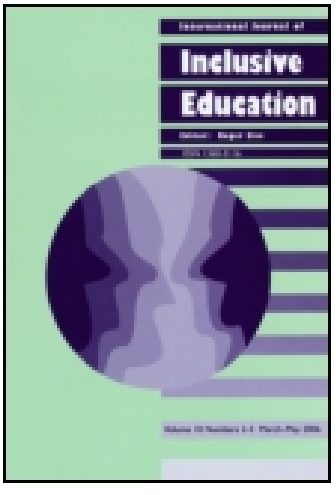

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Inclusive design: developing students' knowledge and attitude through empathic modelling

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Inclusive design: developing students' knowledge and attitude through empathic modelling

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To enhance the function and quality of built environments, designers should consider all possible users in their design projects. Therefore, it is essential to incorporate inclusive design in the education of the design student. This study focuses on the educational objectives of and related learning activities in a course where inclusive design is one of the main subjects. Through empathic modelling, students' engagement with the course was enhanced. Within the course, students simulated disabled users while they experienced the campus environment using wheelchairs, crutches or blindfolds. Their experiences were reflected through descriptive texts and poster designs. Descriptive texts were analysed through developing themes and codes whereas posters were analysed through a content analysis method. Our findings showed that students developed their knowledge of inclusive design concerning the physical environment, the self and the social environment. They also developed immediate emotional responses and a positive attitude towards diversity and inclusion. Thus, empathic modelling supported the development of cognitive and affective learning domains of the novice designer, supporting inclusive design education.

Keywords: design education; educational objectives; empathic design; inclusive design; knowledge; attitude

Introduction

The design professionals play a significant role in enhancing the quality of life of people and their equal participation in social and physical settings, through their roles in shaping the physical environment. In that respect, the scope and understanding of the user by the designer is critical in designing environments that consider human diversity. However, in design practice, participatory practices and user involvement are often not possible because of financial and time constraints. Applying inadequate data during the design process often results in a mismatch between the user and the designed environment, and in excluding users with diverse characteristics, a reported problem in the design industry (McAdams and Kostovich 2011). Therefore, the education of a novice designer plays a significant role in how he or she finds solutions to the requirements of users with differences in age, gender, race and abilities, later in professional practice (Erman, Serpil-Altay, and Altay 2004). The problems arise in the initial design phase, where the new designer's immediate source for information

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is him/her or an idealised notion of the 'normal' user (McDonagh and Thomas 2010; Wijk 2001). One way of solving this problem is to increase designers' awareness in the early education years of the profession (Wijk 2001). Design education must include an understanding of 'design-for-all', which accepts users as non-standardised and diverse. It is crucial to establish empathy between designers and users so that designers can understand the spatial environment from the user's perspective (Strickfaden and Devlieger 2011). This study analyses activities conducted in a course that focuses on inclusive design at the Department of Interior Architecture and Environmental Design. In the course, students engage with the campus environment while adopting the perspective of the disabled user. We discuss the objectives and learning outcomes of the course, using thematic analysis of students' descriptive texts and content analysis of designed posters. Applying the inclusive design approach, we also explore the elements of the course content, focusing on students' cognitive and affective learning domains.

Inclusive design

Inclusive design, also known as universal design or design-for-all, is founded on the principle of inclusion of all, appreciating diversity and equality, within the process and products of design-related disciplines (Erkılıç and Durak 2012). 'Inclusive design is defined by the UK government as a process whereby designers, manufacturers and service providers ensure that their products and services address the needs of the widest possible audience' (Dong et al. 2005, 49). Similarly, universal design aims at products and environments to be used by everyone without the necessity for adaptation or change in the designs (Center for Universal Design 1997). Incorporating inclusive design knowledge into the curriculum of architecture and interior design programmes either as a separate course or by integration to the design studios (Afacan and Demirkan 2010; Olgunturk and Demirkan 2009) aims to increase a student's awareness of human diversity in the design process. This approach supports the social model of disability, with the belief that disability does not reside in the individual, but in the restrictions caused by the society (Carson 2009). Therefore, the design professionals have a responsibility to remove the physical − and thus social − barriers to prevent people from participating equally in all the activities taken within the built environment.

With the above objectives in mind, Human Factors (or Ergonomics) is a one-semester, second-year course in the department of Interior Architecture and Environmental Design at Bilkent University, which aims to incorporate the principles of inclusive design through theoretical and practical applications. Human Factors, or ergonomics, can be defined as 'the application of scientific information about human beings to the problems of design' (Pheasant 1988, 3). The discipline focuses on the study of human characteristics through applying scientific methods, principles and data derived from disciplines such as psychology, cognitive science, physiology and anthropometry. The basic aim is to improve quality of life by adapting human-made systems and environments to user characteristics, including their dimensions, capabilities and limitations (Kroemer, Kroemer, and Kroemer-Elbert 2001). Thus, a user-centred approach based on human diversity lies at the core of the Human Factors and ergonomics discipline (Looze and Pikaar 2006). We based the educational objectives of the course on this approach and developed related activities and assessment methods accordingly.

