



Teaching for Values in Human–Computer Interaction

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There is an increasing awareness of the importance of considering values in the design of technology. There are several research approaches focused on this, such as e.g., value-sensitive design, value-centred human–computer interaction (HCI), and value-led participatory design, just to mention a few. However, less attention has been given to developing educational materials for the role that values play in HCI, why hands-on teaching activities are insufficient, and especially teaching activities that cover the full design process. In this article, we claim that teaching for ethics and values in HCI is not only important in some parts of the design and development process, but equally important all through. We will demonstrate this by a unique collection of 28 challenges identified throughout the design process, accompanied by inspirational suggestions for teaching activities to tackle these challenges. The article is based on results from applying a modified pedagogical design pattern approach in the iterative development of an open educational resource containing teaching and assessment activities and pedagogical framework, and from pilot testing. Preliminary results from pilots of parts of the teaching activities indicate that student participants experience achieving knowledge about how to understand and act ethically on human values in design, and teachers experience an increased capacity to teach for values in design in relevant and innovative ways. Hopefully, this overview of challenges and inspirational teaching activities focused on values in the design of technology can be one way to provide teachers with inspiration to sensitize their students and make them better prepared to become responsible designers by learning how to address and work with values in HCI.

Keywords: values, ethics, HCI—human–computer interaction, teaching, design, technology

1. INTRODUCTION

We are witnessing an increased focus on the role that ethics and values play in the design of technologies. In the field of human–computer interaction (HCI) there have been several workshops (Waycott et al., 2017; Pillai et al., 2021), keynotes (Antle, 2017), panels (Fiesler et al., 2018; Frauenberger et al., 2019; Hendry et al., 2020), research papers on teaching practices (Fiesler et al., 2018; Frauenberger and Purgathofer, 2019; Nilsson et al., 2020), and research papers (Friedman, 1996; Cockton, 2004; Miller et al., 2007; Yarosh et al., 2011) focusing on this (just to mention a few examples), in addition to the development of professional codes of ethics in various organizations (e.g., ACM, 2018; IEEE, 2020). However, there is less attention to sharing concrete teaching resources for addressing the topic of ethics and values in design, and for creating conditions for students to grow into responsible designers of future technologies. Many methods from areas such

as e.g., value-sensitive design (VSD) (Friedman and Hendry, 2019) are developed for research and development purposes, rather than for teaching. The VSD community has generated a rich body of literature on value conceptualizations, methodological papers, and projects, but methodological guidance is largely missing, especially for researchers new to VSD, and there is a need to lower the entrance barrier (Winkler and Spiekermann, 2018). In addition to that, many HCI courses are built up around the various phases of the design process, with or without a design project, often tackling various forms of design problems. Design problems are often referred to as wicked problems, described as “[a] class of social system problems which are ill-formulated, where the information is confusing, where there are so many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing” (Buchanan, 1992). However, while much resources on ethics and values in design has a focus on either the consequences of the design, or the planning and early phases of the design process, there are less resources in the later phases such as implementation and evaluation.

In a recent cross-European research project, we set out to fill these identified gaps: insufficient concrete teaching resources for teaching for ethics and values in design, and especially teaching resources addressing all parts of the design process. Partners from four Universities in three different countries have collaborated in order to iteratively develop a pedagogical framework and an open educational resource including 28 teaching activities and 12 assessment activities (VASE, 2021). We have applied a modified pedagogical design pattern approach (Goodyear, 2005; Laurillard, 2012), based on principles of systematization, sharing, and adaptability.

The contribution of this article is a unique collection of 28 identified challenges related to ethics and values in HCI that can occur throughout the design process, and accompanied by just as many inspirational suggestions for teaching activities for how to teach students how to tackle them. The teaching activities have so far been tested by more than 1,563 students involving 50 teachers at six universities in four different countries.

2. BACKGROUND

There are various classifications of human values, such as those defined by, e.g., Rokeach (1973), Schwartz (2012), or in value-sensitive design (Friedman and Kahn Jr, 2003). In this work, we do not lean toward one or the other model, but rather define what we mean by values in relation to teaching for values in design.

2.1. What Do We Mean With Values?

Values play an important role in design but there are many different ways to consider values, and a literature review of values in design will encounter many of these different notions of value. When teaching students about values in design we need to disentangle these different notions and consider how different methods can be taught for each of the relevant notions. We distinguish three different axes that may be relevant.

2.1.1. Axis 1: Value or Values

As several authors have pointed out (e.g., Andersen and Cox, 2018; Bekker et al., 2019), there is a difference between the meaning of the word “value” and the word “values.” “Value” often refers to the worth of something, whereas “values” refers to what is important in life. The objective view of “having value” can be linked to an economic view of value, and the subjective view of “being of value” can be linked to a sociological view of value. Concepts and definitions of value in the context of innovation have thus been explored in economy, psychology, sociology, and ecology (Ouden, 2012). This use of the word “value” is closely connected to how “value” was initially used by Cockton (2006), and which was later renamed to “worth,” meaning what a technology brings to its end-users. In this report, we are interested in values as what is important in people’s lives. What we mean by this, is that we aim to teach students to take responsibility for their own values, and how their designs can support or undermine other stakeholders’ values (where other stakeholders can be defined in the broadest sense, such as end users, society, but also e.g., nature).

2.1.2. Axis 2: Focus on the Process or the Product

In the design context, values can be connected to either the product of design or the process of design contributing to values or expressing values. The notion that values can be embodied in design, as expressed by Friedman and Kahn Jr (2003) relates to the product’s values, while the notion of empowerment, which forms the basis of participator design (PD), also relates to the process’ values. Of course, values also underlie the ethical framework for doing design and research in general, making sure that stakeholders are treated with respect.

2.1.3. Axis 3: Focus on Designers’ Value(s) or Stakeholders’ Value(s)

Finally, we can consider values from the perspective of the designers and/or from the perspective of the stakeholders. As Ouden (2012) has pointed out, stakeholders may exist on many different levels, from users, to organizations, the ecosystem, and society. To be sensitive to values, designers need to be aware of their own values, as well as the values of all stakeholders. Thereafter, they need to make decisions about potential value conflicts between and within stakeholders.

2.2. Teaching for Values in Design

Values are inherent in technologies (Verbeek, 2011), and “technology affects values regardless of whether the designer has any explicit intention to do so” (Knowles and Davis, 2017, p. 62). In other words, designers—knowingly and unknowingly—both embed values into their designs and affect values through their designs (Friedman and Kahn Jr, 2003). It is, then, important that designers are aware of the role and implications of values in design. We therefore argue that the topic of values in design should be addressed in all educational programs related to HCI.

While various approaches exist to practicing and researching values in design (see, e.g., Cockton, 2006; Belman et al., 2009; Iversen and Leong, 2012; Friedman and Hendry, 2019; Nissenbaum, 2021b), there are only few examples of how to teach

students about values in design (Frauenberger and Purgathofer, 2019; Barendregt et al., 2020; Nilsson et al., 2020; Nissenbaum, 2021a, for recent overviews see Fiesler et al., 2020; Hendry et al., 2020).

A number of other articles have reported on teaching design approaches from various related sub-fields of HCI, such as tangible and embedded interaction design (Martin and Roehr, 2010), interaction design and children (Eriksson and Torgersson, 2014), digital craft (Nitsche et al., 2014), interaction design with a focus on sensor-based interaction (Brynskov et al., 2012), participatory design (Hecht and Maass, 2008; Christiansson et al., 2018), ethnography in human–computer interaction (Weinberg and Stephen, 2002), and interaction design by research through design (Hansen and Halskov, 2018). We have also seen a need for more discussions around teaching various strands of design of technologies, such as in child–computer interaction (Van Mechelen et al., 2020) and in participatory design (Hecht and Maass, 2008), to name a few.

In the broader field of HCI, several authors have also called for initiatives to address ethics in design. (Lilley and Lofthouse, 2010) set out to develop teaching material which will help foster responsibility in design students by encouraging deeper reflection on the social, environmental, and ethical implications of design for sustainable behavior. Similarly, (Frauenberger and Purgathofer, 2019; Nilsson et al., 2020) are developing teaching materials for educating responsible designers. To both describe current trends in computing ethics coursework and to provide guidance for further ethics inclusion in computing, Fiesler et al. present an in-depth qualitative analysis of syllabi from university technology ethics courses (Fiesler et al., 2020). Finally, Pillai et al. (2021) recently argued that beyond defining ethics, an ethics curriculum must enable practitioners to reflect and allow consideration of intended and unintended consequences of the technologies they create from the ground up, rather than as a fix or an afterthought (Pillai et al., 2021). In a recent workshop, they therefore aim to build upon existing practices and knowledge of ethics in HCI and enrich ethics curriculum (Pillai et al., 2021). While these initiatives mainly focus on taking responsibility for the effects of the technology that is being developed (which we think is indeed also very important), there are insufficient resources for also considering the design process.

