Design and Technology Education: An International Journal

24.3

Design for the well-being of domestic animals: implementation of a three-stage user research model

Pınar Kaygan, Middle East Technical University, Turkey

Gülşen Töre Yargın, Middle East Technical University, Turkey

Abstract

This paper presents how we, as design educators, integrated user-centeredness into a design studio course project that is concerned with improving well-being of domestic cats and dogs. Since the primary users of the project were identified as domestic animals, we carried out the project in collaboration with experts from a veterinary medicine school who study animal behavior. We developed a three-stage user research model to enable students to familiarize themselves with the physical and emotional needs of the animals at the beginning, and test their prototypes with the users in both the lab and home contexts during the project. The empirical basis of the paper comes from the interviews we conducted with 12 students who participated in the project, in order to explore their experiences of designing for animals. The paper shows that including animals in a design process as participants, through iterative trials in the real use context, serves as a good strategy to not only overcome the challenges of designing for animals, but also teach students the importance of user-centeredness and building empathy in design in a broader sense.

Keywords

Well-being, design for animals, user research, user test, collaboration, design education, animal-computer interaction

Introduction

Over the years, there has been a transformation in the scope and definition of design activity. With integration and pervasiveness of technology in products and services, the focus has been shifted from object to user and experience as the major subjects for design (Giacomin, 2014; Hassenzahl & Tractinsky, 2006; Redström, 2006; van der Bijl-Brouwer & Dorst, 2017). This shift has also impacts on higher education in design as well as primary and secondary education. At undergraduate level design education, there have been

efforts to integrate topics, such as human factors, ergonomics and user research (e.g. Bødker & Klokmose, 2012; Hanington, 2010; Vorvoreanu, Gray, Parsons & Rasche, 2017; Woodcock & Flyte, 1997). At lower grades, in a similar way, importance of considering users' needs, wishes and values in the design process is highlighted through design and technology courses in the curriculum (DfE, 2015; Nicholl et al., 2013; Klapwijk & Van Doorn, 2015).

Within the later stages of this user-centered shift, especially in the last two decades, the attention has been transferred from usability and pragmatic qualities of user-product interaction to more hedonic aspects such as pleasure and joy (Blythe & Monk, 2018), and eventually to improving quality of life and well-being (Calvo & Peters, 2014; Desmet & Pohlmeyer, 2013; Hassenzahl, 2018). According to the World Design Organization (2018), improving well-being is also considered as one of the major goals for industrial design among the Sustainable Development Goals identified by United Nations. Accordingly, there are many examples of design for human well-being. Focusing on animal well-being, however, is a fairly new issue within both design practice and education (Mancini, Lawson & Juhlin, 2017; Hirskyj-Douglas, Pons, Read & Jaen, 2018). The study of animals and animal behavior for developing products dates from much earlier with examples of technologies and products designed for animal use in different fields such as agricultural engineering, cognitive psychology and animal behavior (Mancini et al., 2017). Studies in these fields have generally focused on the outcome of an animal's interaction with technologies and products, for example, with the aim of increasing animal productivity or investigating animal cognitive structures in order to make inferences about human cognition. In that sense, they serve for the benefit of humans rather than having animals at the center and improving their life quality and well-being.

Animal Computer Interaction (ACI), as an emerging area, aims to support the development of interactive technologies by focusing on animal well-being through accommodating their physiological and psychological needs. With this agenda, it is established as a field that criticizes the aforementioned anthropocentric view in design for animals (Mancini, 2011). In ACI, various tools have been developed to provide playful interactions with animals and humans, monitor their health and behavior, and support animals that work with or for humans in tasks such as caring or rescuing (Hirskyj-Douglas et al., 2018). Since, in these cases, the human is still considered as a critical stakeholder in the interaction, validity and possibility of animal-centeredness and consideration of animals' actual needs are questioned for the area of ACI (Mancini et al., 2017). Likewise, animals' inability to express their needs and expectations may hinder taking their real needs into account, thereby causing power inequality between the designer and the animal in the design process (Lawson, Kirman & Linehan, 2016). Therefore, having a participatory design process in which the animal is considered as a genuine stakeholder remains questionable.

In 2017-18 fall semester, we, two design educators, decided to devise a design studio course project that focuses on design for animals with third year industrial design students. From design education perspective, we saw potential for raising design students'

awareness of user-centeredness through designing for animals by enabling them to experience collaboration with domain-specific experts. Our discussions with an academic veterinarian, who later contributed to the project as an expert, also encouraged us to explore these potentials to improve the well-being of domestic cats and dogs. Being an expert in animal behavior, she explained to us how the existing products do not fully satisfy the emotional and physical needs of cats and dogs, except few expensive products that cannot be afforded by many owners (see for example enrichment toys such as Kong Classic, other interactive toys and exercise equipment for pets produced by firms such as Nina Ottosson, and technology integrated products such as FitBark, Whistle, CleverPet). With her support, we formulated the underlying question of our design brief as follows: How can we design for cats and dogs with the aim of improving their well-being, by placing them at the center of the design project? By doing this, we wanted our students to explore and care for the 'needs and expectations' of a user group from whom they have very different emotional and bodily experiences.

In this paper, we present how we integrated user-centeredness into this animal well-being project. To achieve this, we draw on both our formulation of the project, and the interviews we conducted with our students to understand their interpretation of the experience of designing for animals. In the following sections, first, we outline the structure of the course by explaining the objectives of each stage. Then, we present our methodological approach by explaining the interviewing and data analysis processes. Later on, we report students' overall perceptions about the project and the three user research stages. Finally, we discuss our findings by underlining their implications for design education and practice.