Empathic modelling

In order to transfer the educational objectives into the activities within the course, we used empathic modelling. Empathic understanding refers to stepping out from the role of the designer and stepping into the role of the 'users', the ones that are assumed to experience the designed environment/product (Kouprie and Visser 2009). This necessitates being immersed in the lives, experiences and ways of living of diverse populations. Beyond only having the knowledge of the user, it also encompasses an affection and emotional connection without judgment. Empathy involves *relating to*, more than just *knowing about*, the user. Postma et al. (2012) maintain that empathic design leads the designers to build a rich cognitive and affective understanding and a 'feel' for the user, which would then translate into user-friendly design outcomes. Thus, empathic strategies may allow the designer/student to comprehend the intangibles such as the feelings, emotions, aspirations and fears of users (McDonagh and Thomas 2010).

Three major empathic research strategies can be identified during the design process (Kouprie and Visser 2009). The first is direct contact with users through ethnographic methods of observation, shadowing and interviewing (McDonagh and Thomas 2010). The second includes indirect scientific information about users through communication of user research findings, story telling, photography and original quotes. The final method is simulating the user's condition. This may be through role-playing or adoption of a certain disability by the designer. Empathic strategies for considering diverse users in design, and co-designing with them, were carried out ranging from the disciplines of industrial design to planning (Demirbilek and Demirkan 2004; Nicolle and Maguire 2003; Peel and Posas 2009; Postma et al. 2012).

Within the educational context, promoting students' awareness of social and physical inclusion of people different from them, including people with disabilities, is vital. This requires methods that enhance student engagement and participation. Ballard maintains 'the study of what people do in their everyday lives can reveal the complexity of the personal, cultural, ideological and situational variables that determine how disability is constructed and created within educational settings' (1997, 50). As such, a 'connected knowing' rather than a distant knowing can dissolve the boundaries that construct the differences of the self and other (Baglieri 2008; Ballard 1997). Accordingly, courses among different disciplines have utilised strategies such as empathic modelling, reflective participation, direct contact and interactions etc. to increase students' 'connected knowing'. For example, students took an active role in identifying aspects of the physical environment that did not conform to accessibility standards by actually experiencing the campus in a sociology course for understanding the social construction of ableism (Livingston 2000). The relation between the impositions of the physical environment and the acceptance/rejections of people of diverse groups was central in students' comprehension of discrimination. For a similar learning goal, role-enactment or learning through theatre has been adopted to go beyond abstract conceptualisations of race to embodied knowledge of racism for white students (Sutherland 2011). On the other hand, the reflections of a course on disability in society for teacher education relied on personal interviews, reflective narratives and assessment of a space with regard to its social and physical inclusion. The focus of the course was to connect prospective teachers' own experiences with those identified as disabled, with an aim to close the gap and support inclusive teaching (Baglieri 2008).

One drawback of this approach is pointed out by Cardoso and Clarkson (2012) as disabled people may have lived with their limitations for a long time and learned to

adapt to the environment in a way that a designer cannot predict or experience in a limited simulation time. This may also result in a poor or imprecise simulation that guides designers in adequate design decisions (Hitchcock and Taylor 2003). Being aware of these limitations of role-play, Moody, Mackie, and Davies (2011) concluded that it helps 'to build an understanding of how life is experienced by various users' (195).

As a means to expand students' 'empathic horizon' (McDonagh and Thomas 2010), that is, their ability to relate to other people's lived experience and their challenges, we believe that role-play as a form of simulation method could be used as an effective instructional strategy for the inclusive design unit of the course.

Research questions

We explored the following research questions for the thematic unit of inclusive design in the Human Factors course:

(1) What were students' experiences in the cognitive and affective domains while participating in activities pertaining to the inclusive design unit in the Human Factors course?
(2) How did the simulation and follow-up activities, including written reflections and poster designs, support the course objectives pertaining to the cognitive and affective domains?

Method

We considered the educational objectives of the Human Factors course according to Bloom's (Bloom et al. 1956; Bloom 1984) revised (Krathwohl 2002) taxonomy of educational objectives. The model has three basic domains: cognitive, affective and psychomotor. Through various exercises incorporated into the course objectives, students are intended to extend their learning in each domain. Bloom and his colleagues primarily focused on the 'cognitive domain', which deals with the knowledge, intellectual abilities and skills pertaining to a discipline. They organised this domain into levels of knowledge construction ranging from simple to complex, and concrete to abstract. The categories were revised and renamed by Krathwohl (2002) after years of research and practice. As such, students are expected to acquire cognitive processes from lowest to highest in the following sequence: remembering, understanding, applying, analysing, evaluating and creating (Krathwohl 2002). Through the revised structure, we can analyse design students' learning outcomes and cognitive processes. Krathwohl, Bloom, and Masia (1964) developed the 'affective domain', which involves attitudes, motivation and values that students are expected to acquire regarding their field of study (Miller 2005). Again in hierarchical order, individuals' intended affective behaviours are: receiving, responding, valuing, conceptualising/organising a value system and characterising/identifying with a value set that influences one's overall activities and behaviour (Krathwohl, Bloom, and Masia 1964). In that respect, the 'affective domain' can be influenced in varying degrees; the affective behaviours can be immediate responses to a situation; or it may have lasting effects of organising one's personal value-set in the long term. Various researchers have also built on the third (psychomotor) domain of Bloom's work (Dave 1970; Harrow 1972; Simpson 1966), which

involves manual and physical skills. Bloom originally identified this domain in a broad sense, as he found the academic environment insufficient to analyse and identify reliable categories for such skills.