Several approaches have been inspired by Nelson and Stolterman design judgement as the key element in the design process (Nelson, 2003) and what Vickers (1965) named appreciative judgement. Design judgement is a competence that is not based on formal rules, but rather on the accumulation of the experienced consequences of choices made in complex situations (Nelson, 2003). While appreciative judgement is the capacity to understand a situation through the discernment of what is to be considered as the background and foreground in a design situation (Vickers, 1965).

Le Dantec and Do (2009) drew upon Nelson and Stolterman's taxonomy of design judgments (Nelson, 2003) to ensure taking designers' values into account besides that of the participants'. They did this by analyzing verbal exchanges from a design meeting, however, they do not provide any hints for how to, on a practical level, support for the emergence of values. Similar

to Ludvigsen et al. (2004), Le Dantec et al. (2009) describe how they elicit values through interviewing people using artifacts, in order to provide physical instantiations of values. These methods based on verbal exchanges and interviews can mediate an initial elicitation of values, however, there is no description of how they continuously refine/negotiate values throughout the design process.

In values-led participatory design (PD), Iversen et al. (2010) address a concern for values in PD as a specific kind of design judgment, which they term as appreciative judgment of values, and that this judgment usually occurs in a dialogical process of emergence, development, and grounding of values. This represents the full cycle of a values—led PD inquiry: from the process of early analysis to the development of the final product. However, practical guidance is mainly focused on the emergence of values in the beginning of the design process (Iversen and Leong, 2012).

The Values in Design (VID) Council, Nissenbaum (2021b), proposes a process containing three steps: to discover the values relevant to the project, the translation of those values into specific design features, and finally to systematically verify that the values' content of what is created matches the intentions. This has been applied in and documented from a course on Values Embodied in Computer and Information Systems (Nissenbaum, 2021a). This course is mainly a two parts reading course: first, the students read about the social, political and moral dimensions of technology in general, and secondly the students focus more on information and communications technology specifically.

The Values at Play curriculum (Belman et al., 2009), is meant to be incorporated in any game design course as a 4-week module. Students participate in four activities, one for each week, with accompanying readings. Some specific tools or activities used during the 4 weeks are the Grow-A-Game cards activity (Belman et al., 2011), preparing a video clip of a game in which values are at play, creating a prototype of a game, and play-testing and critiquing the games.

The Design Challenge Based Learning (DCBL) approach was developed by Blevis (2010), who was frustrated by the lack of studio-based learning approaches for design students at universities. According to Blevis (2010) “the core idea of DCBL is to present designers with humanity- and life-centered issues-based design research and design-concept challenges in the arena of HCI [...]” (p. 2). In this sense, it is not a design approach, but rather a pedagogical paradigm. However, one of the pillars is that “[i]t is an issues-and values-first paradigm” (Blevis, 2010) so therefore it is of some interest for this report. In DCBL, students work on individual, collaborative, and competitive activities involving public presentation and critique; they receive implicit rather than explicit inclusion of rigorous concepts in the service of motivated, design challenge goals; and linked pairs of research and concept projects prompt the students to practice, ensuring that their concepts follow from research insights and that their research insights lead to concepts. Although DCBL could be an interesting approach to define projects for students to work on, it does not explicitly explain to students why values are important, or how they can deal with different values of different stakeholders.

A recent example of making ethics and values more easily accessible and integrated into the design process is the design tool: The Moral-IT Deck and Moral-IT Impact Assessment Board (Urquhart and Craigon, 2021). The Moral-IT Deck is a set of physical cards that prompt reflection on normative aspects of technology development. Coupled with our Moral-IT Impact Assessment Board, they help technology designers to reflect on how to address emerging ethical risks and implement appropriate safeguards. The cards and board enable designers to reflect on challenges and consequences posed by their system and plan how to act in response (Urquhart and Craigon, 2021).

One example of a collection of concrete teaching activities for values in design is developed by Hendry (2020), which is a pedagogical resource containing four tech policy instructional case studies. The case studies are planned to be delivered as a 110-min class, but intended to be revised for different pedagogical settings and goals. The educational resource is based on methods from value sensitive design (Friedman and Hendry, 2019), and especially the following methods: Direct and indirect stakeholder analysis, Value source analysis, Co-evolution of technology and social structure, and Value scenarios. However, although this is a great resource for position students to consider the deeply interactional processes of human values and technology, they do not cover the full design process.

This article focuses on teaching for situated ethics and values in the technology design process as well as in designs. As such, we hope to ease entrance barriers to the field, as has been called for Winkler and Spiekermann (2018). Through this, we hope to provide other teachers of HCI courses with teaching material to sensitize their students and make them better prepared to become responsible designers by learning how to address and work with values in design.

2.2.1. Consequences of Insufficient Education in Values

There are many examples of the consequences that HCI and technology design have been suffering, which might partly be due to the difficulties in obtaining consensus about ethical imperatives (Anderson, 1992), but may also be due to an insufficient education in ethics and values. One classic example is by Winner, of the low bridges “designed” by Robert Moses to deny low-income people to travel to the beaches by bus (Winner, 1999). Another example is how until recently, due to a light-skin bias embedded in color film stock emulsions and digital camera design, the rendering of non-Caucasian skin tones was highly deficient (Roth, 2009; Caswell, 2021). A more recent example is how some big data algorithms are increasingly used in ways can lead to decisions that harm the poor, reinforce racism, and amplify inequality (Neil, 2016). We see these examples of how design and engineering professionals play an important role in the shaping of society, but without always being explicitly aware of this (e.g., Facebook’s CEO Mark Zuckerberg who brought a technology to life without being fully aware of the major societal consequences of its use). Of course, it is not a naïve hope that an increased focus on ethics and values in education lead to technologies without any negative consequences, but we still

aim toward students thinking more carefully about values and consequences—all through the design process.

3. METHODS

Through a period of 3 years, we have iteratively developed, piloted, evaluated, and re-iterated a total of 28 teaching activities and 12 assessment activities (VASE, 2021). However, the focus in this article is on the challenges throughout the design process where such teaching activities could be applicable, why it will not present or go further into details of the teaching activities, and not touch upon the assessment activities. The teaching activities have been tested, in isolation or in combination, by a total of 1,563 students involving 50 teachers in six universities in four different countries (Sweden, Denmark, Netherlands, and Turkey). The educations have ranged from first year bachelor in e.g., digital design and teacher education, to master level in e.g., experience economy and interaction design. The pilot tests have ranged in various ways in everything from a guest lecture to a full course on values in design, however the full range of teaching activities have not been tested as one full program. The teaching activities have been piloted and formative evaluated primarily in order to inform re-design and improvement. The formative evaluation was not systematically applied, but the teachers constructive comments and suggestions have been implemented in iterated versions of the activities. In some cases, and as part of the respective universities final evaluation of a course where one or several activities have been piloted, students have been asked to answer some variation of the following question: “To what extent do you experience achieving knowledge about how to understand and act ethically on human values in design?” However, this has not been done systematically, and we have rather relied on the experiences from the teachers and examiners in the partnering universities.

In the development of pedagogical framework, identification of challenges in the design process, and in developing activities, we have used a modified version of the pedagogical design pattern approach (Goodyear, 2005; Laurillard, 2012). The method has been applied in pattern mining workshops, in order to elicit existing best practice from teachers and from related work found through desk research. It has further been applied in that we have developed a specific template for teaching activities, which is separated from assessment activities, and which is based on the SOLO taxonomy for defining intended learning outcomes and objectives (Biggs, 1982), and has a focus on describing every step in the activity in detail. The template is complemented with teaching materials, such as suggested literature, worksheets, and presentation slides (VASE, 2021).