The design project: product family for improving well-being of cats and dogs

Our university-based, industrial design studio activities have been shaped by our concern of providing our design students with real life encounters with diverse partners from various professional and educational organizations, i.e. manufacturing companies and non-profit organizations (Börekçi, Kaygan & Hasdoğan, 2016; Börekçi & Korkut, 2017; Kaygan, Demir, Korkut & Boncukçu, 2017). In these projects, we collaborate with experts whose professional experiences support us in achieving the learning objectives of the courses. This project was carried out at Middle East Technical University, Department of Industrial Design in collaboration with Ankara University Faculty of Veterinary Medicine, Department of Physiology, Behavior Clinic, during the 2017-2018 fall semester, as part of the third-year industrial design studio course. At the planning stage of the project, the expert from Ankara University explained the problems regarding existing products in the market: there is a limited number of products available that are developed for improving well-being of cats and dogs. Yet, since these products are (1) found expensive by owners, and (2) have limited life cycles as they cannot be upgraded or customized according to the changing needs of the animals, this creates a demand for low-cost sustainable solutions which can be easily afforded by owners. Addressing these problems, in this project, we asked our

students to design a product family for improving emotional intelligence and well-being of cats and dogs, considering animals' daily routines, physical needs and behavioral patterns, as well as their emotional and instinctive motivations. The product family involved three products for different activities such as feeding, exercise and playing.

Table 1 summarizes the stages and activities we planned for the project. As design educators, this was the first time we planned a design studio project that takes non-humans as its users. In every studio project, we ask students to interview and, if possible, also observe the user group to understand their experiences, perspectives and needs. In this project, since students would design for a user group that cannot provide verbal feedback, we placed further emphasis on observing the user. We developed a three-stage user research model, which consists of (1) explorative home visits, (2) lab trials with experts, and (3) home trials. Table 1 shows where these stages are located within the project schedule.

Table 1: Project schedule and weekly activities

Project stages	**Weeks #**	**Activities**
Insight Generation	1	Literature search on existing products, animal behavior, caring and training
		Seminar on animal behavior
		User research task 1: Explorative home visits
Idea Generation	2	Identifying design directions
		Idea generation workshop
Detailing & Evaluation	3-4	Low-fidelity prototyping of preliminary ideas
		User research task 2: Laboratory trials with experts
	5	Preliminary evaluation
	6	*User research task 3:* Home trials and owner feedback
	7	Detailing and final screening
	8	Final evaluation

The project was carried out with 24 students (20 women and four men) in eight teams and lasted for eight weeks. Teams started the project by carrying out internet research on existing products, Do-It-Yourself solutions and games for cats and dogs, as well as typical behavioral attributes and physical actions, caring and training of cats and dogs. Following this, they carried out the first user research stage and then decided whether they would like to design for cats or dogs.

As demonstrated in the above table, there were three user research tasks. First, in the *explorative home visits*, students visited owners' homes to observe the context of use, and to understand animal needs from the perspective of owners by interviewing them. In this first user research stage, students explored animals' environment, products used by them, their daily routines, stuff and places they like or dislike, and activities they do when owners are not home. We provided students with the following directives to follow during the observations:

> The aim of this visit is to understand the daily routines of cats/dogs by interviewing the owner and to identify the products that are used by/for the pet in their original context. Ask the owner to show you all relevant items. These items can range from the products that belong to the pet, such as toys, food and water bowls, collar, other accessories, cleaning and hygiene products, to the ones that belong to the owner but are shared with the pet, such as a piece of furniture, a blanket, etc. In addition to these items, you can also ask the pet's favorite places within the domestic environment.

In addition to this, we also prepared an interview schedule to guide students during their interviews with the owners. The schedule included the questions below:

- Can you please describe a typical day of your dog/cat starting from the morning when s/he wakes up? What kinds of activities does s/he do daily?
- What kinds of products does s/he use during these activities? Can we see them?
- Does s/he have a favorite item (among the ones you show or the ones that does not belong to him/her)? How does s/he use (or play with) it?
- What kind of things/objects does she like?
- Where is his/her favorite space at home? Why do you think s/he likes there?
- How does s/he spend his/her time when you are away from home?

Teams reported their research outcomes on posters, as illustrated below by Figure 1.