Krathwohl (2002) stated that the revised taxonomy 'provides a clear, concise visual representation' for achieving a course's learning objectives (218). Thus, the instructors used the taxonomy as a tool to clarify the learning objectives of Human Factors course, pertaining to the development of students' knowledge, attitudes and skills.

Procedure

Based on the higher-order levels of Bloom's revised taxonomy, three main objectives in the 'cognitive domain' were set for the Human Factors course: to enhance students' 'understanding and awareness' of the concepts related to Human Factors and inclusive design; to 'analyse and evaluate' the built environment and its components according to this knowledge and finally to 'create spaces' and their components on such terms. The above objectives also correspond to the desired goals for ergonomics literacy identified by Karwowski (2005). These include acquiring basic knowledge and skills of ergonomics and human-centred design, ways of thinking and acting considering these principles and finally acquiring the practical skills to solve design problems using this knowledge.

One of the major objectives of the course regarding the 'affective domain' is to establish a value system regarding the responsibilities of designers to adopt an inclusive design approach. Underlying beliefs and stereotypical attitudes of exclusion must be challenged and altered to achieve lasting change (Wijk 2001). Students' identities as designers, their ethical positions and attitudes will have a direct impact on the way they design products and environments. Forming a value system thus encompasses emotions, acceptance, concern and attention, valuing and taking responsibility for the user needs.

Objectives related to the 'psychomotor' domain are concerned with developing skills pertaining to the field of study, such as improving one's written and visual communication skills as well as design skills. Although the course incorporates 'skills' as a major domain in educational objectives, we will not focus on it in this study.

The students encountered the subject of inclusive design as a thematic unit in four course sessions (three hours per session). Yet, it was also an ongoing theme as part of other subjects within a 14-week semester. As outlined in Table 1, students were introduced to the topic of inclusive design prior to the first lecture through a homework assignment. They analysed the accessibility of their own homes assuming they had invited a friend in a wheelchair to visit (Activity 1). They were thus expected to gain an awareness of their everyday living environment from a different perspective. The first lecture delivered information about the disabled population in Turkey and presented analytical and visual examples regarding the course's content and principles (Activity 2). In the second course session, students simulated users with different abilities (Activity 3). Using wheelchairs, crutches or blindfolds, students switched between being a disabled user and a guide/helper, visiting areas on campus that they encountered daily. All the 56 students (S) in the Human Factors course participated in this activity. Out of 28 pairs, 11 used blindfolds (39%), seven used crutches (25%) and six used wheelchairs (21%). Three pairs used first crutches and then blindfolds separately (11%) and one pair used first a wheelchair and then blindfolds (4%). Later, students were expected to reflect on their experiences through written descriptions of the activity

Table 1. Educational alignment of the inclusive design unit within the Human Factors course.

Learning activities	Learning goals			Feedback and assessment
	Cognitive dom. (knowledge)	Affective dom. (attitude)	Psychomotor domain (skills)	
Activity 1 – Session 1: analysis of own home for wheelchair	Applying	Receiving, responding	Written and visual communication skills	Analysis of own home for wheelchair (graded)
Activity 2 – Session 1: lecture on inclusive design	Remembering, understanding	Receiving, responding		
Activity 3 – Session 2: simulation: experiencing campus with a disability	Understanding, analysing, evaluating	Responding, valuing, organising and internalising (org., int.) a value system	Psychomotor skills for adapting to environment with a disability	
Activity 4 – Session 3: written reflection of simulation activity	Remembering, understanding, analysing, evaluating	Responding, valuing, org. and int. a value system	Written communication skills, self-reflection	Written reflection of experience
Activity 5 – Session 3: reflection on simulation activity in class discussion	Remembering, understanding analysing, evaluating	Responding, valuing, org. and int. a value system	Verbal communication skills	Discussion and sharing experience with peers
Activity 6 – Session 4: designing a poster on inclusive design	Applying, analysing, evaluating, creating	Valuing, org. and int. a value system	Written and visual communication and design skills	Designing a poster on inclusive design (graded)
Follow-up assignments and activities	Analysing, evaluating, creating	Valuing, org. and int. a value system	Problem-solving; visual and written communication	Follow-up assignments

(Activity 4). In the third session, students shared these experiences interactively in the class discussion (Activity 5). They were also asked to create a poster regarding what they learned and to increase awareness of inclusive design (Activity 6) the following week. Finally, in subsequent sessions, students were required to either analyse or design products and environments based on inclusive design principles.

Table 1 shows the educational alignment of learning goals, teaching−learning activities and assessment methods of the inclusive design unit of the course. To explore the initial research questions, we analysed students' written reflections (Activity 4) and poster designs (Activity 6) that followed the simulation experience (Activity 3). We present the findings from the data analysis in this paper.

