

# Nourishing the design ability through food

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**Abstract:** Designing and cooking highly relate on creativity, but whereas design has inspired culinary education, no explorations were found on how the use of food could inspire design education. In this paper we describe three learning activities in our industrial design curriculum that incorporate different ways of using food for design education and we present student's reflections on these exercises. Food enables a hands-on design approach as it gives immediate feedback on its quality through the act of eating. Secondly, we discuss how students develop social and cultural awareness, by understanding the influence of their own personal ideas and background, explicitly coming forward in food-related co-design. Furthermore, the context of food, offers a very simple and effective tool to explore various user-centered methods in a relatively short time. Finally, food design enables students to go through a myriad of design iterations, which facilitates their understanding of the design process. Therefore, we argue that food is an excellent means to nourish the design ability of students.

**Key words:** *design education, food, bodily understanding, design understanding, complexity, transformation, socio-cultural awareness, form feeling, creativity*

## 1. Introduction

Over the past years there has been a growing interest in food design and designing for food in the design research community as apparent from the recently initiated conference in this field [21]. The processes of food preparation and the general practice of design have many aspects in common and in various projects the line between the role of a chef and that of a designer is fading [e.g. 4, 16]. The creativity present in both cooking and design becomes obvious when reading a quote by master chef Ferrán Adrià “*Last year we ran 4,000 tests and only about 300 of them panned out. Everyone learns from his or her mistakes - it's a necessary consequence of being creative. The important thing is to have lots of ideas simmering. Some of these ideas will work, and from these we build our new dishes.*” [6:267]. However, despite the mutual interest and influence, no explorations have been found into the use of food in the design curriculum.

In hospitality education, such as culinary arts, the integration of approaches from design education [14] or creativity techniques [7] is more common. Furthermore, competences required for both cooking and designing seem to show much communality. According to Hu [8] there are seven dimensions for innovative culinary competency (culture, aesthetics, technology, product, service, management and creativity) that make a successful chef. These dimensions are very similar to the competency areas that are involved in the process of designing as defined by Hummels, Vinke, Frens and Hu [9]. Hummels et al. [9] distinguish between meta-competency areas

and competency areas that are at the core of designing. As can be observed in table 1, the core competency areas can be clearly mapped to the seven dimensions as specified by Hu [8].

Table 1. Mapping of the core competency areas for designing Hummels et al. [9] and the seven dimensions of innovative culinary competence Hu [8].

Core competency areas for designing	Dimensions of innovative culinary competence
Integrating Technology	Technology
Ideas and Concepts	Creativity
Form and Senses	Aesthetics
User Focus and Perspective	Service
Social Cultural Awareness	Culture
Designing Business Processes	Management
Integration*	Product

\*The competency area Integration is not defined as such in the competency framework by Hummels et al. [9]. However, it combines the meta-competencies Teamwork and Communication and Design and Research Processes.

In this paper, we argue that design for and with food can be considered as a nutritious exercise for design students to understand complex issues in design in general. We will describe how we have started to experiment with the incorporation of food related design in our curriculum. Based upon student reflections on these exercises we will discuss how food supports their development as industrial designers.

### 1.1 The program of Industrial Design

The ambition of the Industrial Design (ID) program of TU Eindhoven is to educate designers of intelligent systems, products and related services that will transform society. It proposes a competency based learning model that requires students to be self-directed and continuous learners who reflect on their actions to become design practitioners [17]. Therefore, the curriculum offers a set of design projects, bachelor assignments and master modules that support the student in the development of ten competency areas (Self-Directed and Continuous Learning; Ideas and Concepts; Integrating Technology; User Focus and Perspective; Social Cultural Awareness; Designing Business Processes; Form and Senses; Descriptive and Mathematical Modeling; Teamwork and Communication; and Design and Research Processes). Students compose their semester by freely electing the learning activities that best match their intended development. At the end of each semester they are assessed holistically upon their overall competency of designing, identity and vision based upon a showcase portfolio that combines evidence from their work combined with reflections [9].

Currently, three learning activities are offered that relate to food. Firstly, a project that explores the future impact of ‘in-vitro meat’, in which design students are asked to explore how the user experience of this new product could be. Secondly, a bachelor course (assignment) in which students experiment with the material properties of dough to come to unexpected bread forms that afford novel ways of eating it. Finally, a master course (module) is offered that explores how different cultural perspectives impact the design process by letting different nationalities work on integrating cultures of eating [1]. Each learning activity contributes to the development of one or more competency areas.

