

DOES UNIVERSAL DESIGN EDUCATION IMPACT ON THE ATTITUDES OF ARCHITECTURE STUDENTS TOWARDS PEOPLE WITH DISABILITY?

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Abstract: The impact of the built environment on the participation and engagement of all people in the community is now widely recognized. The principles of universal design originated from the field of industrial design and architecture, as a design foundation for more usable products and environments. The aim of this study was to investigate the attitudes of architecture students towards people with a disability, comparing those who received inter-professional universal design education with those who had not. A sample of 147 Australian undergraduate architecture students (response rate 39.7%) completed the Interaction with Disabled Persons Scale (IDP). Quantitative descriptive analysis of their scores was undertaken, along with inductive analysis (Mann-Whitney U tests and ANCOVA). Architecture students who had previously participated in inter-professional universal design education had significantly less negative attitudes on two items of the IDP - 'I wonder how I would feel if I had this disability' and 'I am grateful that I do not have such a burden. They also expressed significantly less fear towards people with a disability, as measured by that factor on the IDP. This study suggests education around universal design may promote more positive attitudes towards people with a disability for architecture students, but further research is required to gain a comprehensive understanding of this topic. This study is the first to explore the general attitudes towards

disability of architecture students, and suggests that educational interventions may have a positive influence.

Keywords: universal design, attitudes, architecture, professional education.

Introduction

Disability is a universal human experience, currently experienced in some form by over one billion people or 15% of the world's population (WHO, 2013; WHO, 2014). It is widely recognised that the built environment can act as both a barrier and a facilitator to the participation of all people. (Larkin, Hitch, Watchorn & Ang, 2015). In response, architects have to consider diverse user needs when designing physical spaces within their communities.

The principles of universal design originated in the field of architecture when Ronald Mace challenged conventional design approaches and provided a design foundation for products and environments that were more usable and accessible (Burgstahler, 2012). Seven principles of universal design were established for application to product development, education, architecture and built environments (Connell et al., 1997). These were: equitable use; flexibility in use; simple and intuitive use; perceptible information; tolerance for error; low physical effort; and, sufficient size and space for approach and use. Mace's intent was not to develop a design concept exclusive to people with disability or impairment; universal design is about taking a much broader perspective that includes but is not limited to, parents with prams, older citizens and others with diverse physical, sensory, cognitive and other needs. (The Center for Universal Design, 2008).

In recent years, there has been increased uptake and application of the principles of universal design around the world. However, there remain numerous contextual constraints to its application (Larkin, Hitch, Watchorn & Ang, 2015) and public spaces and buildings continue to be created that lack inclusivity and deny people opportunities to participate in society and daily life. With an increasing demand for sensitivity to the needs of users, architects need to develop new abilities and attitudes towards design

(Bernardi & Kowaltowski, 2010). One way of encouraging and increasing the uptake of universal design strategies, is the provision of education and training during the important and influential years of professional education (Chang, Tremblay & Dunbar, 2000; Evcil, 2012; Helvacioğlu & Karamanoğlu, 2012). There has been some uptake of this into architecture and design higher education curriculum in recent years (Olgunturk & Demirkan, 2009; Paulsson, 2005). However, there are only two published evaluative studies around educational interventions in architecture that focused on inclusive or universal design for people with disabilities.

A cohort of architecture students in the Middle East took part in a specially designed course in inclusive design in interior architecture (Olgunturk & Demirkan, 2009). The course provided the opportunity for information transfer through lectures and the building of skills via a series of practical assessments. Students identified weekly assignments and in-class discussion as the most useful aspect of the curriculum, and their self-rated confidence around universal design also rose significantly through the course. However, the authors report the judgement the design project found there was limited application of the universal design techniques taught in the course, so there seems to have been a gap between learning and application. A further description of innovative practice came from a university in Brazil, where the principles of universal design were introduced in an architectural course (Bernardi & Kowaltowski, 2010). The faculty chose to focus on vision impairment as so much in design is communicated visually, with educational opportunities including role play, simulation and a design project with users. The design project with users was found to be more valuable, and challenged the assumptions of both the students and their teachers about vision impairment and design. The authors therefore advocated a combination of methods in initiatives with architectural education.