There are many different more or less established models of the design process which all contain a number of various phases (e.g., Jones, 1992; Maguire, 2001; Council, 2004; IDEOU, 2021). In this article, we have divided our work following five phases: Values theory, Research, Synthesis, Ideation, and Evaluation, and developed teaching activities accordingly in order to fit each phase. The last four design phases are inspired by Maguire (2001), while we have created the first so called meta-design phase, values

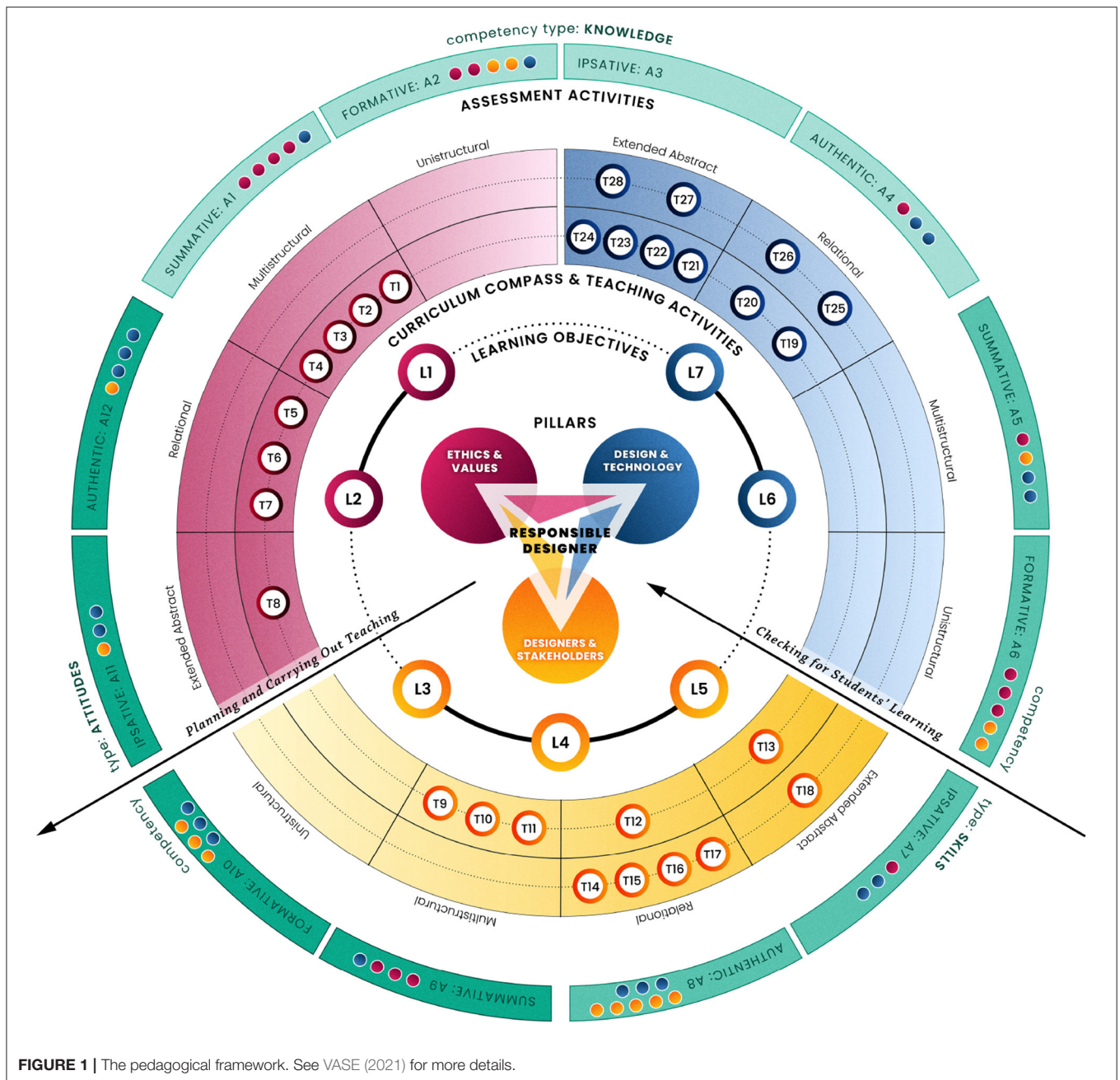


FIGURE 1 | The pedagogical framework. See VASE (2021) for more details.

theory, as a foundation for the activities in the following phases to emphasize the importance of gaining theoretical base knowledge of different approaches and frameworks for ethics and values in the design of technology.

The 28 identified challenges as presented in this article, and the accompanying inspirational teaching activities spread over the whole design process, is part of a pedagogical framework, which will be briefly introduced in the next section. For a detailed presentation of the pedagogical framework and the full collection of teaching and assessment activities see VASE (2021).

4. THE PEDAGOGICAL FRAMEWORK

The pedagogical framework, see Figure 1 consists of five dimensions:

- Pillars: three core competency pillars for educating responsible designers—Ethics and Values, Designers and Stakeholders, and Technology and Design,
- Learning objectives: seven overarching learning objectives that guide teachers when teaching for values in design,

TABLE 1 | Overview of the teaching activities related to the design phase values theory in the pedagogical framework on teaching for values in design.

Pillar	Phase	Teaching activity
(I) Ethics and values	Values theory	T1. Introduction to values in design T2. Introduction to ethics in design T3. Introduction to cultures and values in design T4. Design with and for certain philosophies T5. Manifestos on values and ethics T6. Values manifested in products, system and services T7. Values clustering for developing students' value vocabularies T8. Understanding values changing over time

- Curriculum compass: the curriculum compass contains 20 learning outcomes based on the SOLO taxonomy which outline progression in learning design for values,
- Teaching activities: 28 teaching activities that expand, concretize, and integrate learning outcomes in step-by-step activities,
- Assessment activities: 12 assessment activities that are connected to relevant teaching activities to support teachers in checking whether the teaching activities' learning outcomes were achieved by the students.

We have formulated three main pillars for teaching for values in design. The three pillars aim to cover what we consider the main knowledge and skills for becoming a responsible designer: the theoretical background, a focus on different stakeholder needs, as well as the skills to actively engage with technology and values in the design process. Each of the pillars cover one or two design phases:

Values Theory—Pillar 1: Ethics and Values

The Ethics and Values pillar cover the meta-design phase values theory. It explains the underlying theoretical foundations that students need in order to take ethics and values into account, both in their methods and in their design process, as well as in taking responsibility for their end product or service. The overarching learning objectives are:

- Recognize and describe different values.
- Critically reflect on how values are manifested in design.

Research and Synthesis—Pillar 2: Designers and Stakeholders

The Designers and Stakeholders pillar cover the design phases research and synthesis. It addresses methods and processes for students to ethically engage with different stakeholders and their values, acknowledging that they themselves are stakeholders too. The overarching learning objectives are:

- Identify and describe direct and indirect stakeholders of a design.
- Elicit stakeholder values.
- Identify possible tensions between different stakeholder values and imagine how to mediate these tensions in a design.

Ideation and Evaluation—Pillar 3: Technology and Design

The Technology and Design pillar cover the design phases ideation and evaluation. It addresses methods and processes that allow students to practically design and evaluate products and services with values in mind. The overarching learning objectives are:

- Integrate values into the design process.
- Analyse and critically reflect on the impact of a design (draft) and its manifested values in context.

In the rest of this article, we will focus on the challenges we have identified throughout the design process where teaching about the role of ethics and values in HCI in regards to both process and product is highly relevant. These challenges will be accompanied by brief inspirational suggestions for teaching activities.

5. TEACHING VALUES FOR DESIGN THROUGHOUT THE DESIGN PROCESS

In this section, we will walk through the design process divided into the five phases: Values theory, Research, Synthesis, Ideation, and Evaluation. For each phase, a number of identified challenges related to ethics and values in design as well as arguments for the importance of teaching for values in HCI will be provided and illustrated through 28 inspirational suggestions for teaching activities.

5.1. Phase 1: Values Theory

This meta-design phase is important for students who are about to start designing with values. Through teaching activities in this phase, students gain theoretical base knowledge of different approaches and frameworks for ethics and values in design. Building on this theoretical understanding, the students will be able to carry out the activities in the following phases more effectively. An overview of the teaching activities for this phase is in **Table 1**.

5.1.1. Introduction to Values in Design

While students in HCI are often introduced to different design approaches, such as Agile, User-Centered, Critical, or Participatory Design, they often have the notion that design is value-neutral. This prohibits them from taking a reflective and active stance toward values in present and future design projects. Furthermore, even if students recognize the role that values play in design, they usually lack the knowledge to think about this issue and identify possible approaches to address values during the design process. This lack of knowledge may make them fall short when being confronted with or working with values in design projects. In an "Introduction to values in design" teaching activity, students gain knowledge about the role of values in design, and are briefly introduced to some design approaches that take values into account. The Value-Sensitive Design approach is explained in more detail, specifying the three types of investigation commonly found in VSD: conceptual investigations, empirical investigations, and

technological investigations. Recommended reading for this activity: Friedman et al. (2009).

