Facilitating sustainability in design education and practice

Projects:

Curriculum development
Sustainable Design Cards

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Design School Kolding, October 2017

Reporting of the project Facilitating sustainability in design education and practice. Curriculum development and Sustainable Design Cards.

Written by Karen Marie Hasling and Ulla Ræbild 2017, Design School Kolding, Kolding Denmark with financial support from Fonden for Entreprenørskab (The Danish Foundation for Entrepreneurship). Projects were executed from January to October 2017.

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Introduction

This report documents two development projects executed by Karen Marie Hasling and Ulla Ræbild at Design School Kolding from January to September 2017. The projects have been economically supported by Fonden for Entreprenørskab.

The overall objective of the two projects have to emphasize on and articulate approaches to sustainable design at Design School Kolding as a way to increasingly prepare students to work with approaches to sustainable design during their educational training and in their future professional lives as design practitioners.

The two projects have been:

- A pedagogical project concerning curriculum design and development in relation to sustainable approaches at Design School Kolding
- A methodical project concerning development of a deck of training cards with focus on approaches to sustainability targeting the institutions' students as well as smaller companies and organizations.

Background

Design School Kolding offers a number of traditional design disciplines such as Industrial, Fashion, Textiles, Accessories and Communication Design. Simultaneously, the school has three strategic focus areas: Sustainability, Play & Design and Social Inclusion. These focus areas lie across the disciplines and have developed organically within the different departments through individual initiatives and disciplinary interests. They are therefore in various degrees embedded in the teaching and more or less explicitly present in the course descriptions. This spring, Design School Kolding is in the process of developing a new master course based on the three strategic focus areas. In order to secure the right content and progression, the institution needs to create an overview of current activities in the educational program.

Sustainability

In our work with sustainability, we lean on a number of selected texts that account for and define the concept in relation to design in terms of scope and context (e.g. Ceschin and Gaziulusoy, 2016; Hasling, 2016) and to design practice and methodology (e.g. Keitsch, 2015; Manzini, 2015). More specifically, we draw on a sustainability competence framework (Wiek et al., 2011) that has been developed through an extensive review of sustainability teaching, learning and curriculum building practices across educational sectors.

Furthermore, for the methodical project that looks more in-depth with ways to operationalize and work with sustainability, inspiration has been found in works and anthologies by scholars such as Fletcher (Fletcher, 2016; Fletcher and Tham, 2015), and Chapman (Chapman, 2017, 2005).

Curriculum development in sustainable designe education

At Design School Kolding, working with sustainability is in various degrees embedded in the teaching and more or less explicitly present in the course descriptions. This spring, the institution is in the process of developing a new master course based on the three strategic focus areas. In order to secure the right content and progression, the institution needs to create an overview of current activities in the educational program. To do this, a 'competence matrix' (Worsaae, 2010) has been used as a tool for curriculum development (Christiansen et al., 2015) for the sustainability subject area at Design School Kolding's bachelor (BA) and master (MA) programs.

Objective

Sustainability intersects the traditional design disciplines, and accordingly has fallen between the established areas of responsibility. The lack of overview regarding sustainability teaching activities fosters certain challenges in terms of planning and communication, both internally and externally, which affects management, teachers and students.

In the project, we have worked with the following problem statement:

How do we make visible and further develop the subject area of sustainability in Design School Kolding's curriculum?

Background and development

Educational structure

The educational structure at Design School Kolding is a combination of various models. The BA-level is part disciplinary and integrative (Harden, 2013: 23) as each discipline requires specific learning, and part modular for the interdisciplinary courses (Ibid.: 25). Both are set in a spiral structure, whereby students meet subject areas several times during the education, each time at a higher level (Cita Nørgaard, 2016). The master program has until now followed the same combined form as the BA, but will from this year undergo a change to a strict modular format, in order to support a shift from a disciplinary product and problem solving focus, to an experiential and social critical focus based in the three strategic areas (O'Neill, 2015) with a high level of combinatory flexibility.

Bloom's Taxonomy

Design School Kolding uses Bloom's taxonomy of learning, combining the original (Bloom et al., 1956) and the revised version (Anderson et al., 2000; Krathwohl, 2002) to clarify learning goals and objectives in the curriculum (Hasling, 2015).

Thereby the 6 levels: Remember, Understand, Apply, Analyse, Evaluate and Create are applied in the course descriptions to specify levels of intended learning outcomes within the three qualification areas Knowledge, Skills and Competences (Christiansen et al., 2015).

Competence matrix

According to Worsaae, the purpose of the matrix is 'to visualize the contribution by the individual courses to the competence objectives (intended leaning outcomes) of the education as well as to visualize coherence among the courses' (Worsaae, 2010: 184). The format thus seems appropriate for our objectives, as it can be a tool for synthesizing a complex of elements (disciplines, courses, semesters, progression, competences), and for communicating the content visually to others.