A further initiative in this area was the Design 4 Diversity program at Deakin University in Australia, which focused on inter-professional education around universal design practice for architecture and occupational therapy students (Larkin et al., 2010). This initiative incorporated a range of teaching and learning activities and resources including online interactive multi-media

resources, virtual environments, lectures, practical workshops and inter-professional seminars. All of these occurred over a single trimester and were delivered to third year occupational therapy and first year architecture students. Staff from both disciplines provided teaching and support across both groups, and outcomes from the educational and other aspects of this initiative have been reported previously (Hitch, Larkin, Watchorn & Ang, 2012; Larkin, Hitch, Watchorn, Ang & Stagnitti, 2013).

The study described in this paper formed part of the evaluation of the educational intervention aligned to Design 4 Diversity. The aim of this study was to investigate the attitudes of third, fourth and fifth year architecture students towards people with a disability. In particular, the study sought to compare and contrast the attitudes of two groups of architecture students (those who received inter-professional universal design education through Design 4 Diversity and those who did not) towards disability. The null hypothesis was that there was no statistically significant difference in attitudes to disability between these two groups.

Universal Design in the Architecture Profession

There remains limited research discussing architects' application of universal design during the design process. Identified issues relating to the application of universal design by architects include a lack of knowledge of the principles and a lack of efficient and transparent dissemination of current research and knowledge (Heylighen, 2008), lack of an assessment or evaluation tool (Preiser, 2008), lack of systematic procedures and priority recommendations (Afacan & Demirkan, 2010; Preiser, 2008) and few consumer requests (Karol, 2008).

Many authors have discussed potential solutions for the lack of knowledge and application of universal design, including promotion in the architectural press (Heylighen, Herssens & Froyen, 2009), use of universal design patterns (Froyen et al., 2009) and specialized computer software (Marshall et al., 2010). However, architects currently working in the field are unlikely to have received education regarding universal design or human capacities and

abilities as part of their training (Heylighen, 2008). Some authors have suggested a need for its compulsory implementation into architecture and design curriculum to ensure the appropriate education and training of new graduates (Evcil, 2012; Helvacioğlu & Karamanoğlu, 2012). A number of others have argued for the importance of universal design implementation in design curriculum (Bernardi & Kowaltowski, 2010; Olguntürk & Demirkan, 2009; Paulsson, 2005; Watchorn, Larkin, Ang & Hitch, 2013).

Bernardi and Kowaltowski (2010) further supported this view, stating that curricula must adapt its focus in order to maintain architecture education that is relevant to current public and political debates. Olguntürk and Demirkan (2009) recommended universal design implementation as both a separate course and within design studios. Paulsson (2005) elaborated on this, suggesting a number of important aspects for inclusion in curriculum including teacher education, course and project innovation and cooperation projects with users, experts, partners and other schools and organisations. Paulsson also discussed the need for devoted and competent teachers, further substantial research and the positioning of universal design as a distinct subject within the curriculum.

Overall, the literature supports the implementation of universal design into architecture and design curriculum (Bernardi & Kowaltowski, 2010; Helvacioğlu & Karamanoğlu, 2012; Paulsson, 2005; Watchorn et al., 2013) although there is limited uptake of this approach. While universal design is so much more than being about the needs of people with disability, the key drivers of this approach in the past are in fact people with disability and their advocates. In a sense this has both promoted and limited the recognition of the need for universal design principles in the built environment (Watchorn et al., 2014). However, while people with disability do remain a key driver of this approach, it is important to investigate the attitudes of architects and architecture students towards this population as a potential influence to the application and implementation of universal design.

Attitudes Towards People with Disability

Antonak and Livneh (1988) defined an attitude as “an idea charged with emotion which predisposes a class of actions in a particular class of social situations” (p.109). It is thought that attitudes mirror one's thoughts and opinions and have the ability to motivate behaviours (Shannon, Schoen & Tansey, 2009), although this can't be assumed. Extensive research has been completed investigating the attitudes of undergraduate health students towards individuals with disability (Chenoweth, Pryor, Jeon & Hall-Pullin, 2004; Sahin & Akyol, 2010; ten Klooster, Dannenberg, Taal, Burger & Rasker, 2009; Tervo, Palmer & Redinius, 2004). However, there are few identified studies that have gone beyond the health sector and investigated attitudes within the profession of architecture.

An Israeli study (Vilchinsky & Findler, 2004) included architects (n=51) in a sample of various professions who are required to employ people with disabilities. The study explored attitudes towards new equal rights legislation, and utilised the Disability Rights Attitude Scale - Israel in a descriptive, cross sectional design. The attitudes of architects towards this legislation was found to be less favourable than all but one of the other professions, and the authors concluded that these findings may be the consequence of architects valuing aesthetics over functionality. More recently, a study into attitudes around the sexuality of people with intellectual disability (Franco, Cardoso & Neto, 2012), included undergraduate architecture students (n=78) as a control group in relation to medical and psychology students. In comparison to the health students, the architecture students had significantly less favourable responses, although their overall attitude was generally positive.