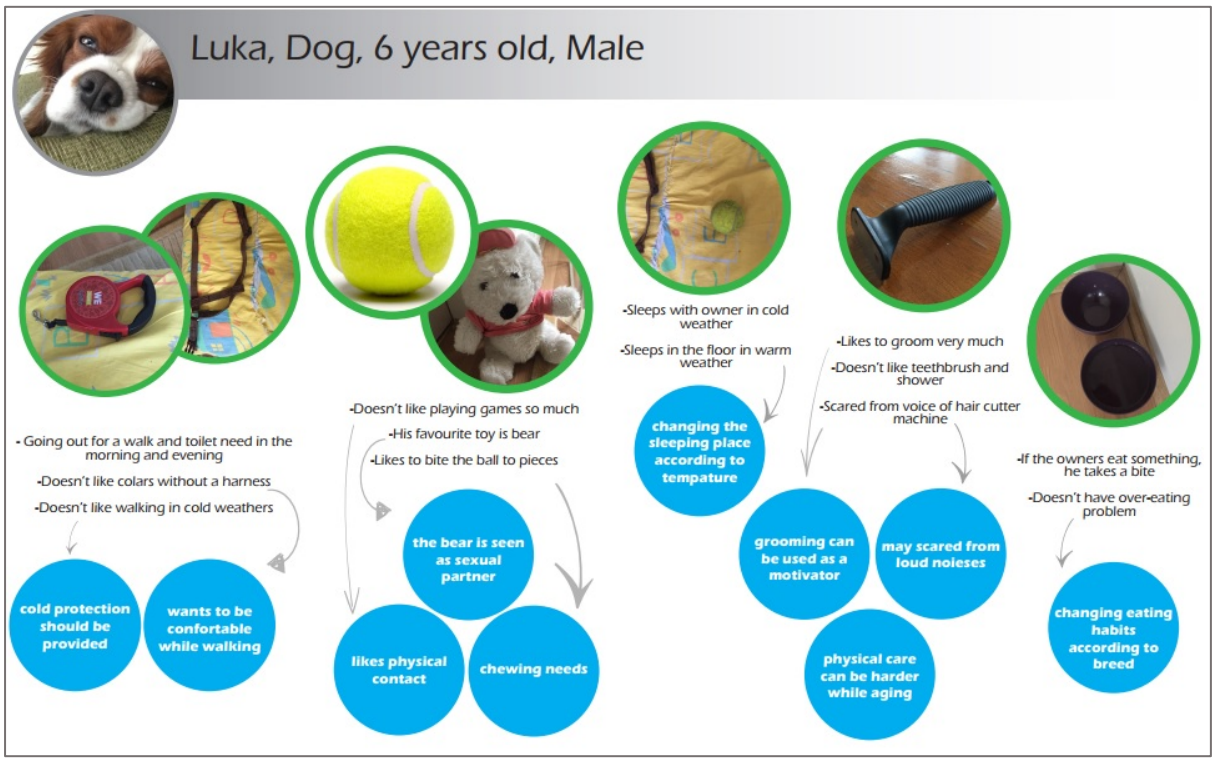

Figure 1. Findings derived from a dog's home visit by Koray Canlar, Melek İnür and Seren Sandıkçı.

In the third week of the project, students prepared low-fidelity prototypes of their preliminary design ideas for the second user research stage, which is *laboratory trials with experts*. The prototypes were tested by cats and dogs at Ankara University Faculty of Veterinary Medicine, Department of Physiology under the supervision of two academics in Behavior Clinic Laboratory. Before the laboratory visit, we asked teams to build the *working* mock-ups of all members of their product families, whenever possible, using actual materials that they plan to use or use similar materials that can simulate the qualities of the actual materials. Each team had 20 minutes to test their prototypes with the cat/dog invited by the experts, and receive feedback from the experts on their product family (Figures 2 and 3).

Figure 2. Gofret is trying to reach the food in the feeder

Figure 3. Gofret is playing with the toy

During these laboratory trials, we, as design educators, were present merely as observers, being careful not to distract the animals, for whom concentrating on the products was already difficult. Trial sessions were video-recorded by ourselves, so that students could watch them again and again later to improve their products. After the sessions, students were asked to organize their notes taken during the trials by considering the positive and negative aspects of their designs, and to propose areas for improvement.

In the sixth and seventh weeks of the project, following the preliminary jury after when students start design detailing, teams carried out *home trials* with their high-fidelity prototypes. In this third user research stage, students visited homes to try and test their projects with animals in their real contexts, where they feel comfortable, and concurrently received feedback from owners by observing the animals together (Figure 4). We advised students to shoot as many photos and videos as possible to be able to show the interaction of the animals with their designs, since it was not possible to bring cats and dogs to the final evaluation jury. After the home visits, we again asked students to consider positive and negative aspects of their designs and areas for improvement in light of the feedback they received on their improved prototypes.

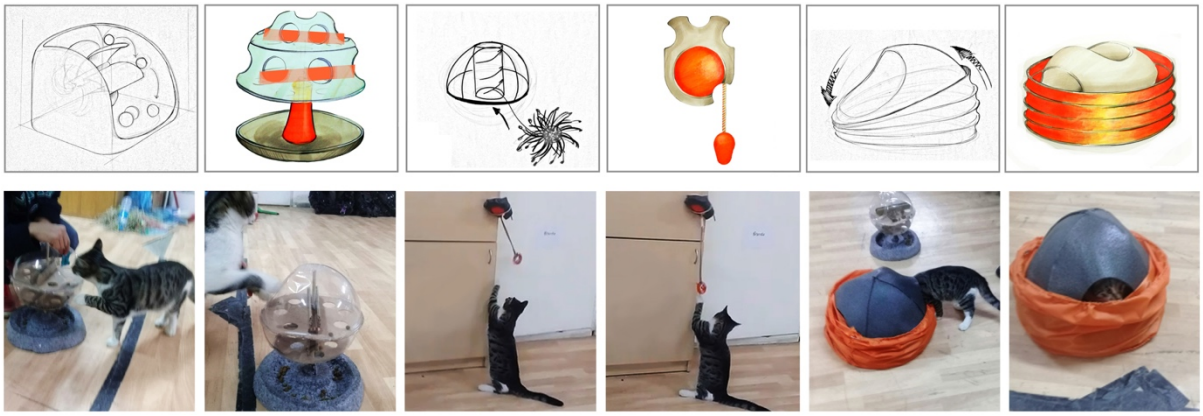

Figure 4. Photographs from home trials and sketches of the evaluated concepts by Dilara Erdoğan, Nihan Öztürk, İrem Yörükoğlu

At the end of the eighth week, the project was finalized with a final jury. Starting from the beginning of the project, we emphasized that this project focused on the well-being of animals and the target group was animals themselves rather than their owners. Throughout the project, we kept reminding students the centrality of the animals. Figure 5 demonstrates the final presentation board of a team, which designed for guide dogs for visually impaired people by particularly focusing on the tiresome and busy lives of guide dogs.