Data analysis of the written reflections

We analysed the written reflections by first developing themes and codes (Boyatzis 1998; Krathwohl 1998) based on the cognitive and affective learning domains. Thus, the naming of these two domains was theory-driven. As our analysis progressed, major sub-themes emerged around the issues discussed and focused by the students that could be characterised as data-driven (Boyatzis 1998). For this study, codes were written with reference to Boyatzis' study (1998) and identified by the code label, the definition of what the theme concerns and a description of how to know as the theme occurs (indicators) for each domain. In the cognitive domain, students' descriptions and analyses centred on the physical environment, the self and the social environment. In the affective domain, students' responses centred on their immediate emotional responses to certain situations, and a higher understanding regarding certain issues. The following shows the main domains and sub-themes:

Cognitive domain (*cog*)*:*

(1) *Label*: Describing, analysing and evaluating an aspect of (a) the physical environment (phys) (b) the self (self) and (c) the social environment (social env.)
(2) *Definition*: the factual and/or procedural knowledge pertaining to an aspect
(3) *Indicators*: the descriptive and factual comments regarding an aspect

Affective domain (*aff*):

(1) *Label*: (a) responding (response), (b) valuing/internalising a value system (value)
(2) *Definition*: (a) immediate affective and emotional responses to situations (b) affective responses at a higher level of understanding related to the relationship between self and others as well as the responsibilities of a designer
(3) *Indicators*: (a) comments regarding a feeling/attitude (b) comments regarding the value of the role of self and/or designer, higher understanding or change in an attitude.

We itemised labels and sub-themes in the students' reflections, as shown in the excerpts below (authors' translations):

> I have never used crutches and this was my first experience. Of course *it was a bad emotion* (*aff-response*) . . . Ergonomically, it was so *hard* (*cog-self*) for me. I *could not*

> *use the stairs* (*cog-phys*) and the campus has *cobblestone pavement, so a person who is disabled can hardly walk* (*cog-phys*). (S4)

> When I helped my friends, I *felt lots of responsibility was upon me since if I didn't help them, they would not have been able to walk* (*cog/aff-self*). Today, most people witness plenty of disabled people and *they don't help these people* (*cog-social env*). However, I recognize that, *all people should help these people and their approach should be more careful in terms of disabled people's emotions* (*aff-value*). (S9)

Next, we grouped and distilled similar domains and themes to form a descriptive list of all such remarks.

Findings of the written reflections

Related to the cognitive domain

In the cognitive domain, the descriptions and analyses of students were centred on the *physical environment, the self and the social environment*.

The physical environment

Students' experiences of simulating a disabled person predominantly related to their immediate relationship with the physical environment. After the course work, students had developed an increased awareness of themselves, given their capabilities and the challenges they encountered. This exercise was particularly useful for helping students identify physical features of the everyday environment from the perspective of a disabled user – something that most had not thought of before.

Figures 1 and 2 show students having difficulty with physical features in the environment. 'Difficult' was a word most students (96%) used to describe their experiences. Problems were mainly related to four physical features: stairs, ramps, ground surfaces and doors.

Fifty-three per cent of students highlighted difficulties with stairs. For example, blindfolded students commented on unequal spacing between stair treads and risers,

Figure 1. Students using crutches try to match their everyday activities and abilities to the physical environment.

Figure 2. A student with a wheelchair faces problems with classroom furniture and elevator thresholds.

the lack of indication about stairs' start and end points (this problem could be addressed by changes in floor texture) and the need for handrails on some staircases. Wheelchair users (14%) faced inaccessibility to or problems in accessing certain buildings and campus areas. Those on crutches found some riser heights and staircase widths to be problematic for balance and their surfaces slippery.

Ramps were a notable part of the environment for all students. Twenty-eight per cent commented on how easy ramps were to access, especially compared to stairs. However, 35% still had difficulties with ramps. The most common problem, particularly for wheelchair users, was the slope of the ramp (noted by 25% of those students). Prior to the exercise, many felt that the ramps on campus seemed adequate. During the activity, however, students realised how the ramp slope determines the strength needed to manoeuvre the wheelchair. Other reported problems included no or low handrails, ramps that were not wide enough for a wheelchair user and a walking person to pass each other, inadequate turning space on landings and slippery surfaces in rainy weather.

Fifty-seven per cent of students noted the significance of surface textures, particularly floors. Since the campus pedestrian alley is paved with cobblestone, balancing and walking required much effort and strength for those on crutches and in wheelchairs and their guides. Blindfolded students were in danger of tripping when a texture change could not be observed or predicted. As one user on crutches explained: '. . . texture is crucial for a crutch user. If floor texture is too rough, it causes stability problems, if it is too smooth it makes crutches slide.' (S3)

Thirty-two per cent of students reported difficulties with doors. Crutches and wheelchair users could not open and close doors without help. Some doors were too heavy and others too narrow; a user's arm could bump the frame of the door. The issue of strength as a determinant of physical design features was again only realised through experience. Students suggested having lighter or automatic doors.

