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CRITICAL DESIGN – A NEW PARADIGM FOR TEACHING AND LEARNING UNIVERSAL DESIGN

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ABSTRACT
The critical design method, which was originally developed as a tool for designers, architects, engineers, etc. to open the (design) brief when designing "extreme environments" of the future [1[a]] – in so doing throwing light upon the design process from a critical perspective and highlighting considerations that might otherwise be overlooked – is now gradually being adapted to and applied in the field of universal design. Bringing this way of thinking about design into higher education could encourage teachers and students to broaden their knowledge in this field, better equipping students to create in an inclusive manner and ensuring that future products, buildings, and exterior spaces are accessible to all to the greatest extent possible [2].
In order to test and further develop this way of thinking about universal design for educational contexts, two series of workshops have been conducted: One at a research institute for rehabilitation engineering and design, and one within a Master's programme in occupational therapy. The purpose of this paper is to describe the process of adapting the critical design method as it is used in institutional environments, such as hospitals and prisons, to various universal design contexts, and to discuss the preliminary results. The paper also examines the question of whether critical design is an optimal method of challenging and ultimately improving the field of universal design – and, if so, how to proceed in order to achieve the best teaching and learning outcomes.

Keywords: Critical design, universal design, design methods, educational practises, workshops.

1 INTRODUCTION

Inclusion, access, and participation are three keywords that are commonly used to describe universal design (UD). What if design educators turned these terms upside down (metaphorically speaking) by implementing, early in the design process, a critical design method that makes it possible for students to focus on what it means to design for a fundamental form of being human (existential designial analysis; EDA) [1[b]], rather than what the thing we design is intended to do as we use it (functional analysis)? Would students have a different learning outcome – perhaps even a deeper understanding of what it means to be human in the physical environment? Moreover, can critical thinking and a certain amount of provocation provide them with alternative starting points for creative thinking, and thus more tools in their problem-solving toolboxes?
The EDA is, in short, a critical design method that has been developed and utilised as an alternative way of thinking about design. While traditional design methods (those of Jones and Cross, for example) merely address the function(s) of a product, service, system, and/or process, the critical design method focuses on what impact it has on the user while they are using it. Furthermore, employing it during the initial phases of a design process enables the designer to shift focus, from "analysis of the functionality of a design in use, e.g. by performing a functional analysis, to analysis of the form of being human that a design in use defines" [1[c]]. In so doing, they are able to open up the design brief and examine it from perspectives which may otherwise be overlooked.
The primary advantage of employing this method in a design education programme is that students learn how to think, analyse, and evaluate ideas, concepts, projects, and processes in a critical manner. A secondary advantage is that students come to possess improved knowledge regarding designing "products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" [3], while at the same time obtaining hands-on experience with the complications that may arise if this aspect of design – "the 'dark side' of

design thinking" [1[d]] – is ignored. The fact that, for example, by 2050 the world population of sixty-year-olds will have doubled [4], and that nations such as Norway have made UD an explicit part of national policy [5], bringing alternative methods into education – and eventually perhaps into other professions' ways of working – will likely help UD to develop as a discipline. This, in turn, implies that future designers will be better equipped to meet the needs of all, desires of those with purchasing power, and requirements of an ever-changing and increasingly complex market.

2 THE APPLICATION OF THE CRITICAL DESIGN METHOD TO EXTREME ENVIRONMENTS

The critical design method is rooted in 'critical design', a term that builds on attitudes of Italian radical design of the 1970s but was first coined by Dunne in 1999, which "rejects how things are now as being the only possibility, [and] provides a critique of the prevailing situation through designs that embody alternative social, cultural, technical or economic values" [6]. The purpose of critical design is, in short, to make people think, and to thus raise awareness, spur debate, and provoke positive action [8]. Critical design has been used over the years to examine social, political, economic, and environmental issues in society (see for example those of Dunne & Raby, Auger & Loizeau, Toran, Caccavale, etc.). In the context of the critical design method, however, the above way of thinking is used to shed light on 'extreme environments': those which people are unable to leave – regardless of whether the reason for this is physical or mental, and of whether the duration is temporary or permanent – and which do not support what is considered to be a 'normal' state of existence [1[e]], such as intensive care units (ICU) and remand prisons.

The critical design method has been used to create a three-step design methodology, which in turn is presented as a functional design manual – ready for use. In order to test and exemplify the method, six workshops, involving approximately eighty students, were conducted in various design schools in Scandinavia in 2011 and 2012, the results of which – the 'output' of the students' design processes – were termed 'critical design examples' (CDEs) [1[f]]. A CDE – the function of which is, in brief, to illuminate a problem – is intended to be applied to the problem-solving process, such as when planning a new hospital or prison, in order to foster innovation, albeit in a rather dark way. The idea is that all involved in the process are forced to leave their comfort zones, think outside of the box, and, thus, find a better solution to the design problem(s).