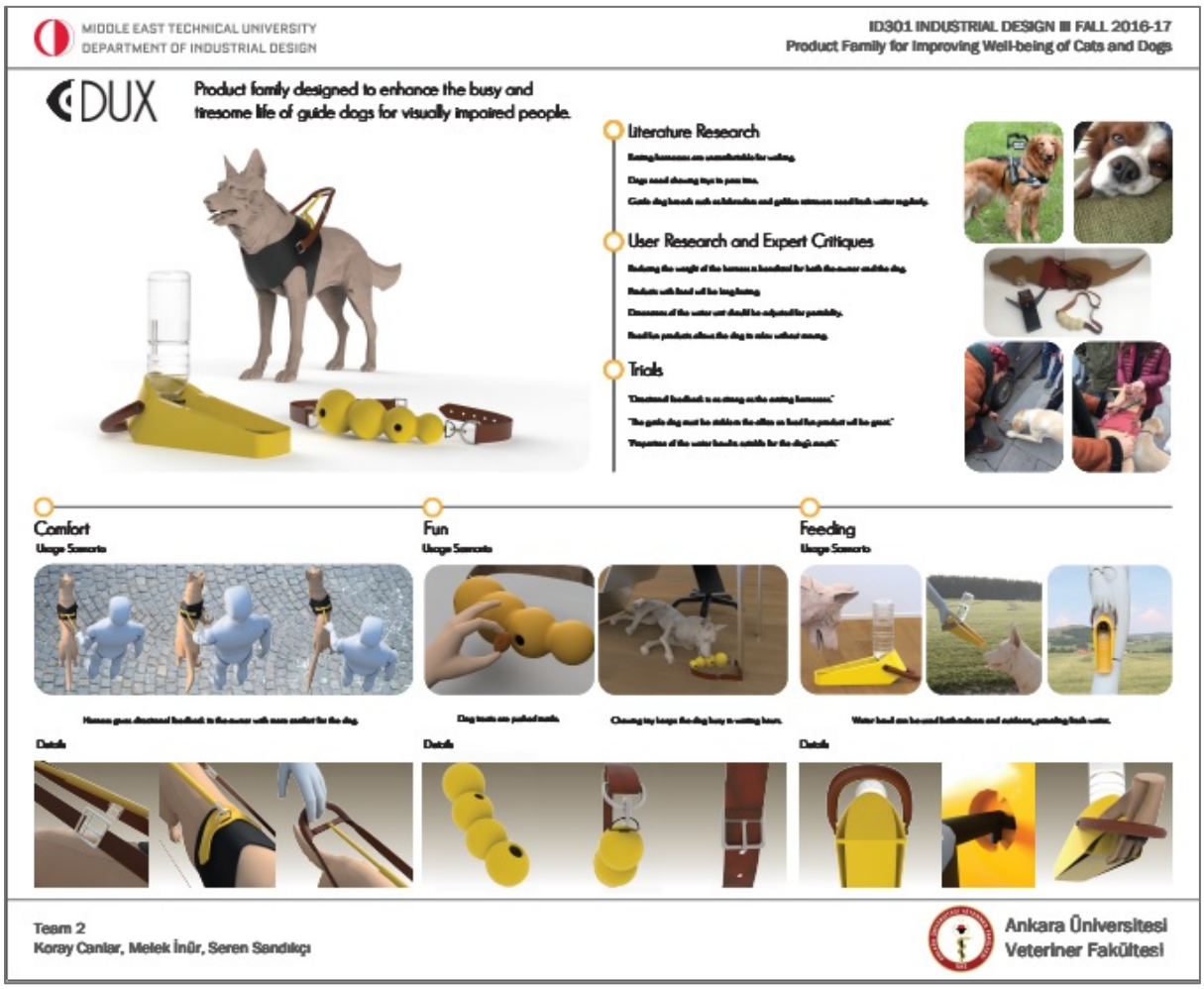

Figure 5. Dux product family for guide dogs

Research design

Since this research aims to explore students' perspectives on their learning and design experiences, our epistemological stance was interpretivist. Adopting an interpretivist stance requires researchers to gain a deep understanding of how participants make sense of their experiences within the given social context. To this end, we carried out semi-structured interviews with 12 out of 24 students (10 women and two men) who volunteered to take part in our research. In the selection of the participants we paid attention to include at least one student who have demonstrated full participation during the semester from each team, and to ensure the representation of both women and men students. We invited students to interviews via e-mail, explaining the aim of the research and how they will contribute by talking to us. The interviews were conducted almost a year after the project ended, in November and December 2018.

Before the interviews, we prepared an interview schedule, which covered questions regarding (1) the evaluation of the overall design process and each single stage of the project, (2) how and to what extent designing for animals is different from designing for

human beings, (3) the skills and knowledge gained in the project, (4) how the focus on well-being was perceived by the student, (5) what would the student do differently, if s/he did the project again, and (6) the student's recommendations for us to improve the project. Interviews lasted between 20 to 40 minutes. All interviews were audio-recorded and were fully transcribed to be coded line-by-line.