Generally projects serve as an open opportunity to develop several competency areas and assignments and modules relate to one or a particular set of competency areas. However, in the discussed learning activities a strong emphasis is placed upon the development of Social Cultural Awareness, Ideas and Concepts and Form and Senses. Social Cultural Awareness focuses on the societal context of design. Awareness for this context is developed by exploring developments in society, both from a historical and cultural point of view. This context is used to evaluate the impact and mediating role of a system, product or service on society. Ideas and Concepts concerns developing visions, innovative ideas and concepts through creativity techniques, experimentations and the translation and interpretation of research results and theory. Form and Senses requires experiencing and developing through exploration and abstraction, investigating aesthetical (physical) languages that connect meaning and interactive form, in order to communicate specific properties of the design concept [9].

## **2. Food Design – Meat, the Expectations**

### **2.1 Motivation**

‘In-vitro meat’, or ‘cultured meat’, is a term used for animal tissue, grown from stem cells under controlled laboratory conditions. Whereas the technology was originally developed as a Bio Medical Technology for growing organs, such as cardiac valves for transplantation, some researchers recognized the opportunity to use the same technology to grow animal tissue for consumption [12]. Important reasons to investigate this technology as an alternative for meat produced in bio-industry are a changing public opinion on animal health in the bio-industry in Western countries. In addition, ‘in-vitro meat’ also offers opportunities to deal with the environmental impact of the continuously growing global meat consumption. The technology of growing ‘in-vitro meat’ may be considered as an emerging technology. The first hamburger made from ‘in-vitro meat’ is expected soon [2], although commercial production may require another 10 to 20 years.

### **2.2 Project**

To develop the competency area Social and Cultural Awareness, students need to explore the ethical implications of emerging technologies such as ‘in-vitro meat’. ‘Food Design – Meat the Expectations’, is one of the various projects offered within the department of ID that allows students to develop this competency area. The subject challenges students to question their own values and beliefs, as well as that of others. It intends to stimulate students to reflect on emerging technologies and their impact on society.

Students at all levels of the program ranging from groups in the Bachelor program to individuals in the Master program can participate in the project. For the project students develop design proposals for ‘in-vitro meat’ within a 13-week period. In addition to Social and Cultural Awareness, students can also develop the sensorial qualities of food, relating to Form and Senses and the commercial aspects of food, relating to the Design and Business Processes. To develop their own vision, students are allowed to define their own design brief.

After a kick-off with a morning meeting where all students share their breakfast, students take control of their own design process. Design coaches guide this process on a weekly basis, with 2 larger cross-coaching sessions during a semester. During these cross-coaching sessions groups of 8-12 students present their work and receive feedback from fellow students, as well as from the design coaches. In addition to the design coaches, students are challenged to consult experts within the field, ranging from butchers to professors on molecular biology. Researchers from Wageningen University and Research Center as well as Bio Medical Engineering of the

University of Technology Eindhoven are connected to the project and consulted on a regular basis. At the end of the semester students present their design proposal during an open group exhibition and document their findings, process and decisions in a report.

### **3. Training the Creative Body through Bread Choreography**

#### **3.1 Motivation**

Today's society is highly focused on cognition and a lack of embodiment is apparent in the way we interact with products [15]. DesignChoreography was developed as a design approach that closely relates to phenomenology and introduces movement as pivotal for embodied design [10]. The approach argues that both product development and product interaction will be essentially embodied when working from the idea of the knowing body [20]. Food and movement are essential elements of life and the authors argue that both require more attention. In particular, because production and consumption need to be more thoroughly interconnected and integrated to build a sustainable society [11]. Bread is the most common food, but it also offers a highly appealing and dynamic material for design. By training a creative bodily understanding through the making of bread it is possible to literally move and nourish the designer's senses and motor system, to form products that afford a meaningful sensorial consumer movement.