3 WORKSHOP SERIES #1 – BRINGING THEORY INTO PRACTICE

3.1 Structure

Although the length of the workshops varied between one and four days, the overall structure – the order of the activities and the amount of time spent on Steps 1-4 – remained the same, aside from Step 1 during those workshops which had a large number of students. Lunch breaks and so on were agreed upon following discussion with each class. Consent forms were signed and handed in before the end of the workshop – with participants able to withdraw their consent at any time – so that the data collected (pictures, sketches, quotations, etc.) would be available for use later in the project. The following example (Table 1) is from a one-day workshop.

Table 1. Workshop structure

Time	Activity	Step
09:00-09:30	Welcome and introduction by the organiser, followed by brief student introductions and an overview of the workshop	1
09:30-09:40	Introduction to functional analysis and the critical design method, as well as a brief run-through of the differences and similarities between these two approaches to design	2
09:40-10:25	Presentation of four fictional scenarios, along with a demonstration of using the critical design method by applying the three steps	3
10:25-11:00	Discussion and presentation of CDEs, including visual material from the field of critical design for inspiration	4

11:00-15:45	Presentation of the assignment, with the students being divided into groups (with a maximum of five in each), and the beginning of the group work	5
15:45-16:30	Presentation of the final concept(s) – the CDE(s) – followed by a discussion and summing-up of the workshop	6

3.2 Participants

All of the participants were students of some form of design; some were working towards a degree in textile design, while others possessed a strong background in industrial design. The participants came from both the BA and MA levels, and both genders were represented.

3.3 Procedure

From a starting point that utilised the three-step critical design method, the students developed CDE(s) in response to a given problem. Half of the students developed curtains, prison jumpsuits, bedding, or door handles for remand prison cells, while the other half created clothing, bedding, room dividers, or bedside lamps for ICU patient rooms. The creative process for tackling this assignment generally unfolded as follows: discuss, sketch, drink coffee or tea, discuss, decide on a concept to develop further into CDE(s), eat lunch, more sketching, possibly create one or more prototypes, discuss, and, finally, present the outcome. Most of the groups made more than one CDE, but all had to select one to present. The students were, for the most part, surprised by what they had achieved by the end of the day; to quote some of them: "But this is like upside down?!", "I'm not that into critical design – at least not until now, but I sure like this way of working with fiction to prove a point", and "Actually, I'm a bit ashamed that we came up with this…" [1[g]]

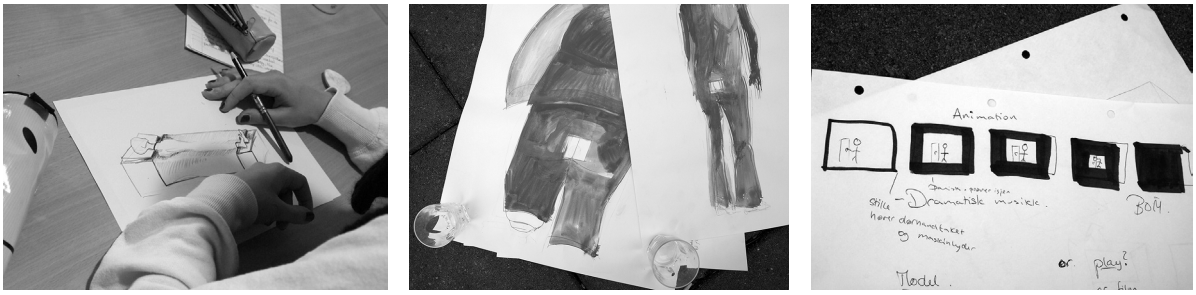

Figure 1. Students' work. From left to right: ICU bedding made out of metal sheets, to – quite literally – anchor the patient to their bed; a prison jumpsuit to cover the inmate's body, including the head, while leaving their buttocks exposed; a door handle for a remand prison cell that is designed so that the cell shrinks every time the prisoner tries to open the door

3.4 Trends and reflections

During the workshops, the students discussed different aspects of the ICU and remand prison environments. The students created CDEs to examine everything from how being strapped down in bed in an ICU makes the individual feel naked, fragile and exposed to violence, sexual abuse, and torture in remand prison. This 'dark' way of thinking evoked both reflections and emotions; one student, whose grandmother happened to be in an ICU at that time, understandably felt appalled at the prospect of causing "harm" to a bedridden person by developing CDEs. However, the same student arrived the next day and was heard to say, among other things, "So we're not supposed to be 'nice'?! and "Yesterday I felt sick. Today it's just fun!" [Ibid[i]].