As typical in interpretivist tradition, our aim was not to generate findings that can be generalized to the entire population. Instead, through in-depth data collection and analysis, our goal was to make conceptual inferences about designing for a non-human user group in order to trigger a new theoretical discussion on user-centered design, in both education and practice (Kvale & Brinkmann, 2009). Aligned with our research perspective, we carried out thematic analysis. In the first round of the analysis, two authors of this paper read the transcriptions and came up with themes separately. Then we explained the themes to each other and developed an outline. Doing this, we aimed to conduct 'analyst triangulation' to avoid individual priorities and biases (Patton 2002, p. 556). In the second round one author carried out a more detailed line-by-line coding following the outline, carrying the codes and related quotes to a spreadsheet in MS Excel to identify the most relevant and frequent themes. In order to illustrate and provide evidence for the findings, excerpts from interviews were selected and added into the analysis section, after being translated into English.

Analysis of the interviews

The project was identified as "challenging" by all participants due to the involvement of non-human users on three grounds. First, particularly for the students who did not live with cats and dogs before, it was very difficult to understand the needs, expectations and feelings of the user group in the absence of verbal communication. They identified animals, particularly cats, as unpredictable. Some students explained that they selected dogs as their user assuming that they will be more predictable and easier to communicate compared to cats. Since interviewing has been the most common and practical method for the students to get to know the user in their previous design projects, being unable to talk to the animals was their main concern at the initial stages of the project. Second, students stated that they find it challenging to design for a different body, with different capabilities, postures and ways of interacting with a product, of which they have no personal experiences to reflect on. In explaining this, some students said that although verbal communication with the user would be missing when designing for babies and small children as well, at least they share the same anatomy with them. However, for them, animals' actions, body movements and the ways in which they interact with products were completely illegible. Third, almost all participants indicated that the limited number of products available in the market for domestic animals, and the lack of available literature on their needs and development prevented them from carrying out an in-depth background research on this user category.

All students highlighted that the role of intense user research helped them to overcome these challenges throughout the project. Since there was almost a year between the end of the project and the time of the interviews, we asked what participants remember regarding the project, and then reminded the project stages to ensure a full account of their reflections on all three user research stages. Overall, the first stage, explorative home visits, was described as a "conventional" initial user research assignment that aims to get students familiar with the user, the use context and the most common issues and concern that users can identify regarding the project topic. In the interviews, students did not place much emphasis on the significance of the first stage, stating that all studio projects begin with this stage and they consider it a standard practice. In a couple of sentences, for example, a student explains below how her team benefited from the explorative home visits, where they interviewed the owners and made observations on the products used by their cats and dogs:

> I've never had a cat in my life. I didn't have much information about them either. However, we went to different people's homes and observed their cats, more than once. So, how does she [the cat] interact with a product? What does she need?

The other two stages, which are the laboratory trials with experts at Ankara University and home trials that teams have carried out after the preliminary jury, on the other hand, were underlined many times in the interviews. In response to our various questions on the most critical stage of the project, the most pleasurable stage of the project, and how students overcame these challenges, these two user research stages were mentioned as key by the participants.

In the laboratory trials, two experts brought a cat and three dogs to test the prototypes of the teams. In the selection of the dogs they took into consideration the different types of dogs addressed in the projects, puppies, very active dogs, and guide dogs, to make the tests as realistic as possible. Overall, for the teams who design for dogs, the interaction with the animal worked very well and they received good feedback. However, Kofi, the cat did not want to interact with the students and the products, and preferred to stay in her box. For these teams the laboratory trial remained merely an opportunity to get feedback from the experts. The teams who could observe the animals testing their products indicated that it was a very critical stage in their project, which shaped their design decisions considerably. One student, for instance, describes her experience as follows:

> Recently, I watched [the laboratory trials' video] again. At the beginning, the things we foresaw were very different. We understood that we didn't have full knowledge of their basic and instinctive movements. For example, we had this pedal idea. The idea was that when you push the pedal, food would drop. We saw that the dog never makes a movement like this. Well, for example, that thing was very good: the way the human thinks certainly doesn't work the same way with the dog [how he thinks]. He never does what you foresee. […] So, trials are absolutely very important. In the projects for humans, we can somehow try on our own or with

> friends, we can experience them somehow, but we realized that animals are a completely different world.

Participant from another team also said:

> In my opinion, [the most critical stage] is trials in the veterinary clinic, because many of the prototypes we made were not actually interacting with the dog. The dog didn't understand [how our product works]. We saw what we did wrong there. It was something that happened to most of [our friends'] prototypes. Dogs... either it didn't happen as we planned or they never interacted. It happened to us as well. Bad dog went there and slept on it [the prototype] (laughs). In that respect, [the laboratory trial] was helpful in guiding the project.

Teams that design for dogs all shared similar opinions regarding the usefulness of the laboratory trials, where they received the first feedback from the user on their products. Participants whose teams designed for cats still argued for the significance of these trials, underlining the value of the feedback of the experts.

> Actually, since our animal was a cat, she was being shy, hiding, not approaching close enough to our projects, but again the veterinary experts were very helpful. Again, they provided feedback from cats' perspective or based on their own pet's behavior.

Overall, students defined this first encounter of their designs with the users and the experts as highly illuminating, providing them with significant feedback that guides their next design decisions.

Our analysis reveals that during the third user research stage, when teams made home visits to test their high-fidelity prototypes, students developed an emotional involvement with the project, carrying what they do beyond mere user test. They often used words such as "pleasure, happiness, enjoyment, fun" to describe their feelings during the home trials. In the data, we identified two factors that shape their deeper involvement. First, being in the real use context, animals were comfortable and acted naturally. Moreover, since students organized these visits out of the course hours, they could observe the animals for a longer time. Students believe that the feedback they received from animals, particularly from cats, was deeper, more genuine and reliable in the home context.