While previous research has had a specific focus, this study is the first to explore general attitudes towards disability of architecture students. Its significance lies in the increased contact and interaction architects are having with people with disabilities, as university continues to grow in influence, community attitudes change and new legislation is introduced. It is therefore important to understand the attitudes of this professional group, as they may have implications for the implementation of universal design and involvement of end users in the design process. The previously identified

less favourable attitudes held by architects towards people with a disability deserves further exploration, as the current evidence base is fairly limited.

Methodology

This study used a quantitative, quasi-experimental design, comparing two naturally occurring groups (Punch, 2005). Using this method to obtain data provided the researcher with descriptive statistics about the sample, and a numerical representation of the attitudes of architecture students.

Sample

The sample for the study was collected via purposive sampling (Portney & Watkins, 2009) from two separate population groups; third and fourth year architecture students who had participated in the Design 4 Diversity program (Group One) and fifth year architecture students who had not participated in the Design 4 Diversity program (Group Two). Inclusion criteria for the study included students who were 1) undertaking a Bachelor of Design (Architecture) in their third year of study in 2013; 2) undertaking a Master of Architecture and in their fourth or fifth year of study in 2013; 3) who began a Bachelor of Design (Architecture) at the studied university and had continued through the degree without a break and without studying at any other educational institute; 4) who were aged 18 and over; and 5) who were able to speak English to a level that supports study at university.

A total of 370 architecture students were enrolled at the time of the study in the targeted classes at Deakin University, Waterfront Campus, Geelong. Of these students, 147 (39.7%) questionnaires were returned. Thirteen were then excluded as the participants did not meet the inclusion criteria or their questionnaires were returned incomplete. This left a total of 134 completed questionnaires with a response rate of 36.2%. Of these, 82 (64.9%) were completed by students in their third and fourth years of study (Group One) with a response rate of 32.8%. Fifty-two (38.8%) were completed by students in their fifth year of study (Group Two) with a response rate of 43.3%.

Instrument

There are a number of measures that have been developed over the years and used within the literature to measure attitudes towards disability. These include the Attitudes Towards Disabled People (ATDP) (Yuker, Block & Youngg, 1970); Scale of Attitudes towards Disabled People (SADP) (Antonak & Livneh, 1988); Multidimensional Attitudes Scale Towards Persons with Disabilities (MAS) (Findler, Vilchinsky & Werner, 2007); and, Interaction with Disabled Persons Scale (IDP) (Gething, 1991). It is important to recognize that most of the measures were developed almost 30 years ago with little attempt to update them to reflect the current and contemporary views of impairment and disability and relevance to current societal norms and values. However, this study chose to use the Interaction with Disabled Persons Scale (IDP) (Gething, 1991) based on its use in previous studies, availability, and ease of, and time required for administration.

The IDP scale was developed by Lindsay Gething in 1991 to measure negative or non-accepting attitudes towards people with disability (Gething & Wheeler, 1992). The scale measures 20 items to establish a person's discomfort in social interactions with people with disability (Gething & Wheeler, 1992), which has been identified as a central factor underlying negative attitudes (Gething & Wheeler, 1992). The IDP is concise and causes minimal inconvenience to participants (Forlin, Fogarty & Carroll, 1999), and its development in Australia was also relevant to the context of this study (Forlin et al., 1999). The IDP demonstrates strong psychometric properties with high reliability coefficients, good test-retest reliability, high internal consistency and construct validity (Gething, 1991; Gething & Wheeler, 1992). The IDP has previously been extensively used with health and medicine students (Brown et al., 2009).

The IDP is a self-administered, pencil-and-paper measure framed in the first-person (Gething, 1991), that asks respondents to rate how much each of a series of 20 statements fit their reactions when meeting and interacting with a person with disability (Gething, 1991). Responses for each item range from 1 being "I disagree very much" to 6 being "I agree very much". The scale has

six factors; Discomfort; Sympathy; Uncertainty; Fear; Coping; and Vulnerability (Brown et al., 2009; Forlin et al., 1999). When scoring the IDP, polarity has been reversed on three statements to eliminate possible response bias (Gething, 1991). Item 19 was also eliminated prior to scoring as its factor analyses was not found to consistently cluster with other variables (Gething, 1991). A lower score on the scale indicates a more positive attitude, as expressed in terms of perceived discomfort during personal interactions with someone with disability, with total scores ranging from 19-114 (Gething, 1991; Gething & Wheeler, 1992).