We use Blooms' taxonomy and the competence matrix as a frame for curriculum development.

Part processes of data collection

In order to create data on current activities we needed to identify courses, teaching activities and learning outcomes (academic year 2016/17) that relate to the subject of sustainability. This work was conducted by reading through all of the existing course descriptions for the entire (current) education, while screening for content that corresponds to sustainability definitions.

Part process 1

In order to understand the many activities in relation to sustainability definitions and competence models (DeKay, 2011; Fleming, 2014; Wiek et al., 2011) we needed to understand data through visual mappings by use of large scale curriculum representations and colour coding (Everitt et al., 2010).

Part process 2

In order to obtain both input and feedback, we needed to create data through interviews, dialogue meetings and evaluation (Crouch and Pearce, 2012; Kvale and Brinkman, 2009; Steensig, 2010) with teaching colleagues who emphasize sustainability in their teaching as well as with department heads and representatives from management.

How we are evaluating the outcome

As described, the outcome has been evaluated by colleagues during the project process and in a final presentation of project. It is our intention to further evaluate to relevant fora such as the study board and the disciplinary committees.

Mapping explicit and implicit articulations

In mapping 1, explicit and implicit aspects of sustainability were first identified in the curriculum based on reading through course descriptions after which courses were categorised by colour. See figure 1.

Findings and consequence for the further investigation

- There were surprisingly few course descriptions that contained explicit

Figure 1.

Overview of identified explicit and implicit articulations of sustainability according to the course descriptions.

content, and the few explicit courses where all situated in the Fashion and Textile curriculum

- On the other hand, there were an extensive number of courses with sustainability potential
- There were no new explicit activities in the MA (external students can join the BA sustainability courses).

We needed to find out more about how the beacons (fagledere) view sustainability, since it is so little present in the course descriptions (Fashion and Textile apart). Is it a conscience decision, lack of knowledge or simply a tradition for using other terminology and conceptual framing of responsible approaches to design than sustainability?

The fact that many courses showed a potential to include sustainability aspects lead us to investigate general competences of sustainable education – to form an understanding of possible types.

We decided to focus on the BA level in our investigation and competence matrix development, and use it as base for the bigger curriculum development, including the new MA.

Mapping Wiek et al.'s 5 key competences of sustainability education

In mapping 2 we find inspiration in a study identifying 5 key competences of sustainability education (Wiek et al., 2011). The authors of the large-scale review claims that it 'synthesizes the substantive contributions in a coherent framework of sustainability research and problem-solving competence' (ibid.: 203). We apply this framework in order to identify and contextualize sustainable competences in the design curriculum with the aid of Wiek et al.'s competence definitions (ibid.:207-211):

- *Systems thinking competences (green)*
- *Anticipatory competences (yellow)*
- *Normative competences (blue)*
- *Strategic competences (white)*
- *Interpersonal competences (orange)*

A small overview is seen in figure 2 on the next page.

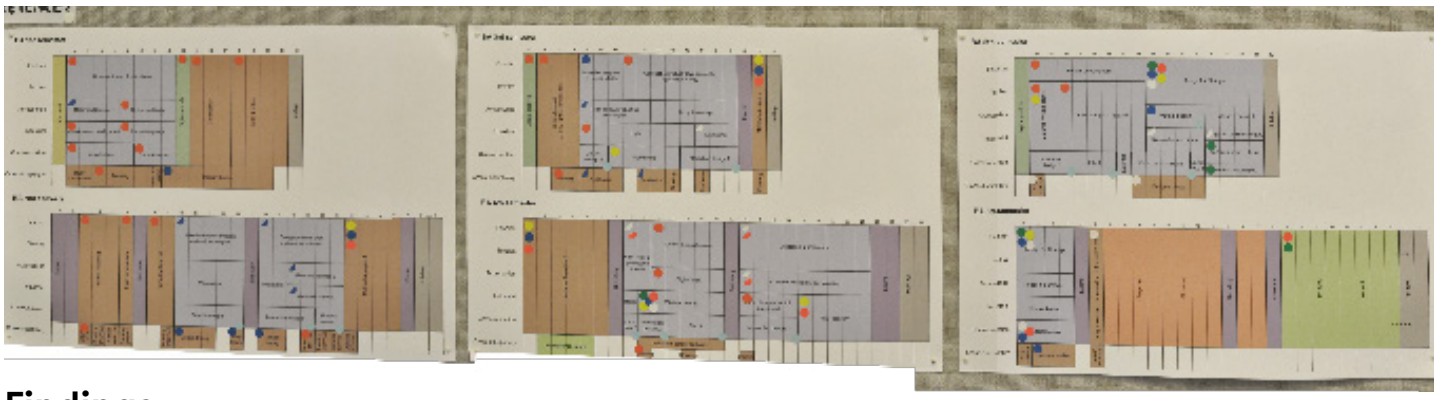


Figure 2.