Second, the participation of the owners in the observation sessions is a strength of home trials. Since owners know the animals very well, they play the role of an interpreter during the observation sessions. They explain, for instance, why animals interact or do not prefer to interact with the students' designs in certain ways. The below quote illustrates this:

> The fact that the owners were being there, observing and commenting [on their pet's behavior] was very, very enlightening. For example, in your mind, you expect the dog to react in a certain way, but there is someone who knows him very well present there, there is his owner. [The owner] immediately explains his pet's behavior to you, like, "He does so, because he doesn't like this" kind of… For that reason, when you interpret [the owner's explanations] together with the

> movements the dog does, at least you can understand the reasons. This can be much clear and valid. Otherwise, there would be many things that you can't understand, like, "Why he [the dog] does that?" etcetera. Therefore, the presence of the owner as a factor is highly important.

Home trials, where animals feel more comfortable and owners play the role of the interpreter, seem to be where students can see their users as living beings with individual characteristics, tastes, preferences and habits. As students develop such a close and deep understanding of their users, they can better empathize with them, and get emotionally engaged with the project. This leads to satisfaction, which is a common emotion mentioned by participants. Observing the user interacting with the product in the ways foreseen by themselves, students get satisfied by both finally being able to understand the user, and contributing to their well-being through the products they designed. One student's account illustrates this very well:

> It was really enjoyable, because our prototypes were exactly of high quality. You know, they were good. We let the dog to try them. He directly picked the toy and started playing with it. That was a very nice pleasure, of course. As I said, to address a completely special group [guide dogs for visually impaired people] ... In such cases, you can't help it, you get a bit emotional as well. In the end, from our side, there is this satisfaction of designing a product for a being who is helping a visually impaired individual by making life easier. Also, I enjoyed it a lot when I explicitly saw this happened in reality.

Reflecting on these experiences, all students underlined the significance of iterative observation in a design process. While home trials were a stage that we placed into the project, once the students saw how they provided valuable feedback that can guide their design decisions, they made revisions in their models and made subsequent home visits. Overall, students saw the solution for designing for a user group with whom they are completely unfamiliar in iterative and close user observation. However, in the interviews they underlined that regardless of to what extent the designer can empathize with the user, iterative and, if possible, longitudinal user observation should be a standard practice in every design project. Some students indicated that after this project their perspective on user research has changed in general, and in their later projects they benefited from this perspective change. They all mentioned that at the end of this project they observed significant development in their observation skills.

Since the focus of the project was on the well-being of the animals, owners, who make the purchase decision and who place the product in their home, were considered as the secondary user. Designing for animals by caring primarily for their needs, expectations and emotions, students tried to go beyond meeting their basic needs and to improve their conditions. In some teams, we witnessed discussions on whether some design decisions prioritize the comfort of the animal or the owner. For example, a team initially suggested to design a toilet for the dogs' home alone all day for long hours. Considering that this may lead the owner to take the dog out for a walk less often relying on the product, they gave

up on the idea. We observed that as students gained more empathy with the animals, they better prioritized their needs and emotions over the expectations of the owners.

Discussion

In the project presented in this article, we developed a three-stage user research model, which includes explorative home visits, laboratory trials with experts and home trials with owner feedback as described above. Drawing on our findings, we can suggest that this model worked well in terms of dealing with the challenges related to designing for animals indicated by our students at the beginning of the project. According to the students, the first user research stage enabled them to get familiar with the user and the use context, especially for the students who did not live together with cats or dogs before. At the second stage, where students visited Ankara University to carry out laboratory trials in the presence of the experts, students brought their low-fidelity prototypes to the users for the first time, and had a unique experience of observing animals interacting with the products. At this stage, the feedback of the experts who observed the animals with the prototypes helped them understand why animals reacted in a specific way, and how and in what ways the students could enhance the interaction of the product with the animal.

Students, however, placed more emphasis on the third user research stage, where they made home visits to test their high-fidelity prototypes with animals. They identified the solution for designing for a user group with whom they are completely unfamiliar and have limited communication as carrying out iterative and close user observation in the real use context. In line with Westerlaken and Gualeni's (2016) suggestion, our findings regarding this stage show that including animals in the design process as participants through iterative tests of prototypes and close observation of animal behavior serve as a good strategy to overcome the challenges of designing for animals. Similar to experts' support in the laboratory trials, owners' support in home trials was underlined by the students. As discussed previously, it is difficult to talk about a complete participation of the animal in the design process, considering the obvious communication barriers. However, our findings show that the presence of the experts and the owners in the role of enablers, facilitators and interpreters could increase the participation of the animals in the user trials by translating and explaining animals' responses and reactions to the designer.

In light of these findings, our research has three impacts on design education. First, we observed that designing for animals raised awareness towards the importance of user-centeredness in design. During the design process, to imagine how the product is used and perceived by the user, designers need to build their presumptions about users' expectations and needs into user models (Hasdoğan, 1996; Norman, 2013). Such models can be based on designers' personal experiences and professional expertise as well as information collected from potential users. When constructing user models, designers' experiential knowledge is effective on how they interpret user research findings (Oygür,

2018). As for novice designers and designs students, such models can be entirely built based on their previous experiences as a user. In the current case, since students do not have any shared experiences and capabilities with the user to build a user model on, it was difficult for them to foresee how their product could be used and perceived in the real life context. Therefore, without having any experiential knowledge of their own, they frequently felt the need to observe the user and consult an expert or the owner. This enabled them to experience and realize the benefits of user research in a design process and raised their awareness towards user-centeredness in identifying and verifying design requirements. This educational gain is also crucial for design and technology education in schools where teaching user-centeredness is one of the key goals (DfE, 2015). Besides, designing for animals can have additional benefits for pupils considering that interacting with animals has positive effects on children's development (Endenburg & van Lith, 2011).