#### **3.2 Assignment**

The assignment 'Training The Creative Body Through BreadChoreography' focuses on the combination of the competency areas Ideas and Concepts and Form and Senses. Students explore the concept of creativity through an understanding of the body when the senses are moved to explore and discover unexpected yet natural possibilities. The students work on the idea of BreadChoreography by touching upon the complete set of the senses, including our motor system. During seven weeks the students iterate towards a final BreadChoreography, where every week the same cycle of making and eating bread is repeated, while shifting and deepening the points of attention.

In the first week the students encounter how to make dough. By bringing flour, salt, water and yeast together the material comes to life and they can explore the movement possibilities and shape the dough. Students learn to create a shape that evolves as a spontaneous and unintended result of moving with the dough, rather than making something to make something that they had devised. The bread that finally comes out of the oven, has a form that comes from the combined dough making and rising movements. By finally eating the breads the students literally unravel the effect of their making movements. In the second week develop variations on the same making movement and couples of students interview each other about where a shape or structure comes from. In the third week students try to copy a colleague's making movement and they make bread that combines their own making movement, with the one learned from the fellow student. The final bread is made in duet with each other, formed through bodily interaction and again consumed, as a reflection with each other.

Consequently students develop bread in pairs that focuses on the eating movements that are afforded by the bread forms and structures. During a lunch with invited couples, students evaluate if their breads indeed elicits the anticipated joint eating, yet they are also asked to stay open for unexpected ways of eating, to make part of their further work. In the pre final week students are asked to bring in toppings or dips to eat with the bread that fit and reinforce the movements of eating. In a last reflective eating session they derive insights for fine-tuning their bread, which they serve to the visitors of a restaurant, thereby completing their bodily training (see fig. 1).



Figure. 1 Unraveling Bread Making Movements

## 4. Intercultural Markers in the Design Process

### 4.1 Motivation

Due to globalization, many cultural values have been lost in industrial design in post-modern society. To repurpose the value of local industry, new approaches need to be explored on how to give more emphasis on the local versus the global. In contrast to the globalization of design, food and food preparation is a craft where local traditions and materials are more and more valued as apparent from the Slow Food movement. Eating and cooking are activities that are very much embedded in culture [13]. Culture is perhaps the most obvious influence on food preferences and choice. It has strong historical antecedents, is rooted in unique combinations of environment, addresses rituals and belief systems as well as communities and family structures [3]. Exploring the experiences and values related to the acts of cooking and eating, might therefore inspire design based on cultural values.

### 4.2 Assignment

‘Intercultural Markers in the Design Process’ is a one-week module addressing the competency area Social and Cultural Awareness. The main goal of this module is to support students in understanding the influence of tradition and culture as a way for differentiating and positioning design in a global market. By highlighting the similarities between the cooking and the design process, students are stimulated to consider how their personal culture influences their decisions and pre-conceptions while designing. As a result of the module, students have to design a kitchen tool that respects and reflects the influences of two cultures.

The module starts with a foreign student (the chef) preparing a traditional meal from her home country in her personal context. Students work in groups of three to four, such that a native student (the sous chef) can assist the foreign student during the cooking process and the other can observe and document the process (observer and recorder). During the process students are requested to point out the cultural differences between the foreign and native cooking rituals and processes. Furthermore, they are asked to reflect on the different perspectives taken while observing the cooking process: the sous chef takes the first person perspective and the observer and recorder take a third person perspective. The roles were inspired by various user experience design methods [see 1].

On the second day, the roles shift and the sous chef takes the role of chef and prepares a native meal inspired by the most remarkable elements observed during the foreign cooking session, so-called intercultural markers. This cooking session could be regarded as the first contextualized design exploration in which students explore

how they can cook (or design) while applying remarkable rituals and processes from the foreign student. One of the Dutch students took the perspective of the chef from the foreign culture. On the third day students remain in a kitchen context, and start to explore new ways of cooking inspired by the comments made by the foreign student during the second cooking session. Students explore and develop new tools and cooking methods, while using different kitchen utensils, prototyping materials and food. Ideas and concepts developed throughout this third day were elaborated upon and developed into a prototype, which was evaluated in context on the fifth day (e.g. fig. 2).



Figure. 2 Serving plate for kale stew inspired by Japanese traditions (Van Den Berg and Van Lankveld)

## 5. Reflections and discussion

Both throughout the process and after finishing an educational activity, students have to reflect on what they have learned. The reflections not only highlight the intended goals of the project, assignment or module, they also illustrate additional experiences that students have gained throughout the process. In the following paragraph we highlight some of the reflections that support our argument for the use of food in the design curriculum.