5.1.2. Introduction to Ethics in Design

The design of technology is not neutral, and the designer is always accountable. Therefore it is vital, in order to become responsible designers, to understand both the various moral traditions, the formal ethical rules and regulations, as well as adopting a reflective stance to applying ethics in the design practice. This can be achieved through an “Introduction to ethics” activity. Students need to understand how their designs are intentional, how they are products of inscriptions by designers, and what the implications are with regards to stakeholder moral, will, and agency—both in the product and in the process. Recommended reading for this activity: Frauenberger et al. (2016).

5.1.3. Introduction to Cultures and Values in Design

In the books *The Patterning Instinct* (Lent, 2017) and *The Geography of Thought* (Nisbett, 2003) the authors argue that humans will not be able to solve today’s environmental problems if they do not combine human knowledge systems from the West, the East, and indigenous cultures. The different knowledge systems or “ways of seeing” present very different ways of understanding values and virtues. Contemporary designers and engineers are educated in university institutions that build on scientific traditions that mainly come out of the Western knowledge systems. Thus, it is important to look beyond the Western knowledge systems and the values that they represent and look into other cultures’ value systems.

The “Introduction to cultures and values in design” teaching activity introduces students to alternative value systems as they are covered in and Somé (1999), Nisbett (2003), Ani (2017), Lent (2017) through a lecture. Through this lecture, students get an introduction to a broader perspective on values than the one offered by Western cultures. Students become aware of how they might look into value systems alternative to the one offered by Western cultures. The lecture is followed by a seminar where students discuss the differences between the value systems that they are introduced to. The students end with producing a combined list of values offered by the West and alternative value systems, and some research questions that open up for further research on values in other cultures.

5.1.4. Design With and for Certain Philosophies

As claimed by Verbeek (2006), engineers are “doing ‘ethics by other means’: they materialize morality,” which also applies to designers. The challenge that students often face is either: (1) an insufficient awareness of the ethical dimension of their designs, e.g., the design of social platforms like Facebook and Instagram are pushing teenagers to perfection and collecting likes from everyone, since all their peers seem to be flawless and liked, or (2) a lack of competency to be able to relate ethics and esthetics in their designs. e.g., how can one design the public space in such a way that it is inviting the 1.5 m COVID-19 distance, while respecting the autonomy and creativity of people?

By ethics, we mean the moral principles of conduct governing an individual or a group. By esthetics, we mean the appreciation

of the beautiful and its effects. It is fairly hard to design, making abstract values “experienceable” when engaging with a product, system, or service. Not being able to identify, describe, apply, and reflect on the underlying values and ethics of products, systems, and services and the relation with esthetics, might lead to all kinds of unintended consequences of designs in use: users feeling frustrated, belittled, not able to express themselves, endangering themselves or others, etc. It might unintentionally push certain values, where others might be societally preferred or beneficial, as also shown with the example of the impact of social media on teenagers. The outcome of the “Design with and for certain philosophies” teaching activity helps students to understand, experience, and reflect on the relation between esthetics and ethics. This teaching activity offers a fairly explicit way of using ethical frameworks, students will start to understand the underlying relations, thus having handles to design and generalize their reflection on ethics and values to other design projects.

5.1.5. Manifestos on Values and Ethics

When writing their own design manifesto, students often focus on what they themselves believe in, meaning that they pay little attention to what others believe in. However, in order to take a position and avoid intolerance toward those who hold different opinions from oneself, it is important to be aware of diverse viewpoints and to learn not only to agree but also to disagree with others in a constructive manner. In the “Manifestos on values and ethics” teaching activity, the students will gain this understanding by reading several inspiring and thought-provoking examples of manifestos from multiple fields and discussing their individual stances. Examples of manifestos for inspiration can be found here: Backspace (2021), Designmanifestos (2021), and Ethical (2021), etc.

5.1.6. Values Manifested in Products, System and Services

While new products, systems, or services are often promoted as adding value to people’s lives, such statements might also veil the philosophical, theoretical, political, and cultural influences on a particular design (Friedman and Hendry, 2019). If students don’t engage in a critical reflection on how values are manifested in products, systems, or services they may not understand how these embedded values might have an impact on the way we think, our lifestyles, and our culture. In other words: how products, systems, and services “speak” to us and shape our everyday lives and mindsets. This teaching activity provides students with some examples of existing products where the underlying motivations and contextual influences behind the designs are brought up for discussion. Students learn to find the underlying values that are embedded in a product, system, or service. This teaching activity trains students in noticing what kinds of cultural and philosophical influences are behind a product, system, or service. When students have done some analysis, they might be able to come up with research questions that address the philosophical, theoretical, political, and cultural influences that shape contemporary products.

5.1.7. Values Clustering for Developing Students' Value Vocabularies

When working with values in design, students sometimes lack a nuanced and elaborate vocabulary for communicating about values. This creates the risk of a narrow understanding of what values in design imply and how to work with and talk about values in a holistic and multifaceted way. By expanding our value vocabulary, we might also gain a more nuanced understanding of the values we are working with—in effect creating better products, systems, or services. If students lack a nuanced value vocabulary, values run the risk of becoming one-dimensional buzzwords with no depth or situated meaning. In the activity, the students are introduced to relevant thesauruses, dictionaries, value vocabularies (such as the HUValue Tool Kheirandish et al., 2019 or Schwartz Theory of basic values Schwartz, 2012) and other materials that might help them broaden and deepen their vocabulary for, and understanding of, a certain value.

5.1.8. Understanding Values Changing Over Time

Students often focus on integrating a predefined set of values identified during the early stages of design. They often assume that these values will remain stable in the later stages of the design life-cycle during widespread adoption and use. However, values can change over time. Value changes can occur either due to social developments (e.g., French Revolution that overthrew the monarchy) or induced by technology (e.g., contraceptives which have had an effect on sexual morality). New values may emerge in society (e.g., emergence of feminist values), the priority of values for a specific technological design may change during its use (e.g., increased emphasis on sustainability over efficiency), and the meanings or interpretations of the same value may change over time (e.g., how privacy is understood in the age of the Internet). The “Understanding values changing over time” activity will encourage students to situate their designs within a broader socio-historical context, to become aware of value changes, and in turn lead students to design products, systems and services that can better adapt to changing conditions. Readings and example of a multi-lifespan timeline, see Yoo et al. (2016) and van de Poel (2018).

5.2. Phase 2: Research

In this phase, relevant information is gathered around the initial design brief. This includes information regarding direct and indirect stakeholders, their values, and the relationships and tensions between them. The values of the designers (students) themselves are also analyzed and reflected upon. The teaching activities related to the design phase research are listed in **Table 2**.

5.2.1. Individual Designer'S Values Identification and Hierarchy

Design work is often based on a collaborative effort of a group of designers. While students are often introduced to design methods for involving other people in the design (e.g., interviews or focus groups), these methods do not necessarily address or relate to other people's values, and they also do not focus on the values of the project members themselves. The “Individual designer's values identification and hierarchy” teaching activity supports

TABLE 2 | Overview of the teaching activities related to the design process phase Research in the pedagogical framework on teaching for values in design.

Pillar	Phase	Teaching activity
(II) Designers and stakeholders	Research	<p>T9. Individual designer's values identification and hierarchy</p> <p>T10. Design team's values identification and hierarchy</p> <p>T11. Design team's value statement manifesto</p> <p>T12. Listing stakeholders and their values</p> <p>T13. Stakeholder values elicitation</p> <p>T14. Mapping stakeholder value landscapes</p> <p>T15. Project values identification</p>

students in becoming able to understand and explain their own underlying values, that their values are different from other students' values, to adapt to other students' values, and explain that values have an impact on the design of products, systems and services. In the activity, show the students a collection of values for inspiration, such as e.g., the HuValue Wheel (Kheirandish et al., 2019) or Schwartz Theory of Basic Values (Schwartz, 2012). The students are asked to formulate their own values and how they might shape them as responsible designers and impact their HCI practice, but also ask the students to describe how their individual values interact with and position them in relation to the values of other students or stakeholders.