Second, students experienced empathic understanding with such a distant user group. Building empathy with users by leaving designer's role and 'stepping into the user's shoes' is considered as the key aspect of user-centered design (Kouprie & Visser, 2009; McDonagh & Thomas, 2010; Postma, Zwartkruis-Pelgrim & Daemen, 2012). Our findings show that especially close observation in the home context gradually enabled empathy with animals. Observing animals where they feel comfortable and relaxed together with the owners, students felt that they could be able to see them as living beings with individual characteristics, tastes, preferences and habits. Developing such a close and deep understanding of their users, students could not only better empathize with the users, but also got emotionally engaged with the design project. The feeling of achievement in empathizing with the user and emotional engagement in the project supported the feelings of satisfaction and pleasure among students. Particularly observing that animals interact with the products in the way they expect, students believe that their designs are understood and 'accepted' by their users, and they contributed to their users' well-being through design.

Third, as design educators, this project provided us with a unique opportunity to (1) broaden our conceptualization of 'user-centeredness' in design, and (2) reflect on and reconsider how we guide our students in understanding the user in different stages of design projects. In this, strong collaboration with experts who study animal behavior was invaluable. Particularly coming together and discussing the focus of the project together before the project starts was important to learn their key concerns regarding animal well-being, and to get familiar with the vocabulary they use. In these meetings, for example, we noticed that frustration is an important emotion of animal that needed to be taken into account by designers who design for domestic dogs and cats. As the design problems of the 21st century are getting more complex and multi-layered, interdisciplinary collaboration has become a key aspect design teams in professional practice (Dykes et al., 2009; Feast, 2012). This research showed us how academic expertise of different fields of science and technology, with which we do not often consider design practice related, can make a unique contribution to students' learning experiences by placing emphasis on user research rather than marketing- or manufacturing-related aspects of the design process. In

light of our findings, we underline the significance of seeking diversity in the expertise fields and types of the partners in collaborative design education projects. Such a diversity not only helps design educators to focus on different stages and aspects of the design process in various projects, but may also support students' self-exploration of their own skills, interests and tendencies as future design professionals.

Conclusion

In a territory where products for animals are mainly developed for the purpose of enhancing their interaction with humans, and where limited solutions exist on improving their holistic well-being, this design studio project can be considered a small but unique step to raise awareness towards animal well-being in design field. In our design studio project, within the three-stage user research model we developed, we received much support from facilitators such as experts and owners to make sense of animal behavior. In addition to exploring the role of facilitators further, how the students can interpret animals' behavior in terms of their interaction with the designed object without the presence of such facilitators is a good question worth investigating in further design studies. Certain objective observation mediums which are indicated by Hirskyj-Douglas et al. (2017), such as eye trackers and sensors, can be incorporated in such a design studio project to assist the trial processes. As also suggested by our students in the interviews, longitudinal research with users can provide designers with the opportunity of creating more room for the participation of animals as users in the design process.

Acknowledgments

The catalogue presenting the project outcomes is available at our department's website (https://id.metu.edu.tr/en/project-catalogs/). We would like to thank Ankara University Faculty of Veterinary Medicine, Department of Physiology, Behavior Clinic, Assoc. Prof. Dr. Yasemin Salgırlı Demirbaş and Etkin Şafak for the expert guidance they provided throughout the design process and for the laboratory evaluation facilities. We also would like to thank Kafi, Gofret and Ice for participating in our laboratory trials. Dr. Mehtap Öztürk Şengül supported us during the project by guiding our students in prototype building. We would like to thank her for this valuable contribution to students' learning experience. Finally, we would like to thank the 12 students who volunteered to take part in this research in the role of interviewees, for their time and sincere responses.

References

Blythe, M., & Monk, A. (Eds.). (2018). *Funology 2: From Usability to Enjoyment*. Springer.

Bødker, S., & Klokmose, C. N. (2012). Preparing students for (inter-)action with activity theory. *International Journal of Design, 6*(3), 99-111.

Börekçi, N.A.G.Z., Kaygan, P. & Hasdoğan, G. (2016). Concept development for vehicle design education projects carried out in collaboration with industry. *Procedia CIRP (Proceedings of the 26th CIRP Design Conference, 15-17 June 2016, Sweden) 50*, 751-758. Available online at http://www.sciencedirect.com/science/article/pii/S2212827116302979

Börekçi, N.A.G.Z., & Korkut, F. (2017). Collaborating with external partners in industrial design education: A review of success factors. In G. Pritchard & N. Lambert (Eds.), *Papers from the LearnX Design London 2017 Conference* (pp. 183-190). London: Ravensbourne Publications, 2017.

Calvo, R. A., & Peters, D. (2014). *Positive Computing: Technology for Wellbeing and Human Potential*. Cambridge, Massachusetts: MIT Press.

CleverPet. CleverPet: Engage Idle Paws. [Online]. [Accessed 14 January 2019]. Available from: https://clever.pet/

Desmet, P. M., & Pohlmeyer, A. E. (2013). Positive design: An introduction to design for subjective well-being. *International Journal of Design, 7*(3), 5-19.

DfE. (2015). Design and Technology GCSE Subject Content. (DFE-00283-2015). Retrieved from https://www.gov.uk/government/publications/gcse-design-and-technology

Dykes, T. H., Rodgers, P.A., & Smyth, M. (2009). Towards a new disciplinary framework for contemporary creative design practice. *CoDesign, 5*(2), 99-116.