Overview of identified competences in the curriculum according to Wiek et al. (2011).

Findings

The assessment of the curriculum through the lens of Wiek et al.'s competence definitions, shed new light on the current activities in a number of ways:

- The analysis showed that Wiek et al.'s competences to a great extend are addressed in the interdisciplinary - and in some respects the foundational curriculum. Thus, the competences are already developed, but not described or communicated in terms of sustainability.
- We found that Wiek et al.'s competences surfaced in the existing curriculum as progressive, i.e. some were more present in the early semesters, others more present in the later semesters.
- The mapping showed that courses can address several competences at simultaneously. i.e. to some extend they can be difficult to separate in practice.

Feedback from other stakeholders

At this point in the process, we held a number of meetings with various stakeholders, in order to present part findings and gain feedback. We held individual sessions with some of the department heads (disciplinary level), with the Head of the sustainability lab (developmental level), with a teacher working with sustainability in his courses (teacher level) and with the Head of education (management level).

Findings

- We got confirmation that no-one had any overview of the current activities in the education in relation to sustainability
- The implicit/explicit mapping of current activities, functioned well as a dialogue tool with all stakeholders and caused reflections on how to improve the curriculum in terms of content and progression.
- Contrary to hear say, there seemed to be no objections to the subject of sustainability within the particular disciplines (those we spoke to). Rather, a desire to strengthen the topic, and a wish to discuss how to do so. As example, communication design expressed a wish to heighten the students' awareness of material usage and CSR early in the education.
- The mapping of competences, as described by Wiek et al., needed more explanation on our part, in order to be understood by the stakeholders. It is therefore important to further clarify and address critically, how the competences should be translated and understood specifically in a design

context

- There is a constant worry in the disciplinary faculty, that evermore new 'stuff' takes over valuable time in what is considered the core disciplinary curriculum. Therefore, the main point of the mapping i.e. that the current cross-disciplinary design curriculum also builds fundamental competences within sustainability, was positively received.

Developing a synthesis matrix

To aid the understanding of the data, we have made a different process tool in form of a matrix. At this stage, the matrix contains on one side (lifted from Wiek et al.) sustainability competence concepts, methodologies and sources for the five types of competences. On the other side of the table, we have placed the current courses in the curriculum at Design School Kolding according to the mapping. An overview of the mapping can be found in appendix 5.

This process has enabled us to look further into the connections and possible digressions between curriculum terminology and design concepts and Wiek et al.'s proposals. In our further work the matrix will be expanded further to include:

- Current courses conducted at Design School Kolding.
- Concepts from design research (and exemplary references).
- Foundational and exemplary literature that relate to each of the concepts.
- Links to sustainability card categories, a collection of sustainability training cards recently developed by the authors to support integration of approached to sustainable design in design education – for more information, see www.sustainabledesigncards.dk.

Findings

The types of competences in the respective categories can in relation to design differ from the general competences, as advised by Wiek et al. For example, we have placed aesthetic theory in the normative competence category, whereas Wiek et al. do not mention aesthetics at all.

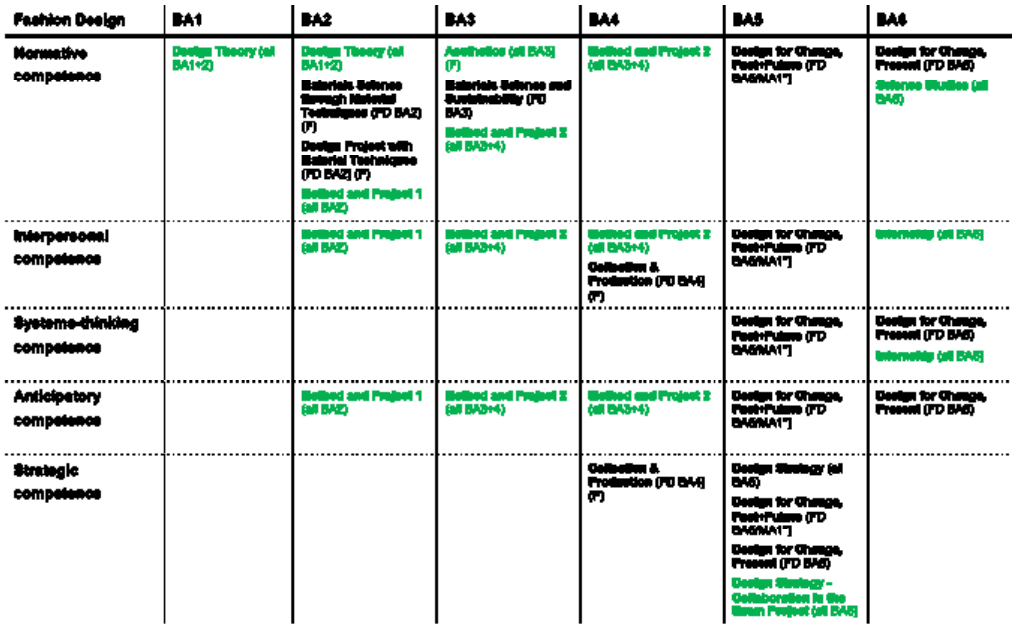
There are a number of alike terms employed in the course descriptions, that seems to refer to related design practice concepts, but can be difficult to differentiate between, e.g. design fiction, design futures, future design, future scenarios.