### 5.1 Food Design – Meat, the Expectations

Over the last two years the ‘in-vitro meat’ project has run three times. Important goals are to explore the opportunities for future development of this technology and to stimulate the discussion on the subject by mapping out a diversity of possible outcomes. So far, the project has resulted in over 25 possible directions, which will be mapped out as input for the next runs of the project. Due to this set-up and the freedom students have in setting their own design brief and directing their process, the final projects show a great diversity in process as well as outcome. However, we have noticed that working with food, and in particular ‘in-vitro meat’ has been an important tool for design students to develop their socio-cultural awareness as well as a hands-on approach towards designing. The following observations are derived from students reflecting on the ‘in-vitro meat’-project.

The first point that was highlighted in the students’ reflections relates to Social-Cultural Awareness. Although this competency area is developed in many projects, we have experienced that students struggle with envisioning the impact of their design interventions on society. Within this project we have chosen to work with an emerging technology that is open to a strong debate, both ethical and practical. Due to this debate students are triggered to reflect on perception, public opinion, ethics, as well as their own values as a designer.

*“This project let me think a lot about: who am I as a designer? This question pops-up every time I think about the project. In the beginning and before the project, I did not think about this, which almost made me*

*design something I cannot agree on. But after I realized the importance of this question, the project became more my own and made me reframe my approach.”*

Designing for a technology that is being developed at this moment, supports students in experiencing an innovation process in which the outcome is uncertain. In this way students are required to envision their design proposals in a future setting, leading them to reflect on the impact of their work on society.

*“This project helped me so much in enlarging my point of view about the design world. My first approach was to stick to the real world. It was really hard for me to design something that doesn’t exist yet and has so many doubts and confusion around it. But as soon as I realized that I was asked to put my mind into the future and design a scenario for the cultured meat consumption that could change people’s life and habits completely the project went fine. For this reason I believe that this project was really helpful for me as I experienced a very different approach to the design compared to what I was used to. And I believe that it is also possible to design a different future than trying to change the present.”*

The food component of the project showed to be of great value. In other projects where the combination of emerging technology and debate is used (e.g. nano-technology) students had more trouble in finding a relevant take on the subject. Despite all its uncertainties, the familiarity of food in this project helped students to connect to the topic. Students were able to reflect on values of food and perception from their personal experience:

*“I want to anticipate on the unconscious association that one makes and so influences the way of experiencing (...) like the meat that hangs in a French kitchen for conservation.”*

Similarly students could envision the characteristics of ‘in-vitro meat’ by building on their own experience:

*“If I think about how I combine flavors, I usually create layers of taste on a dish. (...) knitting (strings of ‘in-vitro’ meat), will weave the flavors creating a texture that you will experience while eating the meat.”*

The second point that was highlighted in the students’ reflections was the use of food as a tool for a hands-on design approach. As students were free to direct their own process, some students choose to focus on an extensive research before starting ideation, other students choose to research through short iterations of making, testing, evaluating, and adjusting. Food showed to be a valuable material for both approaches. The familiarity of the material, the availability and the possibility to adjust the properties by processing and cooking helped to stimulate a hands-on approach in setting up experiments to test the sensorial characteristics of food. These included using chocolate with various textures, basic molecular cooking, the impact of color by changing that of familiar food, and the recognition of ‘meat’ in a variety of products ranging from steak and hot dog to ‘vegetarian meat’.

In the ideation and conceptualization phase we have experienced the same pattern. The material of food allowed for an iterative process of developing concepts through cooking, testing, evaluating and adjusting. One student proposed the possibility of creating ‘in-vitro meat’ powder. Through a series of cooking sessions she experimented how this would alter the process of cooking and provide new opportunities for recipes.