Endenburg, N., & van Lith, H. A. (2011). The influence of animals on the development of children. *The Veterinary Journal*, *190*(2), 208-214.

Feast, L. (2012). Professional perspectives on collaborative design work. *CoDesign, 8*(4), 215-230.

FitBark Dog Activity Monitor: Healthy Together. [Online]. [Accessed 14 January 2019]. Available from: https://www.fitbark.com/

Giacomin, J. (2014). What is human centred design? *The Design Journal*, *17*(4), 606-623.

Hanington, B. M. (2010). Relevant and rigorous: Human-centered research and design education. *Design Issues*, *26*(3), 18-26.

Hasdoğan, G. (1996). The role of user models in product design for assessment of user needs. *Design Studies*, *17*(1), 19-33.

Hassenzahl, M. (2018). The Thing and I (Summer of'17 Remix). In M. Blythe & A. Monk (Eds.), *Funology 2*. Cham. (pp. 17-31). Springer.

Hassenzahl, M., & Tractinsky, N. (2006). User experience-a research agenda. *Behaviour & Information Technology*, *25*(2), 91-97.

Hirskyj-Douglas, I., Pons, P., Read, J., & Jaen, J. (2018). Seven years after the manifesto: Literature review and research directions for technologies in animal computer interaction. *Multimodal Technologies and Interaction*, *2*(2), 1-30.

Hirskyj-Douglas, I., Read, J. C., & Cassidy, B. (2017). A dog centred approach to the analysis of dogs' interactions with media on TV screens. *International Journal of Human-Computer Studies*, *98*, 208-220.

Kaygan, H., Demir, Ö., Korkut, F. & Güngör Boncukçu, I. (2017). Encounters and shifting identities: students' experiences of multi-stakeholder participatory design. In E. Bohemia, C. de Bont & L. S. Holm (Eds.), *Conference Proceedings of the Design Management Academy.* (pp. 1685-1701). Hong Kong, 7-9 June 2017. London: Design Management Academy.

Klapwijk, R., & Van Doorn, F. (2015). Contextmapping in primary design and technology education: a fruitful method to develop empathy for and insight in user needs. *International Journal of Technology and Design Education*, *25*(2), 151-167.

Kong Classic Interactive & Teat Dispensing. [Online]. [Accessed 14 January 2019]. Available from: https://www.kongcompany.com/

Kouprie, M., & Visser, F. S. (2009). A framework for empathy in design: Stepping into and out of the user's life. *Journal of Engineering Design*, *20*(5), 437-448.

Kvale, S., & Brinkman, S. (2009). *InterViews: Learning the Craft of Qualitative Research Interviewing*. 2nd ed. Thousand Oaks: Sage.

Lawson, S., Kirman, B., & Linehan, C. (2016). Power, participation, and the dog internet. *Interactions*, *23*(4), 37-41.

Mancini, C. (2011). Animal-computer interaction: a manifesto. *Interactions*, *18*(4), 69-73.

Mancini, C., Lawson, S., & Juhlin, O. (2017). Animal-computer interaction: The emergence of a discipline. *International Journal of Human-Computer Studies*, *98*, 129-134.

McDonagh, D., & Thomas, J. (2010). Disability+ relevant design: Empathic design strategies supporting more effective new product design outcomes. *The Design Journal*, *13*(2), 180-198.

Nicholl, B., Hosking, I. M., Elton, E. M., Lee, Y., Bell, J., & Clarkson, P. J. (2013). Inclusive design in the Key Stage 3 classroom: An investigation of teachers' understanding and implementation of user-centred design principles in design and technology. *International Journal of Technology and Design Education*, *23*(4), 921-938.

Nina Ottosson Dog Activity Games and Toys. [Online]. [Accessed 14 January 2019]. Available from: https://www.nina-ottosson.com/

Norman, D. (2013). *The Design of Everyday Things: Revised and Expanded Edition*. New York: Basic Books.

Oygür, I. (2018). The machineries of user knowledge production. *Design Studies*, *54*, 23-49.

Patton, M.Q. (2002). *Qualitative Research and Evaluation Methods*. California: Sage.

Postma, C. E., Zwartkruis-Pelgrim, E., Daemen, E., & Du, J. (2012). Challenges of doing empathic design: Experiences from industry. *International Journal of Design, 6*(1), 59-70.

Redström, J. (2006). Towards user design? On the shift from object to user as the subject of design. *Design Studies*, *27*(2), 123-139.

van der Bijl-Brouwer, M., & Dorst, K. (2017). Advancing the strategic impact of human-centred design. *Design Studies*, *53*, 1-23.

Vorvoreanu, M., Gray, C. M., Parsons, P., & Rasche, N. (2017). Advancing UX Education: A Model for Integrated Studio Pedagogy. In *CHI'17: Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems.* (pp. 1441-1446). New York: ACM.

Westerlaken, M., & Gualeni, S. (2016). Becoming with: Towards the inclusion of animals as participants in design processes. In *Proceedings of the Third International Conference on Animal-Computer Interaction*. ACM.

Whistle: Activity Monitor and GPS Pet Tracker for Dogs. [Online]. [Accessed 14 January 2019]. Available from: https://www.whistle.com/

Woodcock, A., & Flyte, M. G. (1997). The development of computer-based tools to support ergonomics in design education and practice. *Digital Creativity*, *8*(3-4), 113-120.

World Design Organization. (2018). Achieving the sustainable development goals by design. [Online]. [Accessed 14 January 2019]. Available from: http://wdo.org/about/vision-mission/un-sdgs