Students commented on other problematic areas on campus, such as street intersections, washroom inaccessibility and elevator thresholds, narrow aisles in bookstores and cafes and obstacles such as bushes too close to walkways. The exercise helped to build a collective knowledge base for the course, since the instructor had not considered certain reflections. For example, one female student recognised the importance of hygiene, especially in washrooms; blindfolded, she had to touch all surfaces to navigate. This is the opposite of able-bodied people's practices, where touching surfaces is often avoided, *especially* in washrooms; the sensors and automatic doors designed for hygiene usually only consider the able-bodied person.

Students also became more aware of and thankful for places that they could easily access and use: buildings with good ramps, ATMs, wide corridors and accessible classrooms.

The self

Through experiencing the challenges of the built environment, students also accumulated knowledge about their capabilities. Thus, physiological self-awareness emerged as a significant sub-theme in the written reflections. Students, particularly those on crutches and in wheelchairs and their guides (35%), reported that extra strength was needed to open doors and climb up or down stairs. Some students using wheelchairs and crutches experienced aches and pains in their arms or legs. Pain in various body parts were also reported in the literature as a limitation of the role-play technique (Moody, Mackie, and Davies 2011), since the bodies of students were adapted to using different muscle types.

Difficulty in and the importance of maintaining balance were also noted (17%). Some blindfolded students (14%) stated that they were unaware of the space they were in and they could not find their way. Strickfaden and Devlieger (2011) explained this issue as: designers mainly use their visual experience in navigation and orientation in their everyday life where they do not develop other sensory capacities within spatial environments. Due to the lack of sight, 28% of students experienced an increased use of other senses and clues, such as sounds and voices, the wind, directions given by their guides as well as an additional reliance on what their hands and feet touched. These comments reveal an understanding of how people of diverse capabilities engage with the environment to compensate for their disabilities.

An increased awareness of time was noteworthy for 28% of the students. Some moved much slower than usual, which affected their patience level and tolerance. Some found they needed more time to get to their next class than the given 10 min. One blindfolded student reported that time seemed to pass more slowly.

In their analyses and reflections, students went beyond acquiring factual knowledge and comprehension of their physical environment to suggest changes and alterations. This reflects a higher level of learning in the hierarchy, involving evaluation and creation. Suggestions to add handrails to areas required, changing the ground texture at the beginning and end of stairs, providing automatic doors were among their suggestions as previously mentioned. Similarly, one student pointed out:

> There can be simple design solutions. As we experienced, if the riser height of staircases became lower and treads became a little wider, it would be easier to use staircases for people who use crutches. (S19)

The social environment

Focusing on their relationship with the social environment, students documented a number of primary aspects. First was the recognition that a disabled user is often dependent on others for help, even for basic activities. Students found that this dependency increased when using stairs and doors, and, for wheelchair users, when level changes were required, as well as for orientation purposes. Students using blindfolds or crutches also needed help carrying extra weight such as bags. The second aspect concerned students' role as guides; helping their friends, they had to adjust their own behaviour

accordingly. These realisations at the cognitive level were almost always accompanied by an emotional response, as discussed in the following section.

Related to the affective domain

Enabling students to organise and internalise a value system that encompasses the inclusive design approach is a major goal of the course. The 'affective domain' of Activity 4 involves the categories of responding, valuing, organising and internalising a value system (see Table 1). Within the affective learning domain categories, two major subthemes stood out with different realisation periods. The first was students' *immediate responses*, which consisted of emotional reactions and responses regarding themselves and their social−physical surroundings through their experience. The second was *changing values*, which consisted of implications of organising and internalising values regarding the subject, paving the way to a long-term alteration of attitude.

Immediate responses

These responses were immediate outcomes of the experience and expanded the students' empathic horizons. The physical inability, even for such a short time, had an emotional impact on the view of the self. Role-play proved beneficial for going beyond the cognitive understanding to provide affective links for students; they particularly emphasised how they felt trying to cope with physical obstacles while comparing their abilities to others'.

Regarding immediate emotions, 42% of students expressed general worry and discomfort during the experience. Out of these, 32% were blindfolded students; experiencing a space without vision was disturbing. Students reported feeling helpless, nervous, fearful, inadequate, angry and different from able-bodied people. One student had trouble breathing in the first moments of the experience from insecurity and loss of orientation. Students also documented worries of falling and tripping, particularly when encountering stairs or other obstacles (14%). Other reasons for negative emotions (given mostly by blindfolded students) included encountering people without being able to see them and being unable to identify sources of voices and/or frightening sounds.

Comparing their awareness of accessibility prior to the experience, 21% of students commented that, to the extent that this experience allowed them to comprehend, the built environment posed challenges to the disabled people, which they did not realise before. More importantly, this realisation would have an input in their design considerations.

> First of all, we want to say that this situation is very difficult psychologically and I guess it must be very difficult to accept this situation. Actually until this lesson and experience, I did not think about people who had physical disabilities. Therefore, I was ashamed of myself because I thought that I was very selfish. Now I have started to think about this topic. (S1)

The built environment has a direct impact not only on the experience of the disabled people, but also on their guides, physically and emotionally. The emphasis on guides seems particularly important since the impact of the environment increases to influence twice the percentage of the population if guides are included. Moreover, the personal experience of the first author/instructor of being a guide to her wheel-chaired cousin

for 3 months personally influenced her emphasis of students role-playing as guides as well as disabled people. In that respect, the immediate relationship of the disabled with a guide or dependency on others was new to students; so was the experience of being a guide. Seventeen per cent of guides commented on the weight of the responsibility to help the disabled user, feeling pressured to prevent accidents and possible falls. Twenty-five per cent noted their inability to understand all the needs of the disabled and thus the difficulty in warning their friends about problems. From this experience, they maintained that a guide must be tolerant, patient and trustworthy, should remain cheerful and be able to place his/her needs behind that of the disabled friend's.