Procedure

Prior to commencing this study, ethics approval to conduct the research was obtained from the Deakin University Human Ethics Advisory Group - Faculty of Health (HEAG-H) on 2 July 2013. Architecture students in the targeted classes received a brief oral presentation from the student researcher 20 minutes prior to the conclusion of the class, outlining the research and inviting them to participate. A Plain Language Statement and a copy of the IDP (as part of a more extensive questionnaire that included demographic and other information) were distributed to all students attending the class. Completed questionnaires were deposited in a box placed at the exit of the classroom as the student departed. Consent was assumed if participants returned their questionnaires and all information provided was non-identifiable. The researchers were not employed by the School of Architecture, and had no relationship with the students prior to contact with them for this study.

Data Analysis

Following data collection, the IDP scale responses were scored according to the instruments manual. The research team visually checked 10% of the data to ensure accuracy of entry (Portney & Watkins, 2009). The data were transferred to and analysed by the Statistical Package for Social Sciences (SPSS) Version 21.0. Quantitative demographic data obtained from the questionnaire were analysed using descriptive statistics to summarise the

characteristics of each sample. A two-tailed Mann-Whitney U-Test was performed to determine if a significant difference between participant groups existed in regards to attitudes towards people with disability. A parametric ANCOVA was also completed for the IDP total score. For all statistical tests, the significance level was set to $p < .05$.

Results

Table 1 highlights the characteristics of the two groups of students who participated in this study. A two-tailed Mann-Whitney U-Test was completed to determine if the two groups were statistically significantly different, but no significant differences were found apart from age (U-Test=.000, $p < .05$). This difference would be most likely to have occurred as participants in the group without universal design education are all likely to be older as they are more senior students.

Table 1. Sample Characteristics.

Sample Characteristics	Arch. Students with UD Education	Arch. Students without UD Education
Number of students	82	52
Age	Mean = 24.5	Mean = 26.5
Gender	Male 64.6% (n=53) Female 35.4% (n=29)	Male 65.4% (n=34) Female 34.6% (n=18)
Personal Experience with temporary or permanent health condition	13.4% (n=11)	17.3% (n=9)

Sample Characteristics	Arch. Students with UD Education	Arch. Students without UD Education
Knowing someone with temporary or permanent health condition	52.4% (n=43)	62.7% (n=32)

The participants' total scores on the IDP across both groups ranged from 42-88, with no extremely high or low scores recorded. These raw scores are provided in Appendix 1. Descriptive statistics were also calculated for factor scores on the IDP, and are displayed for both groups in Table 2.

Table 2. Participant IDP Factor Scores (Mean and Standard Deviation).

Item	Arch. Students with UD Education	Arch. Students without UD	Possible Range
Discomfort	9.83 (± 3.22)	10.48 (± 3.55)	4-24
Sympathy	17.90 (± 3.06)	18.06 (± 2.61)	4-24
Uncertainty	12.62 (± 3.06)	12.58 (± 2.94)	4-24
Fear	7.65 (± 1.84)	8.42 (± 1.90)	2-12
Coping	7.56 (± 2.00)	7.77 (± 2.08)	2-12
Vulnerability	7.63 (± 1.66)	8.21 (± 2.08)	2-12

A two-tailed Mann-Whitney U-Test was performed to determine if there was a statistically significant difference between the groups on attitudes to disability. The results of an initial analysis of the total scores identified that there were no statistically significant differences (.136, $p < .05$). A further U-Test was completed for each item of the IDP scale, and significant differences were identified for Item 5; "*I wonder how I would feel if I had this disability*" (.014, $p < .05$) and Item 7; "*I am grateful that I do not have such a burden*" (.009, $p < .01$). In each case, the group of architecture

students who had received universal design education had significantly less negative attitudes to interactions with people with disability.

A Mann-Whitney U test was also completed for factors scores on the IDP. Only one statistically significant difference was identified on Factor 4, *Fear* (.037, $p < .05$). Once again, the group of architecture students who had received universal design education was significantly less fearful of interactions with people with disability.

An Analysis of Covariance (ANCOVA) was also completed for the entire sample to identify any confounding variables. As can be seen in Table 4.15, age, gender, personal experience of a temporary or permanent health condition and knowing someone with a permanent or temporary health condition were not identified as factors influencing attitudes to universal design as scores did not reach $p < .05$.