5.2.2. Listing Stakeholders and Their Values

Students often focus only on the end-users and overlook others, who do not necessarily interact directly with the technology, but are still implicated by the technology nonetheless. Students often lack a broader perspective on people and the social context in which products, systems, or services will be integrated. In particular, the roles of non-targeted users such as adversaries and indirect stakeholders such as bystanders are often overlooked by the designer. If students only think of people in terms of users, they might end up focusing on immediate tasks and short-term goals without considering the ripple effect of their design that might cause unforeseen consequences in a long run. Students may end up unintentionally creating products, systems, or services that do more harm than benefit for some people. Through this activity, students will become able to identify a diverse range of direct and indirect stakeholders, and discuss their different roles and values implicated in products, systems, or services. This understanding is materialized in a list of Direct and indirect stakeholders, and their values, which enables discussion and reflection between teacher and the groups about the impact and ripple effects of a specific product, system, or service. In the activity, ask the students to read a text that describes the concepts of direct and indirect stakeholders, e.g., Section 6 in: Friedman et al. (2013) or chapter 2 in Friedman and Hendry (2019). The students are asked to understand the diversity of possible

stakeholders, and show that they can reflect on the possible consequences of considering diverse stakeholders in their project.

5.2.3. Stakeholders Values Elicitation

While students are usually introduced to methods for the elicitation of design requirements from diverse stakeholders, these methods do not necessarily address the stakeholders' underlying values. This teaching activity helps students to plan and perform elicitation activities with stakeholders that address values, and to analyse the results. In the teaching activity the students practice the skills to plan and perform interviews with diverse stakeholders to elicit their values related to a specific product, system, or service, or to a set of similar products, systems, or services. The activity is based on the Socratic questioning structure (Robinson, 2017), and the repertory grid and the laddering technique (Kelly, 1991) where the stakeholders are asked about their appreciation of one or more products, systems, or services. This is done by structuring the answers from the interviewees on three levels: attributes (e.g., “light,” “hexagonal shape,” or “soft texture”), functions (e.g., “simple to use,” “not expensive”), and values (e.g., “control,” “ownership,” or “comfort”).

By doing so, the students gain a deeper understanding of how values relate to consequences and attributes. The teaching activity could also be used as an evaluation method to understand whether a designed product, system, or service fulfills the goal to support certain values according to the stakeholders. In this case, the students should have identified and described the intended values of the design before performing this activity. At the end of the activity, they will compare their intended values with the values as experienced by the stakeholders.

5.2.4. Mapping Value Landscapes

In contemporary society, we are facing complex challenges that can no longer be addressed by individual designers or design teams. Addressing challenges such as sustainability, the energy transition, and obesity requires a multi-stakeholder approach. When working on such challenges, students should be aware of and understand all the direct and indirect related stakeholders that might have stake or influence the challenge, even though they might not be able to actually run a multi-stakeholder project and meet all these stakeholders. Hence, students require competencies to explore the broader perspective on people and the societal context in which products, systems, or services will be integrated. In case students lack these competencies, they might not consider the ripple effect of their designs, which could have unforeseen consequences, such as excluding specific user groups. Moreover, with such complex issues, there is a fair chance their design solution will be experienced as rather naïve, or their design will never end up in practice, if they ignore the multi-stakeholder perspective.

In order to gain such a broader perspective on people and the societal context, they can create a stakeholder value landscape. A value landscape visualizes the (key) stakeholders and beneficiaries related to the challenge/topic at hand, as well as the key values that they hold and share and how they differ between the different stakeholders. The stakeholder value

landscape aims at showing basic values, which Schwartz calls those trans-situational goals that guide people to live their lives (Schwartz, 2012), but it also shows other meaningful and valuable relations stakeholders have, both intangible (e.g., needs, feelings, expressions), tangible (goods and services), financial (money), or in the form of information.

Creating stakeholder value landscapes can be done in various ways, depending on the topic at hand, the intended outcome and the availability to meet stakeholders. A very well known example is the “value flow model” by Ouden den and Brankaert (2013), although they put less emphasis on basic values. There are many more (expressive) forms of value landscapes that can be made to explore the challenge. See the provided slides for various examples. The mapping is best done after having done the initial research phase so students can have some understanding about the stakeholders involved.

5.2.5. Project Values Identification

Becoming aware of the underlying project values at the beginning of a project—even before the idea sketching phase begins—is just as important as identifying the problem situation or design opening that students are designing for. Upon entering the second half of the first diamond in the Double Diamond design process model (Design council, 2021), students review their user research data through for example an affinity diagram (Interaction design Foundation, 2021) and identify four underlying project values. In this analysis phase, most experienced designers might have a gut feeling what the underlying project values are. However, this teaching activity makes it very explicit by enabling a design team to anchor what they identify as the four main project values in their empirical research.

The four project values should be regarded as provisional, and can serve as material for discussion throughout the design project. For example in a dialogue with stakeholders, where the student group later can introduce stakeholders to the project values, and negotiate the project values through an iterative process. Furthermore, the project values might serve as triggers for a discussion with stakeholders how to deal with value tensions, and how to concretely manifest the project values in a product, system, or service.

5.2.6. Value-Based Reformulation of the Design Draft

To our experience, students have a hard time critiquing design briefs and maps (e.g., value landscape map, mindmapping), as well as assessing the values in a design brief they receive. They tend to take what is explicit for granted and to ignore the untuned. A design brief is defined here as the formulated demands and expectations of the project provider, e.g., the client.

This activity teaches students to work with toned and untuned values in a design brief. By “toned” values, we mean values that are explicitly mentioned in the design brief (such as the available resources of each stakeholder involved in the project). By “untuned” values, we mean values that are not explicitly mentioned in the design brief, yet that are implied; taking them into account may impact the project (such as power relations among stakeholders). The aim is not to broaden the design brief,

but to make better informed decisions on which values to take into account in the design process.

The teaching activity is performed after the Mapping value landscapes teaching activity, which results in a direct and indirect stakeholder analysis and a value landscape map, that is, the relations, objectives, ethical stances of stakeholders involved in the design project. The students analyse the value landscape map, which enables them to characterize untuned relations, and may lead to an evaluation and adaptation of some aspects of the design brief.

Example: Original design challenge: how to connect small and medium sized enterprises (SMEs) and expatriated partners. Through combining a value landscape map with reflections on all the relations that are not described in the previous description, the new design challenge can then for instance develop into: how can the region and a big company support local SMEs to find and hire new staff among expatriated partners.

5.2.7. The Game Changer

Designers and developers need to take responsibility and create products, systems and services that lead to positive environmental and social change. Nudging (Thaler, 2008) can be a way of creating change through a product, system, or service because nudging encourages people to act differently in ways that promote positive changes, sometimes in very unconscious ways, because of how salient qualities and features might influence behaviors. However, when designing for change, designers may tend to focus on designing for stakeholders who are already ready to become change agents. There might even be a tendency to design for some stereotypes in that regard. For example, when producing stereotypes around vegans and view them as “natural” change makers, when it comes to environmental issues.

Not everyone might be inspired to use new products, systems, or services that contribute to change. Simply because they are not motivated, and cannot associate themselves with being change makers. For example, why would a person who is into bodybuilding start to eat less meat, because it is good for the environment? Especially if the consensus within the bodybuilding environment is that protein contributes to building muscles, and that meat contains a lot of protein. However, what if a new design, or the way that a product, system, or service is introduced, could change a consensus within a specific group of stakeholders? An example of this is given in the video *The Game Changers*¹ where bodybuilders are convinced to switch to a plant-based diet. This is an interesting example of how visual language, combined with celebrity presence and expert knowledge might convince a group of stakeholders to change both convictions and their resulting behaviors. It basically changes the game for them. In this teaching activity, students will identify a stakeholder group, who they do not immediately recognize as the “natural” users of their product, system, and service.

Based on empirical research on a specific stakeholder group, students create personas (see Grudin and Pruitt, 2002, and Guan et al., 2021) that could be part of this “radical,” but potential new stakeholder group. Students will then imagine how their product,

TABLE 3 | Overview of the teaching activities related to the design process phase Synthesis in the pedagogical framework on teaching for values in design.

Pillar	Phase	Teaching activity
(II) Designers and stakeholders	Synthesis	T16. Value-based reformulation of the design draft
		T18. Constructing value based design requirements
		T17. The game changer

system, or service might create new ways of being and acting in the world from the point of view of the stakeholder. When imagining this, students will judge what kind of visual material and storytelling might be the most convincing in relation to the selected stakeholder(s).