Students also reacted to the behaviour of the people around them. Twenty-one per cent of students felt angry and resentful because people did not offer any help and were intolerant. Only 7% of students experienced positive emotions, either because people offered help or appreciated the students' attempts to understand diverse requirements. The following excerpt reflects a guide's feelings about the relationship between herself, her 'disabled' friend and the social environment:

> It is so strange that people don't understand your situation. They don't help you. To cite an example, my friend and I were exiting B building, people did not wait and we had to wait for them. As a helper, I felt so bad because you are helping someone who does not have the same abilities as you. Therefore, we should say, think, and behave twice before we act. (S14, guide for a blindfolded student)

Changing values

In addition to involving an immediate emotional response, the affective domain involves a change in values, i.e. the belief system as to what is right or wrong, and how things ought to be. The desired outcome of the Human Factors course is for students to make the consideration of diverse people as an integral part of their identity as a designer, i.e. to incorporate this type of thinking into their value systems. Seventeen per cent of students reported such self-awareness and felt an increased responsibility to help and design for disabled people. As the excerpt below indicates, the seeds of such change were evident in one of the student's reflections:

> Some places were not designed properly, such as platforms where you cannot turn because the area is too narrow. Designing for such issues should be taught and solutions must be appropriate for disabled people. (S6)

Related to the psychomotor domain

Role-play as a whole helped students to deepen their sensory involvement with and increase their empathy towards disabled users. It also enabled a development of skills and senses to adapt to the challenges that they faced in the built environment by increasing their self-awareness. Also within the psychomotor domain, we believe that in-class discussions about the experience and the task of writing written reflections enabled the communicative skills of the students, but we did not investigate this further through analysis.

Reflection on simulation activity in class discussion

Following the simulation activity (Table 1, Activity 3), and the reflection of the students through written descriptions (Activity 4), a course session was reserved for the

discussion of the activity (Activity 5). This discussion placed the role-play activity in the wider context of disability awareness, and related it to the theoretical lecture course prior to it (Table 1, Activity 2). Moreover, the students not only had a chance to compare their different experiences according to the disability type and whether they were guides or disabled people, but also according to the actual experiences of disabled people, based on readings, informal interviews or actual lived experience. For example, the instructor shared her experience of having lived with her cousin, a wheel-chaired person, and aunt, her major guide who had physiological problems due to the age of 65. The guide as a significant individual also directly affected by the built environment was stressed. Moreover, a student who used crutches due to her broken leg shared her strategies of adaptation over a period of time. Students becoming more sensitive to their immediate environment offered helped to two blind students in the campus after this activity and had informal interviews with them. The feedback from the blind students, such as counting steps to reach a specific destination, and the importance of using canes which we did not use in the role-play activity, were highlighted. In that respect, role-play, an activity to embody some physical/emotional states of the disabled/guide, was supported with theoretical data as well as observations, interviews etc. with disabled people.

Data analysis of the posters

Students can obtain direct or indirect design reflection from the role-play activity conducted in Activity 3. Ho and Siu (2012) tried to understand how emotion issues are related to human-oriented design activities and concluded that designers reflect their emotions as a direct or indirect form in their subsequent design works. The design may reflect emotion by its form or its appearance may motivate emotions in people.

In Activity 6, students were asked to design a poster in pairs using the concept of inclusive design. Twenty-four pairs submitted a poster, which were evaluated using the content analysis method (Bell 2003). Four pairs did not submit posters. In accordance with the research question, we identified variables and values in the posters and determined the presence or absence of each variable. It should be noted that the values identified were exploratory in nature, seeking to determine ways that students reflected the knowledge and experience they gained from this design task. The initial category aimed to identify whether the general intention of the poster was cognitive or affective; the poster was cognitive if it had the intention to increase knowledge regarding certain components of inclusive design or disability, and affective if it intended to change attitudes or values regarding inclusive design or disability.

We also identified sub-categories when analysing the posters regarding textual and visual components. We analysed the text to determine whether it (a) emphasised knowledge or attitudes, (b) was created by the students or was generic, (c) contained a single slogan or long sentences and/or (d) referred to the simulation experience. We analysed the graphics to determine whether they (a) were created by the students or were generic, (b) contained photos from the simulation exercise or from other sources, (c) contained figures or abstract geometric shapes, (d) showed examples of the physical environment and/or (e) contained people or mobility aids. Below we show two examples of posters and explain how the content was analysed accordingly.

The first poster (Figure 3; S16) contains cognitive content. The text (a) emphasises knowledge related to inclusive design/disability, (b) was created and written by the students, (c) contains long sentences and (d) refers to the simulation experience. The

Figure 3. Poster with cognitive content, designed by S16.

graphics (a) were created by the students, (b) contain photos from the simulation exercise, (c) do not contain drawings or abstract figures, (d) contain images of the physical environment and e) do not contain people or mobility aids.