Building the competence matrix

Due to the multifaceted content of the intermediate stages, the products of this report have different characteristics.

The first product is related to the progression of the curriculum with respect to Wiek et al.'s five competences and the development of an overall competence matrix. After having identified which courses that relate to each of the five competences, for each discipline (i.e. fashion, textiles etc.) a diagrammatic overview was made, where courses were placed in the semester they are taught in and within the competences they had been identified to relate to. In figure 3 an overview of the

sustainability related courses for the fashion design BA program is shown. Here the courses in black are discipline specific and the course in green are cross-disciplinary courses.



Fashion Design	BA1	BA2	BA3	BA4	BA5	BA6
Normative competence	Design Theory (el BA1+2)	Design Theory (el BA1+2) Materials Science through Material Technologies (FD BA2) (F) Design Project with Material Technigues (FD BA2) (F) Skilled and Project 1 (all BA2)	Aesthetics (all BA3) (F) Materials Science and Sustainability (FD BA3) Skilled and Project 2 (all BA3+4)	Skilled and Project 2 (all BA3+4)	Design for Change, Fest+Future (FD BA5/MA1*)	Design for Change, Present (FD BA6) Science Studies (all BA6)
Interpersonal competence		Skilled and Project 1 (all BA2)	Skilled and Project 2 (all BA3+4)	Skilled and Project 2 (all BA3+4) Collection & Production (FD BA4) (F)	Design for Change, Fest+Future (FD BA5/MA1*)	Internship (all BA6)
Systems-thinking competence					Design for Change, Fest+Future (FD BA5/MA1*)	Design for Change, Present (FD BA6) Internship (all BA6)
Anticipatory competence		Skilled and Project 1 (all BA2)	Skilled and Project 2 (all BA3+4)	Skilled and Project 2 (all BA3+4)	Design for Change, Fest+Future (FD BA5/MA1*)	Design for Change, Present (FD BA6)
Strategic competence				Collection & Production (FD BA4) (F)	Design Strategy (el BA5) Design for Change, Fest+Future (FD BA5/MA1*) Design for Change, Present (FD BA6) Design Strategy - Collaboration in the Green Project (all BA5)	

Figure 3.

Courses with applied sustainability approaches mapped for BA fashion.

In Wiek et al.'s introduction and discussion, the five competences do not seem to be hierarchically ordered. However, as we interpret the competences and based on our experience with working with aspects within the competences, they can be hierarchically ordered in accordance to a progression in the cognitive understanding of the respective competences. Consequently, in the following, we work with an order of the competences being:

Normative – Interpersonal – Systems-thinking – Anticipatory – Strategic

When doing so, in the mapping of the disciplinary curriculum for fashion design above, it appears that the current curriculum already follow a certain pattern when it comes to the order of courses. Based on this, we will propose an elaborate focus on one competence per semester as it is illustrated in figure 4. This is in line with the above-proposed hierarchical progression of the five competences and would mean that each semester in the five first semester of the BA would introduce a new competence. As the competences overlap and in different ways influence each other, it should not be understood as allowing students to only work with one competence at a time, but to promote course activities and topics that can activate different competences at different times.

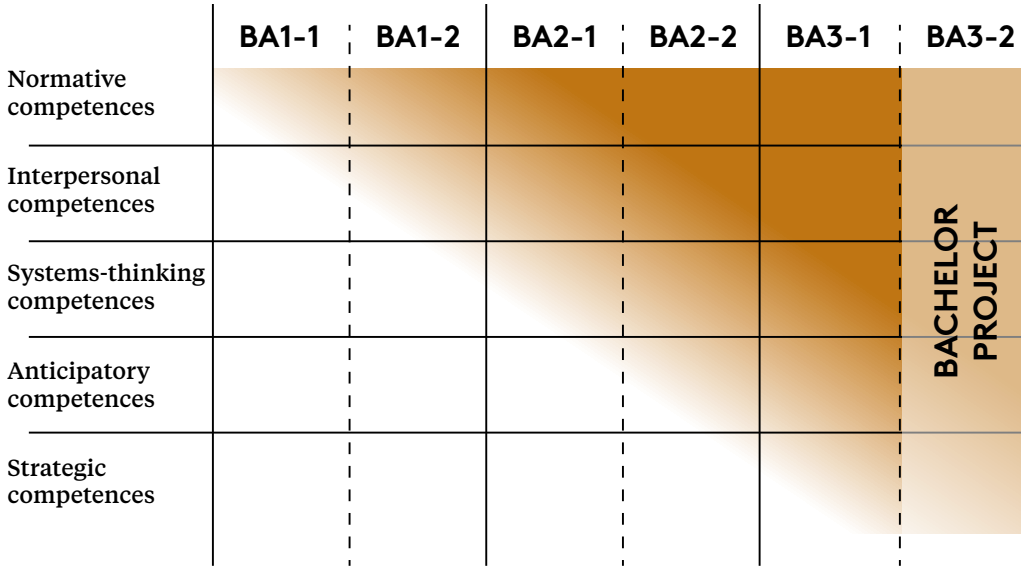
The sixth semester, when students are having their internships and they make their BA graduate projects, they have, in different detail, worked with all five competences and will be able to integrate it into their projects.