Finally, when students have created visual material, e.g., a video, that works like a commercial for their product, system, or service, they will have an ethical reflection on how they argue for the change that their product, system, or service might create in the stakeholder’s life.

5.3. Phase 3: Synthesis

In this phase, research findings are clustered. Insights evolve and potential areas of opportunity are identified. Students build the foundation to frame and specify the initial design brief. The teaching activities related to the design phase research are listed in **Table 3**.

5.3.1. Design Team’S Value Identification and Hierarchy

If students are only able to take into consideration and orient themselves on the basis of their own individual value sets rather than a team’s shared value hierarchy, they run the risk of creating value tensions or conflicts within the team, the team’s design process and, subsequently, the final design.

This teaching activity helps students working in groups or teams to establish a common ground with shared and prioritized values. Furthermore, it helps students sort, hierarchize, and interconnect values into a value hierarchy for the group, where some values are in the foreground (primary values) and other values are in the background (secondary values). The value hierarchy is materialized in the Designers’ Value Hierarchy Map enabling discussion and reflection between students in the design team—as well as between teacher(s) and the groups—or group and stakeholders—about how their values come together with stakeholders, design contexts, etc. If students are not able to identify and arrange a shared and prioritized value hierarchy within their group or design team, they might end up with a design that is created based on a patchwork of more or less conflicting and unprioritized individual values, rather than a product integrating and expressing values in a prioritized and harmonious ways. When students have established a shared and prioritized Designers’ Value Hierarchy Map, they are subsequently better able to negotiate, work with and integrate indirect and direct stakeholder values.

¹(2019). *The Game Changers Official Trailer* (Video File).

Generally, the Designers' Value Hierarchy Map, is to be constructed before the group or the design team begins communicating and negotiating with stakeholders, in order for the design team to give stakeholders a clear and solid impression of the design team's values.

5.3.2. Design Team'S Value Statements Manifesto

Even if students as a group have established their values, they often find it challenging to know how to turn them into actionable principles for the group or design team in a design process and project. This activity helps students construct a shared value manifesto with design principles constituting the design team's design position and orientation in the design process. Furthermore, it helps students combine and classify their manifesto-like design principles into a unified value statement manifesto for communicating their attitude and approach to design as a design team. This helps the group or design team negotiate with stakeholders and make decisions in the design process.

The group's value statements are materialized on the Value statement workshop cards provided and in the Design team's value statement manifesto, enabling discussion and reflection between students in the design team—as well as between teacher(s) and student teams—or student teams, and stakeholders—about how their value-oriented attitude and approach is acted out in the design process with stakeholders, design contexts, etc. If students are not able to formulate how they want to integrate or act on their values in the design process or project, they run the risk of creating design conflicts or paralysis within the team, the team's design process and the final design product, system, or service. Here, the students need a shared design stance or argument in the form of a designers' value statements manifesto to guide their work.

When students have formulated shared and actionable value statements, they are subsequently able to engage in reflective value-oriented design arguments that can guide their design work with stakeholders. Generally, a Design team's value statements manifesto is to be constructed before the group or design team begins communicating and negotiating with stakeholders, in order for the design team to give stakeholders a clear and solid impression of the design team's design principles and approach.

5.3.3. Constructing Value-Based Design Requirements

As values are general in nature it can be hard for students to make them concrete and incorporate them into design work. In this activity the students will learn how to analyse the identified project values and construct specific design requirements, which play an important role in guiding a design process. The teaching activity is an adaptation of a method originally developed by van de Poel (2013).

In the teaching activity, the students formulate a value hierarchy consisting of three levels: (1) the project value (identified in a previous teaching activity), (2) the design objectives, and (3) the specific design requirements. By constructing a value hierarchy, the identified project values are systematically translated into design requirements, and

TABLE 4 | Overview of the 28 teaching activities in the VASE pedagogical framework on teaching for values in design.

Pillar	Phase	Teaching activity
III) Technology and design	Ideation	T19. Visualizing values in design with mood boards
		T20. Understanding value tensions
		T21. Identifying and resolving value tensions
		T22. Exploring values through extreme worlds
		T23. Re-designing for different cultures
		T24. Envisioning future scenarios
		T25. Contextualizing values through reflection in action

the value judgments involved become explicit, debatable, and transparent. Value judgment is defined here as the designer's opinion about whether something is good or bad, right or wrong. Making these judgments explicit allows for critical reflection upon the translations made, and enables the debate among the stakeholders involved. Moreover, a value hierarchy may be helpful in pinpointing exactly where there is disagreement about the specification of values in design. A value hierarchy makes design choices, and especially the implied value judgments, more transparent to other stakeholders, which is important because design usually impacts on others besides the designers.

5.4. Phase 4: Ideation

In this phase, students generate value-sensitive ideas based on their re-framed design brief through different ideation activities. Moreover, students choose ideas to produce in the form of prototypes. The teaching activities related to the design phase research are listed in **Table 4**.

5.4.1. Visualizing Values in Design With Mood Boards

The underlying values in products, systems, or services are manifested in use through e.g., their visual appearance, the symbolic language associated with them, or the different elements that they consist of. The underlying values may encourage and discourage people to act in certain ways when they interact with a product, system, or service.

A prerequisite for this teaching activity is that students work on a project and have already identified their project values. During the activity, the students are challenged to express the values and the intentions of their product, system, or service through visual means in order to support the prototyping process.

It is important that the students are able to reflect upon how they might integrate, embody, and manifest values in their design. If students are not able to find ways of embodying values in a prototype, the values behind the product, system, or service might not be obvious to the direct and indirect stakeholders.

Thus, in this teaching activity the students use a mood board as a prerequisite for a prototyping process to reflect upon how they would like their design to "speak" to different users and how their products, systems and services influence user

behaviors and lifestyles. The visual representations of values are collected in mood boards (a visual presentation or a collage that communicates a concept or an idea) that inspire further development of prototypes.

5.4.2. Understanding Value Tensions

Value tensions occur when different stakeholders have different values or value priorities, causing them to dislike elements of a product, system, or service that other stakeholders do like. To be able to design the product, system, or service in such a way that it is as much in line with all stakeholders' values as possible, the designer first needs to identify the value tensions.

It can be difficult for students to do this, because it requires an in-depth consideration of (the manifestation of values in) various design elements. As guidance in the process, this teaching activity provides an introduction to the Value Dams and Flows method (Miller et al., 2007), which is a method for identifying value tensions. By exploring what value tensions are, how the Value Dams and Flows method works, and taking the first steps toward working with this method, students will be equipped to identify value tensions in the future.

5.4.3. Identifying and Resolving Value Tensions

Value tensions occur when different stakeholders have different values or value priorities, leading them to dislike elements of a product, system, or service that other stakeholders do like.

To be able to design the product, system, or service in such a way that it is as much in line with all stakeholders' values as possible, the designer first needs to identify the value tensions. The designer can then consider how these tensions can be resolved, i.e., how to design for one value that is important to some stakeholders, without sacrificing another value that is important to other stakeholders. This is necessary to ensure that all stakeholders will appropriate the product, system, or service.

It can be difficult for students to identify value tensions, because (1) it requires stakeholder input about many different (potential) elements of the design, and (2) it requires a criterion for when conflicting stakeholder preferences are important enough to be considered a value tension. The Value Dams and Flows method (Miller et al., 2007) offers guidelines for this process. By applying the Value Dams and Flows method, students will be equipped to identify value tensions within their own project, and consider how these tensions could be resolved in their design.

5.4.4. Exploring Values Through Extreme Worlds

Most students are unintentionally including many implicit values into their designs. It seems hard to step out of one's world and question things that seem so natural and generally accepted, such as for example, considering autism as a disorder. But also the values underlying more everyday situations, for example when interacting with interactive devices like smartphones and tablets, often seem determined by unquestioned boundaries of values related to hedonism, achievement, and power.

Designing for extreme worlds is a technique that opens up new perspectives and possibilities by not taking commonly accepted starting points for granted, and questioning the status quo.

This can be done by (1) changing paradigms and norms, e.g., designing for extreme worldviews (e.g., Design a PDA for a world where dementia is blessing; van Dijk and Hummels, 2017), or (2) by focusing on different people to design for, e.g., designing for extreme characters (e.g., Design a PDA for a drugsdealer; Djajadiningrat et al., 2000).