The second poster (Figure 4; S17) contains affective content. The text (a) emphasises an attitude or value, (b) was created by the students, (c) contains a single slogan and (d) does not directly refer to the simulation exercise. The graphics (a) were created by the students, (b) do not contain photos, (c) contain drawings or abstract figures, (d) do not show the physical environment and (e) contain abstract representations of people.

Figure 4. Poster with affective content, designed by S17.

Findings from the posters

The assignment was to create a poster about inclusive design and directed the designer to convey a message. For this reason, the affective components of the posters were very high. The posters also contributed to students' self-awareness, showing attitude change and value prioritisation, communicating their position in and experiences with society during the simulation exercise.

Regarding the content of the posters, 67% of students' main intentions were to influence people's attitudes on the subject. Thirty-three per cent of students were mainly concerned with delivering information about the physical aspects of the built environment related to inclusive design. Thus, the affective component dominated the majority of students' work.

The analysis showed that 87% of the posters contained either generic text such as 'Design for Everyone' or 'Inclusive Design' (37%) or self-generated text that was chosen by students to emphasise a particular message. Sixty-three per cent of the texts accompanying the images had value-driven content, 29% expressed knowledge and values and 8% expressed only knowledge. Seventy-five per cent of texts made no reference to the simulation experience while the rest expressed different aspects of the experience.

Figure 5. (a) and (b) Posters reflecting cognitive learning (5a, S18).

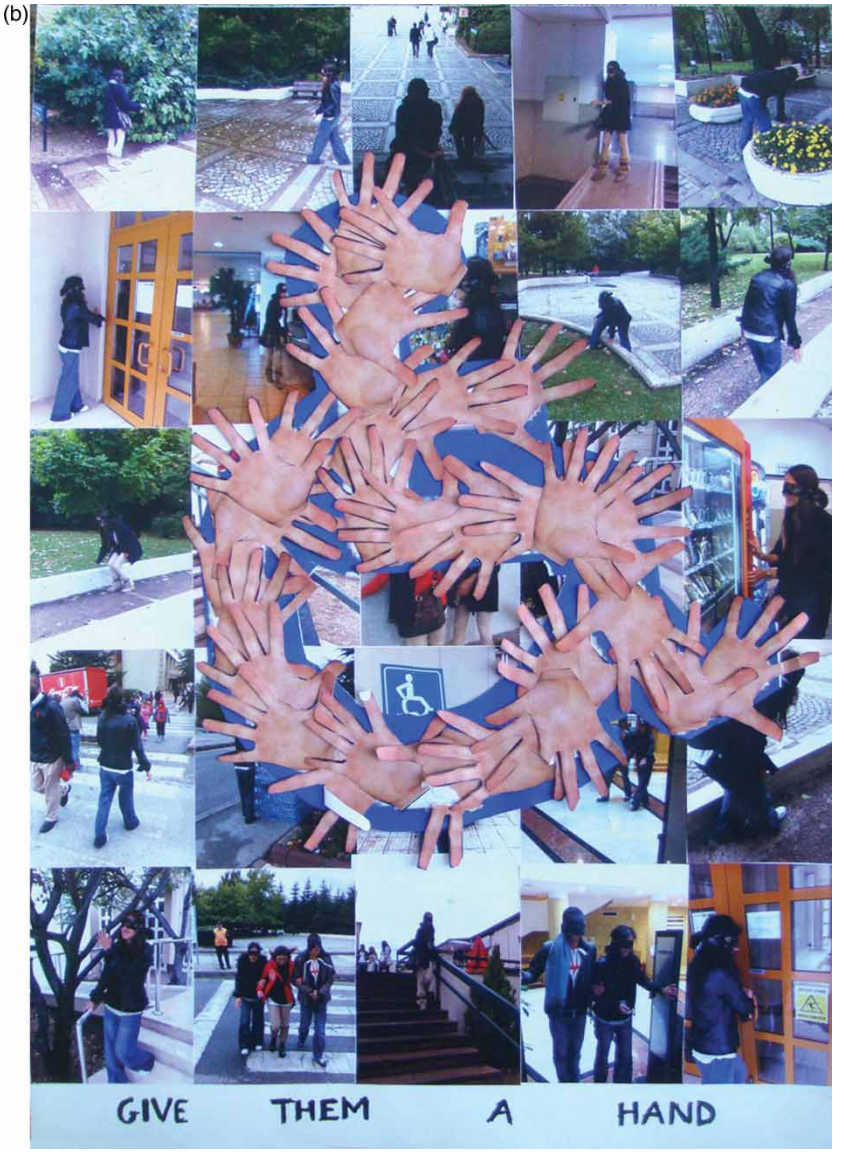

Figure 5. Continued (5b, S7).

Analysing the posters in terms of their visual content revealed that students used a wide range of presentation tools to express their ideas. Images of people, physical environment or mobility aids were either represented through photographs taken during the simulation exercise and from external sources, or through abstract figures.