Final Product

This taxonomy of competences can further be translated into a guiding competence matrix to increasingly integrate sustainable aspects in the curriculum. This competence matrix is shown in figure 7.

Figure 4.

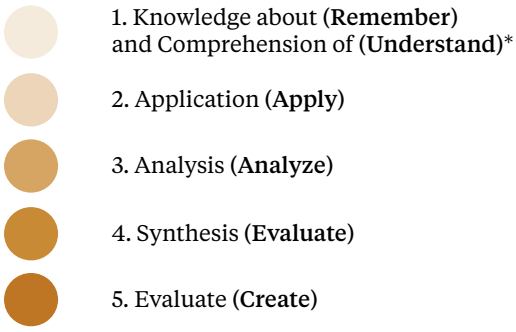
Color-coded guiding competence matrix.



In the competence matrix, the colours relate to a cognitive level in accordance with Bloom's taxonomy:

Figure 5.

Colour codes for the competence matrix in relation to Bloom's taxonomy.



Bold = terms applied in course descriptions
*we combine the first to levels, as they are often connected in the course descriptions

The matrix depicts how the competences are developed through the BA program, reaching in to the MA, in the sense, that the competences are further developed and almost all reach the highest level on Blooms taxonomy during the MA education.

We are aware, that the next step in the matrix work, is to describe the exact level of expected competence within each of the matrix' boxes. Yet, this work requires an attentive and sensitive translation of Wiek et al.'s five competence definitions (and/or sorting of appertaining concepts and methodologies) to a design context, in a manner that accommodates all disciplines. Therefore, the translation process must involve people that can supplement our own backgrounds, and that is a process that lies outside the scope of present developmental project.

Discussion and recommendations

It was evident that there is overall support to further strengthen focus on sustainability in the curriculum, but this is challenged by different perceptions and knowledge on, what sustainability is and how it can be integrated in different levels. It is further challenged by the fact that disciplines apply different structure and the degree in which students across disciplines are working with sustainable aspects are therefore not synchronized and coherent.

Design School Kolding uses Bloom's taxonomy to define learning goals and consequently, we have aligned a proposed guiding matrix to this and linking it to Wiek et al.'s five competences. Based on our experience with working with sustainability, we understand these five competences as hierarchical and in our mapping of the current curriculum it was evident that the course structure somewhat follow this progression (see figure 5 and appendix 6). Nevertheless, we also argue that this progression can become clearer by emphasizing one competence per semester, as this can ease the ability to define and position course content and learning goals.

We believe that a competence matrix can support communication in relation to curriculum between relevant actors, as it can be regarded as a tool to communicate shared intentions and goals. This is relevant not only internally between department heads and permanent staff, but also for the great number of external staff, i.e. professional practitioners hired in to take part of courses.

However, we are also aware that not all courses are and should be directly related to sustainable thinking and that some of the competences students acquire are relevant to design practice in general as well as to the school's other focus areas.

We further believe that a competence matrix can strengthen the communication regarding a sustainability curriculum for future teaching activities. Mapping 1 identifying implicit and explicit approaches to sustainability in course descriptions, showed that there are many 'low-hanging fruits' and that it's possible to strengthen focus on sustainability in a course without having to change the entire structure and content of the course. Therefore, it is proposed to explicate these aspects in the course descriptions and a competence matrix that elucidates cognitive competence (according to Bloom's taxonomy) and sustainability competences (according to Wiek et al.' five competences) can be regarded as a tool for this.

The competence matrix has in this project emerged as a format that seems able to engage the many levels and disciplinary backgrounds contained in the education. Our experience is, that the competence matrix is perceived by the many types of stakeholders (management, researchers, developers and practitioners) as a neutral ground, from which dialogue can set out, and thus aid the overcoming of perhaps otherwise immediate responses, in terms of resistance or reluctance to align. We therefor see the competence matrix as a good tool for further curriculum development at Design School Kolding, embracing other subjects e.g. the other strategic areas of Play and Social Inclusion.