The CDEs were presented through black and white sketches, detailed scenario descriptions, short films, verbal presentations, and role-play. Without doubt, however, the learning outcome was much more important than any physical results produced, and the discussions at the end of each workshop revealed that most of the students felt that this way of thinking design was liberating in relation to their world of problem-solving. Moreover, it seemed that the students (mostly) had fun developing CDEs: "This is like bad and fun at the same time" [Ibid[h]]; "its fun to be a bit artsy…" [Ibid[i]].

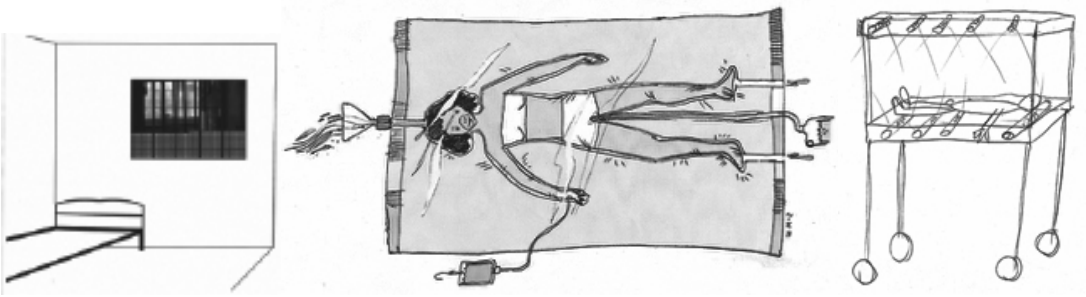

Figure 2. CDEs that were created during Workshop Series #1. From left to right: Prison curtains that slowly block the view of the inmate; transparent bedding for use in an ICU ward to fully expose the patient; hospital bed dividers to put the patient 'in the spotlight', rather than acting as protection

4 APPLYING A CRITICAL DESIGN APPROACH TO UNIVERSAL DESIGN

The physical environment, which includes housing, products, transportation systems, buildings, and so on is mostly designed for the able-bodied; as Norwegian Design and Architecture states on its website, "Most products and services are generally designed for the average user – a typically healthy, right-handed, white, young male" [9]. Thus, those who have difficulty walking or suffer from colour blindness, cognitive disabilities, and even incontinence fall outside this definition. Originally applied in the field of architecture in the early 1960s (Goldsmith), then thirty years later in relation to commercial products and information technology, for example (Mace), UD is a relatively new concept in design education. Strong methods of teaching have, however, been established [10, 11], but as Denizou states, teaching UD requires a foundation of design methods that are based on, among other things, creation and simulation exercises [12], which is why the critical design method should be a welcome contribution to the field.

5 WORKSHOP SERIES #2 – BRINGING THEORY INTO PRACTICE

5.1 Structure

The second workshop series consisted of two half-day workshops, both of which shared the same overall structure, i.e. the order of activities as well as the time spent on each part, and were identical to those of Series #1 as regards administrative aspects.

Table 2. Workshop structure

Time	Activity	Step
12:30-12:45	Welcome and introduction by the organiser, followed by brief student introductions and an overview of the workshop	1
12:45-13:15	Introduction to the critical design method, including a brief explanation of how to apply it during the design process and a discussion and presentation of CDEs	2
13:15-15:45	Presentation of the assignment, with the students being divided into groups, and the beginning of the group work	3
15:45-16:30	Presentation of the final concept(s) – the CDE(s) – followed by a discussion and summing-up of the workshop	4

5.2 Participants

The eight participants in the first workshop were researchers from a rehabilitation engineering and design research institute, while the twelve of the second workshop were occupational therapy Master's students.

5.3 Procedure

As in the previous workshops, the participants developed CDE(s) to solve a given problem, creating speculative design proposals for staircases, headphones, entrance door, smart phones, and E-textiles. The scenarios included: "Caroline (67 years old) has lost her peripheral vision and has poor depth perception, making crossing the road and going down stairs very difficult" (design task: staircase); "Tom (37 years old) was diagnosed with multiple sclerosis 12 years ago, and has poor balance and

some difficulties in walking, and finds that he bumps into things every now and then" (design task: door entrance).
The two groups had different ways of solving problems, with the researchers performing a miniature version of a traditional problem-solving process, featuring ideation and concept development towards a result, while the students quickly decided upon a solution. In addition, the students had a tendency to create CDEs that featured an element of cliché and pastiche, rather than letting the viewer, in the words of Dunne and Raby [8], "experience a dilemma, [and so decide for themselves;] is it serious or not? Real or not?" Whether this was due to a lack of design method background, general product development skills, or speculative design approaches, to the fact that time was very limited, or to a combination of these is difficult to say. It should be noted that all of the groups had conducted relevant discussions, both within each group and with the organiser.

