8