Moreover, we have reflected upon how the competence matrix might work well as a way to formulate a literature curriculum, in terms of semester based textbooks, which could make it easier for external and internal teachers to familiarise themselves with applied approaches and theory.

Lastly, the process of developing the matrix i.e. the extensive mapping of current activities and the synthesis of data, has shown us, that the matrix not only functions as a container of information, but also as a way to develop new knowledge. This insight holds potential in terms of grounding further initiatives in relation to knowledge building within sustainability and design and company practices.

Further work and prospects

In order to support knowledge-building in education and industry as well as building bridges, we can see great potential in the following:

- Exploring sustainable practices in selected companies of various sizes in order to understand and exemplify for teaching purposes.
- Building relations for long time dialogue with companies for knowledge-sharing and -creation.Sustainable Design Cards.

Sustainable Design Cards

In educational design research, it is agreed upon that in novel and non-routine situations and where experimentation is necessary to gain a level of theoretical or practical experience (e.g. Basadur, 2005; Daalhuizen, 2014), method cards have shown to help making things concrete and outline relevant topics (Friis and Gelting, 2014, 2016) and that 'Game pieces' can speed up the process and create common ground when working in teams (Hornecker, 2014).

Consequently, training cards can be used as a way:

- to inspire.
- to mediate knowledge and values in multidisciplinary teams.
- to reflect and create analytical awareness.

Background and development

The deck of cards is a further development of a deck of cards with focus on Design for Longevity developed in collaboration with Kopenhagen Fur in the fall 2016. These cards were generally positively received and experience with using the cards, in Design School Kolding and among Kopenhagen Fur's collaborators were good. Nevertheless, to target a broader spectrum of design education and profession, it was in our interest to re-think the deck of cards to target product design in general and to all five lines of study at Design School Kolding.

This was done by:

- re-thinking the components of the cards
- re-assessing the content on all cards with respects e.g. examples and literature references
- re-considering if some cards should be removed or added
- mapping which cards that related specifically to each line of study to ensure an equal distribution

In the new version, the deck of cards contains:

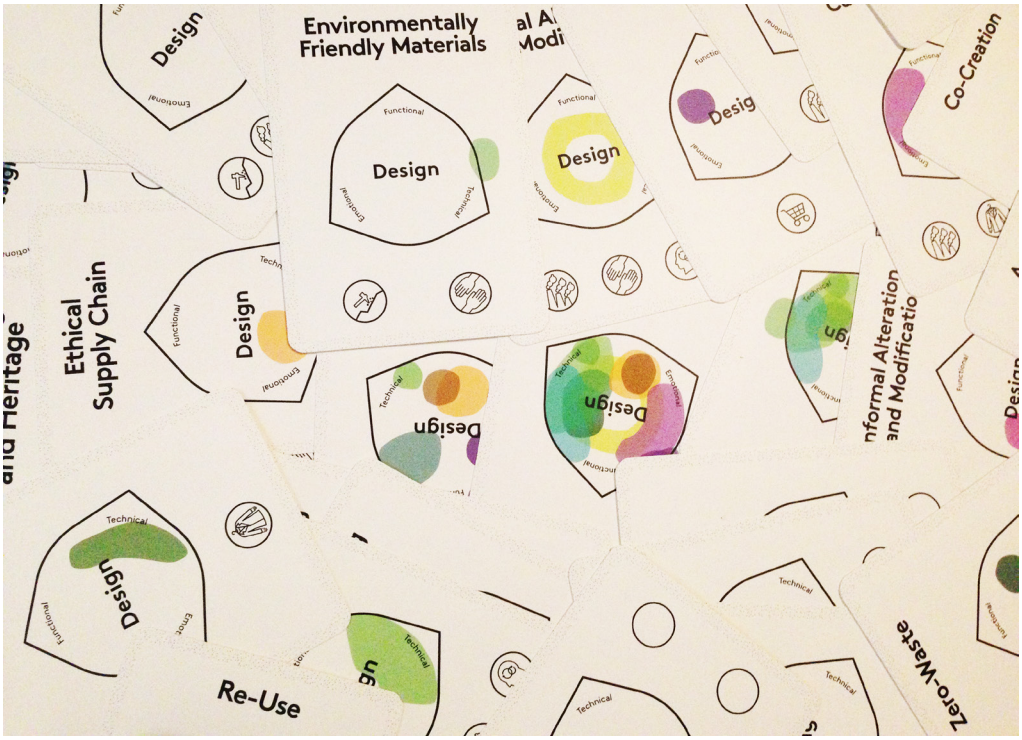
- 29 approach cards
- 4 empty approach cards
- 6 category cards
- an information pamphlet

Cards

The cards have been printed on 400 gr. FSC certified paper in A6 format (105mm x 148mm) with rounded edges. This size was chosen to ensure cards that were big enough for detailed information to be read and small enough to have in your hands.