– Extreme worldviews strongly deviate from prototypical and socially accepted ways of living, and are for now imaginary and speculative, such as a world where everyone has dementia, a world where the average age is 150 years old, or a world where people live in hibernation 9 months per year. This way, conflicting values which we might take for granted can be questioned through designing in this world (van Dijk and Hummels, 2017). – Extreme characters are the opposite of prototypical characters from a target group, which often remain emotionally shallow during the design process. Instead, extreme characters have exaggerated emotional attitudes and character traits, such as a drug dealer, the pope or a 3-time Olympic triathlon champion. This way, character traits can be exposed which can be antisocial or in conflict with a person's status, thus questioning personal values we might take for granted (Djajadiningrat et al., 2000).

On the one hand, this teaching activity can support opening up the design space and the creation of new ideas, and on the other hand it can support the awareness, reflection on and discussion of implicit values in design. Working with extreme worldviews and characters helps to reflect on and discuss implicit assumptions of new design ideas and concepts, by opening up new design spaces that trigger imagination and new views on values. It stimulates reflection on implicit values, questioning of trodden paths, as well as out-of-the-box ideation.

5.4.5. Envisioning Future Scenarios

When focusing on users and user experiences, students may approach their own or others' designs from a single, narrow perspective without realizing its potential impact on a broader society. Evidently, designs can have widespread consequences and long term effects on various stakeholders beyond the stakeholders initially imagined, both in positive and negative ways.

If students lack an understanding of the broad impact and long term effects of their designs, they run the risk of inadvertently causing more harm than good in society.

For this teaching activity, envisioning prompts are used as a tool for developing future scenarios to analyse and explain a use or user situation based on four criteria (stakeholders, time, values, pervasiveness). Each envisioning prompt will draw students' attention to a particular socio-technical issue that is important yet easily overlooked (e.g., diverse geographics, political realities, obsolescence).

The teaching activity builds on the Envisioning Cards (Friedman and Hendry, 2012a) developed by the Value Sensitive Design Research Lab at the Information School at the University of Washington. However, since these cards are not freely available, the main concepts are explained without requiring purchase of the cards.

5.4.6. Contextualizing Values Through Reflection-In-Action

In our experience, students seldom consider the act of making as a means for reflection, but rather as a way to demonstrate their ideas or concepts (which mostly takes place later in the design process). This teaching activity brings them to realize other uses of their design skills in the design process, namely reflecting-in-action on values engaged in the designs (output) and in designing (activity).

This exercise focuses on “making for exploration,” which is characterized by ambiguity and a lack of predetermined planning (Frens and Hengeveld, 2013), i.e., with no expected plan and result planned before starting making. Such making supports the designer to engage in a reflective dialogue with the material in order to ideate and reflect, and may therefore lead to reflection-in-action on values engaged in the design project.

In this teaching activity, the students are introduced to a value-based perspective (e.g., oppositions such as individualism vs. collectivism) or a worldview (for example, cognitive embodiment), and through making, the students reflect on the values and value stances addressed by the aforementioned value-based perspective. Instead of working toward an end product the focus in this activity is on the reflection-in-action.

5.4.7. Public Evaluation of Values in Design

Often students do not have the opportunity to present their designs at open events or public exhibitions and explain or argue for their design to a wider audience. When students do not get the opportunity to receive, integrate, and adapt feedback on their designs from a wider audience they might lack a broader value-check and validation of their values in design. By inviting external audiences to engage with and evaluate the values of the design, students are able to evaluate how successfully their products, systems, or services embody and communicate the intended values in a meaningful and appropriate way. And, subsequently, how successfully they themselves are in acting as responsible, value-sensitive designers.

This teaching activity supports students in presenting their products, systems, or services at open events or public exhibitions to external audiences. The exhibition focuses on students’ explanation, exemplification, and substantiation of their designs’ values and value sensitivity in order for them to interpret and integrate audience feedback into their designs. This gives students the opportunity to adapt their designs based on the feedback they received so they become more value-sensitive before presenting them to a client or direct stakeholders.

5.5. Phase 5: Evaluation

In this phase, students test their prototypes with a focus on values. The values are embodied in the prototypes, and, one by one, they are investigated together with stakeholders and reflected upon in order to improve the design solutions. The teaching activities related to the design phase research are listed in **Table 5**.

5.5.1. Re-designing Concepts for Different Cultures

Many designers are often not aware of the implicit culture-related values they incorporate into their designs. Semantic meaning related to color, forms, people, relations, etc. can be culturally

TABLE 5 | Overview of the teaching activities related to the design phase evaluation in the pedagogical framework on teaching for values in design.

Pillar	Phase	Teaching activity
(III) Technology and design	Evaluation	T26. Evaluating values in design with stakeholders
		T27. Public examination of values in design
		T28. Design after evaluation of prototype

specific and relate to social norms within a specific culture. Not being aware of these values can lead to embarrassing situations. For example, the translation of a Dutch Dick Bruna children’s book about “Betje Big” (Poppy Pig) to Turkish (Betje Big’in, Dogum Günü) changed the connotation completely, since the pig is considered unclean in Turkey.

We are moving toward a global multicultural world, which is asking designers to be more aware of cultural values and norms. Researchers like Geert Hofstede, a Dutch organizational psychologist renowned in the field of intercultural studies, developed culture and organization-related frameworks (e.g., Hofstede, 2010). These frameworks provide a starting point, but are not immediately transferable to a design. They do not say, e.g., whether colors and materials have the same connotation all over the world. That might require exploration and engagement with people from this culture during the design process.

This teaching activity supports students in getting an understanding of the role of esthetics in their designs, regarding the appearance and interaction in relation to different cultural connotations. Through learning about and designing for different cultures than their own and having their designs evaluated by people from another culture, students are sensitized to these often implicit cultural values, and supported to include them more consciously in their design process.

Overall, this activity supports students becoming aware of and more competent in addressing the complexity of values and the situatedness of values given a certain culture or setting.

5.5.2. Evaluating Values in Design With Stakeholders

When designing products, systems, or services, it is important that students invite stakeholders to evaluate and reflect together with them about whether their designs managed to integrate and express the intended and desired values. That is, students need to engage the stakeholders as a gauge to see whether they managed to act as responsible designers and successfully consider values in design. If students do not present their designs to stakeholders they will lack validation of their value-sensitivity as well as the value-sensitivity of their designs.

Through evaluating values in design together with stakeholders, students go full circle by returning to their values, stakeholder values, the values of the design context and the values of the design project. In doing so, they reason, judge, and reflect on whether values were appropriately and attentively embedded in the product, system, or service.

Overall, the teaching activity provides students with arguments for the suitability and value sensitivity of their designs, allowing them to judge if there is alignment between

the values identified at the beginning of the design process and the values the stakeholders experience in the product, system, or service.

For this teaching activity, students and stakeholders meet in a workshop where the product, system, or service is presented, tested, and discussed in order to evaluate values in design.

5.5.3. Design After Evaluation of Prototype

A product, system, or service is never fully finished, in the sense that it needs iterative or incremental design and development after it has been appropriated into the use contexts that it was directed toward. At the end of a design process, when students are evaluating the reception and impacts of their designs in use, they can perform this activity as part of the evaluation phase.

To maintain the students' critical perspectives on the impacts of their product, system, or service, and the values that it generates in real-world/real-life contexts, students should reflect upon the results of the stakeholder evaluations of their prototypes and how they might differ from the original visions behind a design.

Additionally, students will predict a few potential impacts of their product, system, or service on the contexts in which it is deployed. They will set up criteria for how they might evaluate the impacts of their product, system, or service, and how different stakeholders have appropriated it to fit their user contexts.

The students bring the prototypes to the use contexts and bodystorm (Oulasvirta et al., 2003), or do contextual inquiries (Beyer and Holtzblatt, 1999; Holtzblatt et al., 2005) with their prototypes in the different use contexts in order to evaluate them together with a selection of stakeholders.

The students will also discuss which parts of their product, system, or service that might need to be changed or modified later on, based on the different appropriations that they might discover in the evaluation phase.

The teaching activity ends with a proposal for how the students might follow up on the development of their product, system, or service after it has been used for a while. In other words: how they might assess future use patterns and their consequences.

6. DISCUSSION

Most approaches in related work on ethics and values in design and HCI deal with values rather than value, which goes in line with our intention to make designers aware of the influence of their designs, take responsibility, and be able to reflectively address the role that values play in design. However, values and value are not completely disparate concepts. Therefore, it may be necessary to explain to students what the connection between value/worth and values could be, especially in the context of working with businesses. For the collection of teaching activities presented here, we mainly focus on values and how these may also relate to ethics and morals.