*“As a result of my experiments, I can state that not all kind of food is suitable, since people need texture while eating. For this reason ‘in-vitro meat’ needs to be introduced in dishes where something else guarantees a certain pleasant texture, in order to compensate for the lack of texture in ‘in-vitro meat’.”*

Since the technology of growing ‘in-vitro meat’ is still under development, there was no possibility within the project to experiment with the material itself. This stimulated to experiment with other ways of representing the material, which led some students to new inspiration. One student substituted ‘in-vitro meat’ by strips of toilet paper. This allowed for an exploration of shape, resulting in a concept inspired by jewelry. Another student substituted ‘in-vitro meat’ by various types of fruit, exploring aesthetics for her Pure Protein concept (fig. 3).



Figure. 3 Exploring aesthetics for ‘in-vitro meat’ with fruit (Groeneveld)

## 5.2 Training the Creative Body

In assignment students are trained to develop a creative bodily understanding through the making of bread. Dough is highly behavioral material with rising qualities that can be shaped into beautiful forms. It challenges students to stay open and to work with the unexpected effects of rising when being baked. The shape of the bread affords a way of unraveling and the eating movements of the consumer are considered in relation to the movements of making. This brings about an interesting opportunity to explore the concept of affordance, an important concept of embodied design, both in the process of forming and consuming the object.

In this exercise the working with dough, offered the possibility to go through a myriad of iterations in a relatively short time. It forced students to let go of pre-thought goals and process planning and to trust their senses and impulses. Therefore, the material of dough is ideal for the students to thoroughly experience the effectiveness of embodied work and they learn to rely on that experience in their industrial design projects.

*“Starting on the assignment it became clear that the mode of learning has an impact on the process involved, and that the kinesthetic process can be unfold in different ways. It was somewhat new to work with a process where idea, material and construction merge in one flow. The assignment and nature of the material at hand, dough, really afforded a continuous iterative process.”*

*“The material if allowed can directly influence or even dictate the process of creation. This was explored by approaching the material with few expectations in terms of end result. This allows for the unforeseen to happen and in this space true novelty might come into existence. I believe that the intellect works by repeating or at least start from memorized patterns, giving control back the material widens the chance for the new to become.”*

Learning to rely on the senses is particularly important for students in a technological environment. The program has a strong focus on complex systems, products and services. The fact that dough has a certain level of unpredictability, adds to the training of the students, to work with the complexity of high tech materials.

*“Working with dough and its transformation to bread symbolizes how designers cannot fully predict the behavior of the adaptive and interactive systems they design, and how to work with that phenomenon turning design in a process of discovering. Form study for interaction and systems. Food as living material... bread as material with inherent behavior”*

Finally, students are able to better feel the relation between producing and consuming, and how design affects both, as in this assignment making and consuming bread are very close in time and space. Moreover, students can experience how making and consuming are physically interconnected, thus how maker and user relate.

*“The aspect of the relationship as designer and as host to the user was also explored. The designer and user relationship is a complex one involving many aspects. In this assignment we focus on how the traces of making translate to the user and their experience.”*

### **5.3 Intercultural Markers in the Design Process**

The purpose of this module was to teach students how to understand different cultures and how to design while being inspired by these cultures. However, many students reflected that the approach also supported them in getting a better grip on their own culture. The discussions with the students, in particular during the different dinners that were organized to test the various explorations, clearly supported them in their cultural awareness. Not only did they understand more of the culture of their peers, they learned more about their own culture and how they could use cultural elements to inspire their designs.

In addition to developing a social and cultural awareness in this module, students also developed various other competency areas. Understanding the importance of details is key in the process of becoming a good designer for which many examples of form giving exercises have been explored in design education since the setup of Bauhaus. Due to the high technological focus of our program, students often have difficulty in developing a sense of aesthetics. In the current exercise it became apparent that students could develop a sense for understanding and appreciating quality through the act of cooking. Food gives immediate feedback on its quality through the act of tasting, for which cooking can be used as a relevant lesson on quality transferable to the design process.

*“I was happy that we decided to make this prototype entirely by hand, painstakingly cutting and sanding for hours until our fingers hurt. I almost felt obliged to my fellow student to put the same effort and attention to detail into our prototype as he did into his meal. I believe this effort can somehow be felt from the model, influencing the user to be gentle and careful”*

Secondly, students realized that in a cooking process they went through design iterations at a much faster pace. Envisioning a taste or combination of ingredients, thinking of a new recipe, preparing it and evaluating it by

tasting, could be done in a matter of minutes. The act of making and evaluating the food made students realize how important it is to go through various iterations before you can be confident about a design.