Figure 3. A visual impression of the workshops

5.4 Trends and reflections

The participants worked diligently throughout the workshop, and the topics that were discussed ranged from the extent to which our environments drive and direct our possibilities and actions to how the CDEs could be used to fuel a design process. The CDEs were generally more 'half-baked' than those produced during Workshop Series #1, which is to be expected due to the differing backgrounds of the participants and the limited time available. The ways in which the CDEs were presented, furthermore, varied from simple sketches to more detailed concept drawings and verbal presentations. It should be noted that the researchers were more refined in their visualisations, whereas the students presented sketches that were generally relatively simple, but this is to be expected due to the differences between the two disciplines. Just as in the Series #1 workshops, the participants were positive regarding their experiences, aside from one who felt that this way of working was childish and a waste of time. To quote some of the participants: "This is like anti-universal design"; "What a great way to kick start a project!"; "The critical design examples remind me of 'design probes' [Gaver] and 'provotypes' [Dunne and Raby]".

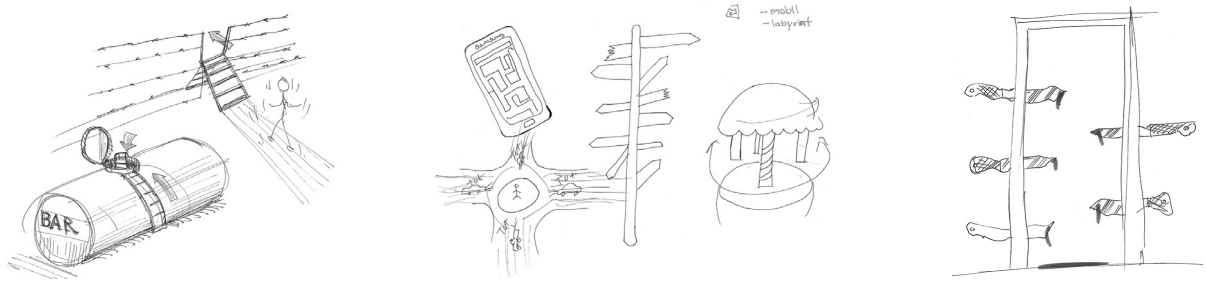

Figure 4. Examples of the CDEs that were created during Workshop Series #2. From left to right: A staircase, with a mandatory 'spinning drum stop' in front, so that every person entering the building is equally off-balance; various 'orientation-devices' to make users walk in circles; a doorway that punishes those who do not walk straight when passing through it

6 DISCUSSION AND CONSIDERATIONS

This paper has presented the critical design method, and discussed how it can be implemented in the design process to expose assumptions, generate interesting questions, and discover new ideas. Incorporating this way of thinking into design education programmes would provide students with greater insight into what it means to be human in the physical environment, and what may happen if

they – the next generation of designers – do not take into account this aspect of designing. Furthermore, critical design methodologies, be they in the form of the three-step approach used in Workshop Series #1 or the fictional scenarios of Workshop Series #2, encourage students (and, on one occasion, a group of researchers) to think outside the box – to not simply engage in 'affirmative design', i.e. design that "reinforces how things are now, [how] it conforms to cultural, social, technical, and economic expectations" [6]. As Einstein once allegedly stated: "The significant problems we face cannot be solved at the same level of thinking we were at when we created them" [7]. Hence, the critical design method is likely a good contribution to the field of UD, as both a method of teaching and learning and as a means of practicing UD further down the road – when students have stepped into the real world and will have to deal with UD at some point in their careers.
Before this point, however, more workshops in educational contexts, primarily within creative disciplines such as design, architecture, and engineering, need to be held in order to see the whole picture. The discussions in plenum that followed after the workshops of Series #2 revealed that some of the scenarios that were set were experienced as too specific, making it difficult to truly 'design for all' rather than for a specific individual (this was particularly true for those scenarios that involved personal assistive technologies). This was extremely useful feedback as regards revising the content and structure of future workshops. To further develop these, participants could first spend time creating fictional scenarios and then develop suitable CDE(s), in so doing gaining valuable experience of both aspects. Another idea is to take one step back, implementing the EDA and the critical design method of Workshop Series #1 as well. However, the experiences of the participants of the eight workshops show that – regardless of the backgrounds of the participants, be they textile, industrial design, or occupational therapy students or researchers seeking new inspiration – there is indeed something to learn from the 'dark side' of design thinking, particularly as regards the ways that it challenges assumptions and preconceived ideas about the role of the physical environment, be that housing, products, transportation systems, or parks, in people's everyday lives.

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