Posters that emphasised the cognitive dimension expressed difficulties that disabled people encounter and showed possible design solutions through photographs of the students' experiences (Figure 3; S16) or photos from other sources (Figure 5 (a); S18). One poster reflected the experience with the built environment and the responsibilities

Figure 6. (a)–(c) Posters reflecting affective learning (6a, S27; 6b, S14 and 6c, S21).

of the able-bodied person/designer. It thus presented the cognitive and informational dimension as well as the affective dimension. Observing examples of a blindfolded person encountering significant aspects of the environment, we, as responsible citizens and as designers, are given the message to recognise their difficulties and help them (Figure 5(b), S7).

Posters with a predominantly affective content conveyed the message of awareness and responsibility, encouraging the viewer to question his or her attitude. In the poster in Figure 6(a) (S27), the students imply that one of the few places where there are no differences between people is in the air within a balloon where everyone has a similar experience. Moreover, the diverse colours of the balloons suggest embracing people's diversity rather than focusing on their differences. This poster shows thinking inclusively rather than stigmatising the disabled people. On the other hand, Figures 5(b) (S7) and 6(a) (S27) and 6(b) (S14) are examples that aim to break the barrier – mental or physical – between the self and diverse users in the socio-physical world.

The poster activity enabled students to reconsider their roles as designers while developing their skills at conveying a message regarding inclusive design through visual/textual means.

Discussion

One of the main agendas of Interior Architecture and Environmental Design curriculum in general and the Human Factors course in particular is to promote inclusive education. In that respect, activities adopting a user-centred inclusive approach through applying the concept of empathic modelling had positive outcomes.

First, it highlighted, from the perspective of a disabled user, the positive and negative aspects of the existing university setting revealing many aspects requiring change and alteration to increase inclusion. Second, as the main objective of the course, it expanded students' empathic horizons. It changed students' perceptions of their everyday environment, as they engaged with it through walking in someone else's shoes (or on their crutches) and increased their understanding of the multidimensional challenges disabled users face (Cardoso and Clarkson 2012; McDonagh and Thomas 2010).

Empathic modelling was particularly helpful in supporting the affective component in the learning domain. At a personal level and in daily interactions, it also supported the cognitive domain through direct feedback on certain qualities of the built environment that may not have been acquired as textbook knowledge. Strickfaden and Devlieger (2011) maintain that physical and emotional qualities that emerge through practical experiences of designers are an important method to lead to successful design outcomes. The long-term impact of this approach on the organisation and internalisation of designers' value systems and creative design processes is yet to be explored.

Role-play in education

Role-play as a form of simulation has a number of advantages over other design methodologies and media in design education. Design students stated that role-play is more interesting, intrinsically motivating and closer to real world experiences compared to other learning modalities. Role-play approach allows students to practice a situation that could be dangerous, expensive or impossible to experience. Since design education uses problem-based learning methods, role-play approach is very suitable for experiencing real-life situations. Compared to lecture-based passive education techniques only, the support of role-play activity can lead to a significant fostering of positive attitude towards disability in planning and design professionals (Lewis 2011), encouraging a

design problem-solving approach that builds on empathic understanding (Moody, Mackie, and Davies 2011).

Besides design disciplines, understanding issues of inclusivity have been a major concern in other educational contexts, being considered in disciplines ranging from planning, sociology (Livingston 2000), geography (Treby, Hewitt, and Shah 2006), teacher education (Baglieri 2008) and medical education (Symons, McGuigan, and Akl 2009). Role-play activity could be developed and adopted for such educational contexts as well, to dissolve the boundaries of difference and allow for a more inclusive educational approach. In order to overcome distanced and stereotypical representations of different others, one must first make the unfamiliar familiar and embody the affective aspects of a certain lived experience into the personal history/memory (Baglieri 2008). Role-play as an educational strategy may provide such an opportunity.

Limitations of the study and suggestions

The major limitations of the exercise were time and resources. Whether blindfolded, walking with crutches or using a wheelchair, students experienced the campus environment for less than an hour. They would have benefited from living all experiences (and other types of disabilities) for a longer period.

Another limitation is the difficulty to predict the impact of the role-play activity on the long-term change in students' attitudes towards disability, which in turn is to affect their design process. The poster design (activity 6) was one activity to overcome this limitation. In this study, it was analysed how the students depicted their emotions and ideas with respect to inclusive design in their poster designs after 2 weeks. Moreover, role-play activity in the Human Factors course can be reinforced through follow-up projects in Design Studio courses, where students are required to apply a universal design approach as a primary concern.

Finally, the role-play activity provides discrepancies between the students' experience of being in the place of a disabled person although they are able-bodied. Thus, while some of the experiences may resemble the disabled persons' others may not. This issue was raised in the class discussion that followed the role-play activity. Possible real-life experiences of disabled people were compared with students' simulation experience based on readings, personal experiences and informal conversations students had with disabled people. Thus, instructors applying this method should be cautious that if this approach lacks enough coaching, feedback and debriefing, it gives the learner an imprecise understanding of real-life problems (Lunce 2006). Thus, the role-play activity can be supported with other empathic research and design methods, such as interviews, shadowing, observation of different users as well as participation and co-designing with them to arrive at inclusive environments.

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