*“Of course, prototyping food is generally a faster process than prototyping an interactive system, but in both settings prototypes and design iterations are equally important. One could even argue food is an interactive product, in the way it stimulates our senses, responds to our chewing, our saliva, and our tongue. It is all chemistry, but the chef carefully designs every aspect of it. Clearly, some of the best dishes ever made are the most crazy and innovative ones, and the only way to discover their potential is simply to try. Make the food, taste the food, have others taste the food.”*

Throughout the process we observed that students that designed their products while cooking came to very concrete products [1]. On the other hand, groups that returned to the drawing board to think of design opportunities remained in a very conceptual stage, addressing an opportunity for further exploration rather than coming to an embodied design. Through the exercise, students realized that designing in context yields more concrete results than designing on the drawing table.

*“Most of our ideation was done on paper and it took us a while to start working on a physical mock-up. I must say that as soon as we did, our process really took off.”*

Finally, students appreciated the first and third person perspective roles as a valuable asset to develop empathy in the design process. One of the main goals of this project was to contextualize and make methodologies as proposed by various design researchers [e.g. 5, 18] experienceable. The exercise highlights, that a combination of acquiring knowledge (through the reading of literature), developing a skill in context, and having the attitude to build a relationship offers a far more efficient approach to learning about user experience than by being exposed to the methods alone. The context of food, offered a very simple and effective tool to explore the differences between the various methods in a relatively short period.

*“What is more interesting is the setting of chef and sous-chef, which builds a sophisticated relationship between a subject and a researcher. According to the knowledge in the book and my personal experience, subjects would be encouraged to share more when they are treated as masters. However, the way to build this relationship is the tricky part because usually subjects would think that they are being observed, inspected, or investigated. Through role-playing, they might lower their alerts easily and share as much as they could through doing without thinking.”*

## **6. Conclusion**

In the current paper we have presented three examples of how food can support industrial design students in developing their attitude, skills and knowledge of designing taking the Competency Framework for Industrial Design as described by Hummels et al. [9] as a reference. The link with the competency area Ideas and Concepts is clear as food triggers the creativity of design students and preparing food is a highly creative process that allows to freely experiment by doing and exploring for which gastronomic programs have been inspired by design

education [7, 14]. Also, the link to Form and Senses seems clear as students are able to develop their senses and feeling for form. Food as a tool allows for a highly hands-on design approach and gives immediate feedback on its quality as it can and should be sensed on all levels. However, the use of food has also addressed development in competency areas that may not seem as apparent.

Firstly, students can develop a strong Social Cultural Awareness by designing with food. Food has a strong social and cultural connection [13] and students have indicated that it makes them become aware of their own cultural identity and how it influences their work as well as that of others. They learn to understand different cultures and how to design for our increasingly multicultural world. Furthermore, students were able to explore their personal role and expression in design. Due to its nature and the fact that food is so deeply embedded in our daily lives, it can easily trigger discussions on the ethical implications. Secondly, students were able to explore several user-centered research methods in a relatively short period of time addressing their development in User Focus and Perspective. In addition, they were able to iterate on the relation of producing and consuming, hence understanding how both relate and might be even integrated in the future. Furthermore, food provided them a clear reference point while exploring emerging technologies, such as ‘in-vitro’ meat. The unpredictability of a material like dough shows parallels to high tech materials and thus helps to learn to design with unpredictability and high complexity of behavior. Finally, in all the learning activities students came to realize that work with food allowed them to go through the design process at a very high pace. In a matter of minutes, they could ideate, make, evaluate and reconsider their designs. Thus, while running the exercises we discovered that students saw opportunities to develop competency areas that were not initially intended by the lecturers, showing how the organic iterations with food stimulates an integral understanding of different design competencies.

Given all the above-mentioned benefits, we argue that the exercise of involving food in design education, offers a high contribution to the development of design students. It supports them in dealing with aspects such as vision development, user-centered design, training their senses and sensitivity for form and meaning, understanding quality and dealing with (technological) complexity. The act of cooking enables students to reflect on action [17] more effectively, as design iterations are short and the experience addresses all the senses. Alike the incorporation of design methods and creativity techniques in culinary arts education [7,14], food is highly valuable as a tool in design education to nourish future designers.

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