Figure 7.

The printed cards



The physical cards can be seen above in figure 7.

Each card contain a graphics and navigation side and an information side:

Graphics and navigation

On the graphics side of the card, you will find different ways to position the card approach based on a sustainable design compass and six categories.

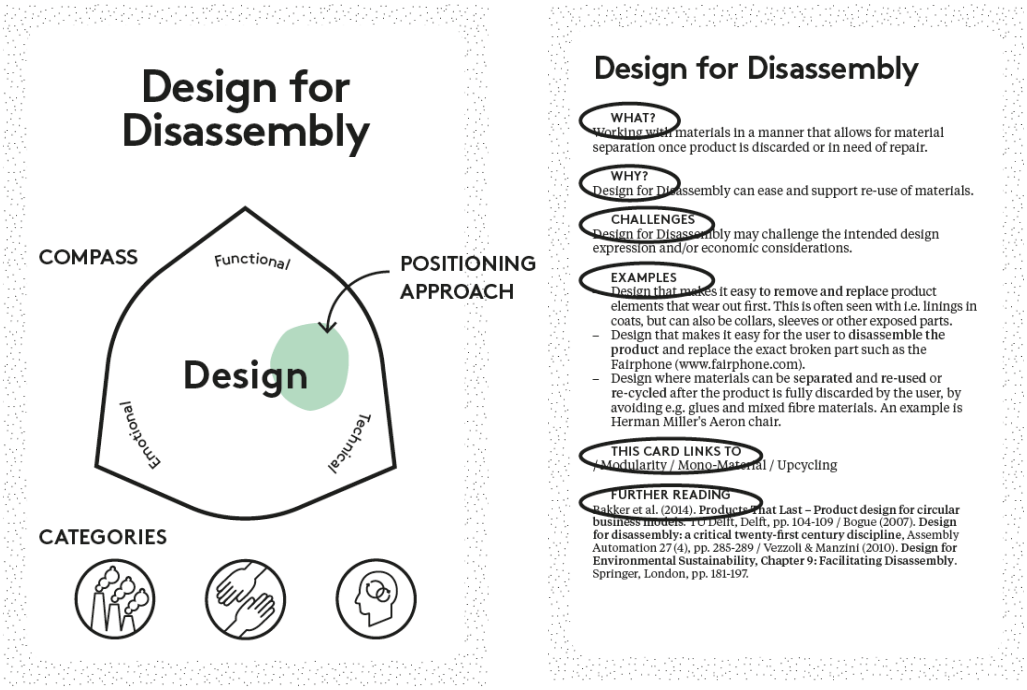
What, why, how & where

On the fact side of the card, you will find information on how to use the individual approach, including possible challenges, examples, links to other cards and further readings.

In figure 8 an example of a card (Design for Disassembly) has been included:

Figure 8.

Example of a card – Design for Disassembly



Webpage

To make the deck of cards more accessible, as a supplement a digital platform has been developed. This is called: www.sustainabledesigncards.dk. A screenshot of the platform entry page is included below in figure 9.

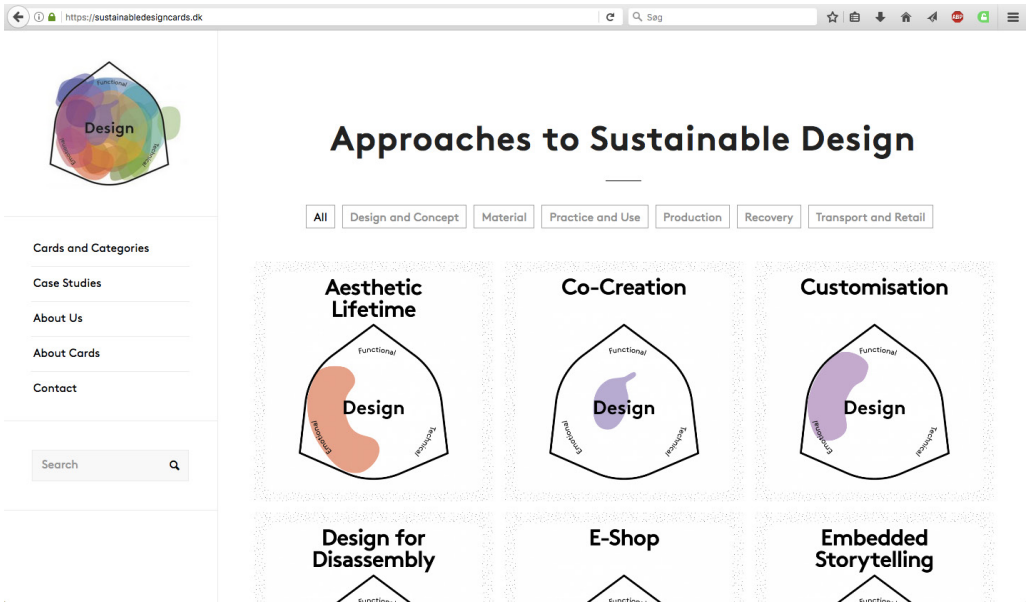


Figure 9.