Also, most approaches found in related work focus on the values in the product rather than the process. However, Values-led PD also focuses on values during the process (Iversen and Leong, 2012). This is not surprising since stakeholders are closely involved in the process of PD. However, whenever working

directly with stakeholders in other approaches, it may also be useful to consider values (and even value) in the process. While we do think it can be useful in many educational programs to consider approaches that focus on values in the process, such as (values-led) PD.

There is a split between approaches that focus mainly on understanding and accommodating for stakeholders' values, and those that focus more on understanding and expressing designers' values. To provide students with a full understanding of what it means to address values in design, we argue that we need to incorporate both.

While Values at Play (Nissenbaum, 2021a) and Value-sensitive design (Friedman and Hendry, 2019) have been taught to students, Values-led PD (Iversen and Leong, 2012) and Worth-centered Design (Cockton, 2006) have mainly been used only by experienced designers, even though we are aware that they have introduced it in some courses. However, we have not been able to find any articles describing how to teach these approaches in detail.

When teaching students about values in design, it may be useful to determine whether one wants to work with a certain set of values, such as those defined by Rokeach (1973) and Schwartz (2012), or whether one wants to leave the concept of values more open. Here, we do not think we should adhere to a certain framework of values. Rather, we suggest making students aware of the different frameworks. Furthermore, it can be important to decide whether one wants to delve deeper in the different kinds of values and how they may or may not relate to morals and ethics. In Value-sensitive design (Friedman and Hendry, 2019) for example, the focus is mainly on values that have moral implications, rather than on all possible values.

6.1. How to Apply Teaching for Values in HCI in Practice

The collection of 28 identified challenges throughout the design process and the suggested inspirational teaching activities presented above, are extensive. We are aware of that it is difficult to implement all of this in one single course, and that is not the intention either. We would rather see this as an inspirational educational resource, where it is possible to pick and choose what is needed, and what fits into the existing curriculum. There are many considerations to take when planning to teach about values in HCI and design that will influence how the course will be set-up. Such considerations include:

- Who are they following. For example: design students, engineers, social scientists, computer scientists.
- Length of learning activity, course. For example: introductory workshop, 8 week course.
- Level of knowledge of the students in relation to values and/or design: beginner or more advanced.
- Attitude and intention of the course (vision): ranging from providing knowledge to indicating the role of activism (active or pro-active).
- The dimensions of knowledge, skills, and attitude that need to be taught (competences, and through lines), e.g., Awareness activities pointing out that values are a part of design, Investigating diverse (own and stakeholders) values Designing

for (diverse) values, Evaluating values, Coverage of different design phases, and teaching a balance between knowledge, skills, and attitude.

The collection of design challenges and accompanied inspirational suggestions for teaching activities can be used in several different ways, some of them described below:

Select specific stand-alone activities

Teachers can explore the overarching learning objectives for each activity and select those that are the most relevant to their discipline, curriculum, or course. The learning objectives are described in broad terms, while the teaching activities connected to each of the learning objectives execute them in concrete ways.

Create in-depth learning pathways

Teachers can combine concrete teaching activities that move students from a simple (unistructural) to a complex (extended abstract) level of understanding of values in design within a specific pillar in accordance with the SOLO taxonomy (Biggs, 2003). Each of the three pillars represent core areas of teaching for values in the design of technology connected to specific design process phases. Integrating learning pathways in teaching allows students to build deeper knowledge, skills, and attitudes progressively to acquire a desired set of competencies within a specific pillar.

Give students a broad foundation

Teachers can combine concrete activities across all three pillars and design phases that create a broad foundation for students to become more responsible designers. Creating a broad foundation within a certain level of understanding allows students to develop a more holistic approach to values in the design of technology in relation to a select level of competence.

Whatever way is chosen to apply teaching for values in the design of technology, it is important for teachers to adapt and appropriate the teaching activities (as described more in detail in the open educational resource, VASE, 2021) to fit their specific educational context (Hendry, 2020; Nilsson et al., 2020).

6.2. Consequences of Teaching for Values in Design

In a recent study, an adapted version of the teaching activity Envisioning future scenarios was used in order to identify the large-scale effects of teaching values in design (Kok et al., 2021). One traditional scenario was developed (Rosson and Carroll, 2002), and two value scenarios (Nathan et al., 2008), using prompts divided into four envisioning topics: direct and indirect stakeholders, time, values, and pervasiveness (Friedman and Hendry, 2012b). While the traditional scenario mostly considers the obvious and desirable consequences of teaching values in design for direct stakeholders, the value scenarios reveals less obvious, unintended, concrete, and long-term effects, both good and bad. It demonstrates that individual classroom outcomes are not the only important consequences one's teaching may have (on students nor on society). Rather, the way education shapes students continues to play out beyond the classroom and throughout their professional lives. Envisioning can help clarify in what ways students as well as indirect stakeholders could be affected by teaching, and can therefore be an effective

tool to use when planning teaching. However, we are aware of that over time, the political significance of educational approaches will change, and that we can never envision and imagine the full implications of our teaching or educational designs (Winner, 1999; Tromp et al., 2011; Kok et al., 2021).

Results from piloting one or several of the 28 teaching activities, indicate that teachers involved in the pilots experience professional development within teaching for values in design, a qualitative update of the design curriculum, and increased capacity to teach for values in design in relevant and innovative ways. The participating students have reported that they experience achieving knowledge about how to understand and act ethically on human values in design. From the initial trial period of evaluating pilots through questionnaires, we have seven responses from teachers. In those responses, over 70% indicate the highest relevance possible regarding the question “To what extent was this material relevant to you?,” and 86% indicate high on the question “To what extent do you experience increased capacity to teach value sensitive design in relevant and innovative ways?”. From the initial trial period of using the student evaluation questionnaire, we learned that 90% out of 30 students indicate high to the question “I have learned something about working with values in design that I consider valuable for my professional development”. However, we soon decided not to provide a separate evaluation questionnaire for each activity, but instead add one question to the respective universities mandatory course evaluation forms. In one example with 35 students, 78% answer very great or significant outcome to the question: “To what extent do you experience achieving knowledge about how to understand and act ethically on human values in design?” For shorter interventions, such as a guest lecture in a university that was not a partner of the project, an exit ticket was provided asking the students to list three things they have learned during the lecture. The answer to this was e.g., values, design values, and ethics. So, in that sense, early results indicate that we have achieved what we set out to do, to educate more responsible designers. However, not all teaching activities have been through this evaluation, and the activities have so far only been tested in a limited number of educational contexts, why more work is waiting ahead, such as large-scale testing in other educational contexts and cultures with non-Western value systems. We further acknowledge that values are of course but one angle on teaching how to become a responsible designer—many other angles exist.

A final limitation to this work is that in the identified challenges, we outline students' approaches through our unique perspective as teachers in higher education. This is due to that we have used a modified version of the pedagogical design pattern approach (Goodyear, 2005; Laurillard, 2012), in order to elicit existing best practice from teachers and from related work found through desk research. Other approaches could have been applied in order to incorporate the students perspective better, such as a collaborative approach to the design of learning goals and teaching materials. Active participation of stakeholders is the basis of Participatory Design (Simonsen and Robertson, 2012), and could have been applied by e.g., to introduce the students to values and ethics in HCI and ask what they believe a responsible

designer of technology is, and what a responsible designer needs to know and should be able to do. Acknowledging that involving students in the assessment process is a key attribute for students' motivation to learn (Falchikov, 2004), we leave this collaborative approach as a suggestion for future work.

7. CONCLUSION

In this article, we have argued for the value of teaching for values throughout the whole design process, as a mean to educated more responsible designers of technology. We have identified insufficient hands-on teaching activities throughout the design process, and especially in the later parts of the process. In this article, we argue for the importance of teaching for values throughout the design process, by identifying a unique collection of 28 challenges accompanied by inspirational suggestions for teaching activities tackling these challenges related to values and ethics in HCI. Participants in various types of pilots of the suggested inspirational teaching activities experience achieving knowledge about how to understand and act ethically on human values in design (student perspective), and increased capacity to teach for values in design in relevant and innovative ways (teacher perspective). However, it can be discussed whether we have covered all parts of the design process. For instance, we have less teaching activities in the phases synthesis and evaluation than in values theories, research, and ideation. This does not mean that we consider these less important, but rather that it has been

more difficult to design activities for these phases. We see this collection of challenges related to ethics and values throughout the design process and the inspirational teaching activities as a first start to educate more responsible designers of technology, and invite members of the HCI community to test, critique, and complement this work.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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