Screenshot of the entry page for the digital platform.

A digital platform has some advantages compared to physical cards:

On content and maintenance

- It is possible to continuously update existing cards, e.g. with new examples and literature references.
- It is possible to add new cards
- Information is not restricted to fitting into a specific physical format, which makes it possible to provide more in-depth information. This especially accounts for background of the cards and how they can be used.
- It is possible to include a section with focus on companies that work across different approaches. This can give an understanding of how companies can work in different directions at the same time having an overall agenda.
- It is possible to include a section on how students have worked with the cards in different educational settings.

On navigation and accessibility

- Hyperlinks make it easy to navigate between different cards and categories.
- Students can download digital copies of approaches to be used on mood-boards, process outlines etc.
- The platform can be accessed everywhere
- On the platform, it is possible to download individual cards as well as the entire collection as PDFs.

Experience

The cards and the digital platform were officially launched on September 27 2017 with an information event at Design School Kolding. Unfortunately, few people made it to the event.

In figure 10 Below, two examples of groups of students using the cards have been included. In the above example, they work with Co-Creation, Embedded Story-telling, Aesthetic Lifetime, Mono-Material and Up-Cycling. In the below example, they work with Labelling, Information and Product History.

Figure 10.

Two examples of students using the cards.

In the same week, decks of cards were given to 25 third year fashion and textiles students to be used and tested in the course Design for Change and we can now start to see, how the cards are used by different students. Below there are some examples of very preliminary uses of the cards.

In the first month after the cards were launched, they have been presented, distributed and have been used for workshops on sustainable fashion at events at Aalto University, Department of Design in Helsinki, at Parsons The New School for Design in New York and in a conference on luxury fashion in Kuwait.

Simultaneously, publicity for the digital platform was made on one of the author's and the school's social media accounts. Consequently, within the first days, on Facebook, the platform reached out to and were commented on by researchers and professionals within areas such as sustainability, design, methods etc. in countries such as Sweden, Finland, Germany, Netherlands, Belgium, Great Britain, Spain, The United States and Canada, which are some of the communities the platform is specifically targeting. The platform is linked to Google Analytics and here we can see that the platform was visited by:

- September 26 2017: 65 users
- September 27 2017: 107 users
- September 28 2017: 26 users

Since it was launched, it has been visited by 280 users, which means that interest has increased but that it is still actively in use. This tendency was expected, but we hope that with students being accustomed to using the cards and distributing/selling cards to other interested actors, the platform will become a place people go to, if they do not have immediate access to the physical deck of cards.

Further work and prospects

As the deck of cards was recently introduced to students, it is still necessary to observe and discuss, how they are used in projects and how and if they influence students' way of working in the long run. Examples of projects, as the ones included in figure 9, will become availble on the platform as inspiration for others.

There also still need to be included more company-based case studies on the digital platform. The case studies serve to demonstrate, how companies in different ways can work with sustainability. These will be added continuously.

Prospects

Even though the information on the cards has been restricted to the physical card format, for students that work with sustainability for the first time, it might be relevant to develop an even simpler alternative. This is based on experiences with using other decks of cards in teaching. Such a deck of cards could benefit from leaving out most components and for example only provide pictograms for each approach as ways for students to create correlations.

Conclusion

In the projects we have identified current activities relating to teaching in sustainable practices at Design School Kolding and we have proposed a way to structure and develop ways of working with sustainability in the institution's curriculum. We believe that this is uncomplicated to implement as it in many aspects reflects the already existing practice; however, it would make it more clear and visible.

If you are interested in reading more about sustainability in relation to curriculum development, we recommend you to read the following report:

- Hasling, K.M., Ræbild, U., 2017. **Exploring the Competence Matrix - as a tool for curriculum development and communication within the subject of sustainability in design education** (Development project, teachers training). Design School Kolding, Kolding, Denmark.

The Sustainable Design Cards, the deck of training cards developed can be used for design and communicative purpose in design education, among design practitioners as well as in small and big companies and organizations as a way to unfold and frame ways to work with sustainability.

If you are interested in reading more about the development of the Sustainable Design Cards, we suggest you to rea the follow conference paper:

- Hasling, K.M., Ræbild, U., 2017. **Sustainability Cards: Design for Longevity**, in: Proceedings of PLATE 2017 – Product Lifetimes and the Environment. Presented at the PLATE 2017 – Product Lifetimes and the Environment, Delft, the Netherlands.

And if you want to look more into the deck of cards, we suggest that you go to:

- **www.sustainabledesigncards.dk**

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