Table 3. Analysis of Co-Variance

Confounding Variable	Gender	Age	HC-Pers	HC-Other
UD-Pub	.109	.514	.296	.152
UD-Priv	.163	.885	.459	.382
UD-Tot	.112	.704	.316	.228
UD-Imp	.370	.258	.851	.994
Visibility Reqs	.222	.804	.418	.592
AS Fam	.809	.464	.446	.337

Note. UD-Publ=Attitudes to universal design of public buildings and built environments

UD-Priv=Attitudes to universal design of private buildings and built environments

UD-Tot=Total of both attitudes to universal design scales

UD-Imp=Valued importance of universal design to participant future professional career

Visitability Req=Support for implementation of proposed visitability requirements

HC-Pers =Personal experience of a temporary or permanent health condition

HC - Other=Knowledge of someone with a temporary or permanent health condition

AS Familiarity=Familiarity with the Australian Standards 1428.1 - 2009 Design for Access and Mobility

Conclusion

This study is the first to address architecture students' general attitudes to disability and as such addresses a significant gap in the literature. Initial findings indicated that overall, no statistically significant differences existed between groups on total scores to interaction with people with disability. However significant differences were identified on two single items of the IDP; *"I wonder how I would feel if I had this disability"* and *"I am grateful that I do not have such a burden"* and on one factor, *Fear*, of the IDP. Given the findings of this study, the alternative hypothesis is supported, limited to two items and one factor on the IDP, with architecture students who received universal design education possessing significantly more positive attitudes about some aspects of interacting with people with disability.

To explore the significance of these findings, they were compared to those of health professionals and the standardized norms of the IDP. In relation to an international sample of occupational therapy students (Brown et al., 2009), the mean scores of the architecture students in this study were slightly but not significantly higher. This indicates the occupational therapy students had more positive attitudes to interaction with people with disability than the architecture students, which is consistent with the findings of previous studies comparing architects with health professionals (Vilchinsky & Findler, 2004; Franco, Cardoso & Neto, 2012).

The findings of this current study also identified higher scores, indicating more negative attitudes, predominantly within the Sympathy factor of the

IDP. While not statistically significant, these scores indicated that architecture students had particularly negative attitudes to sympathising with people with disability. In regards to this finding, it is useful to reflect upon developments in societal views of disability, with a move from providing sympathy to empathy. While it is imperative that architects understand the implications of built environment design for people with disability, sympathy may no longer be an appropriate response - rather empathy and understanding are required. An exploration of attitudes towards people with disability could be overtly addressed as part of architectural education around universal design, as it often is in health course to encourage reflective practice. Overt consideration of the architecture students existing assumptions and perspectives, and their impact on the design process, could assist in challenging misconceptions based on misunderstandings and prejudices.

In relation to the standardized norms of the IDP, which are drawn from the general public, further similarities and differences were identified. An analysis of covariance (ANCOVA) determined that the demographic characteristics of gender and age were not confounding variables of scores on the IDP within the current study. These findings are supported by Gething (1991), in which 10 out of 11 studies identified that gender and age did not have a significant effect on IDP scores. However, the finding from this study that personal experience of a temporary or permanent health condition was not a confounding variable is not consistent with the existing empirical research. A considerable body of evidence supports the idea that people who have experienced regular close personal contact, tend to possess more positive or accepting attitudes towards people with disability (Gething, 1991).

The implementation of simulation activities in the Design 4 Diversity initiative was used to enhance the architecture students' exposure to people with disability, which is a strategy previously used in similar initiatives (Altay & Demirkan, 2013; Bernardi & Kowaltowski, 2010; Paulsson, 2005). However greater exposure, over longer time periods may be required to substantially shift attitudes, which could explain why there were few statistically

significant findings in this study. Introducing weekly simulation tasks (i.e. taking a shower and dressing one handed, doing shopping on crutches) as part of a unit could provide this prolonged exposure and a greater range of experiences. Another strategy to achieve this could be to encourage architecture students to seek employment that increases their contact with people with disabilities or diverse needs to support their studies. With most students needing to work throughout their study (Devlin, James & Grigg, 2008), it is possible universities could encourage architecture students to work in such roles or organisations to create greater awareness of end user needs and aspirations, thus preparing them after graduation with a greater understanding of user diversity.

The statistically significant changes in attitude found in this study indicate that Design 4 Diversity as an educational intervention may have had a positive impact. While no prior research is available for architecture students, this is somewhat consistent with prior studies with interior design students. Chang et al. (2000) found a statistically significant difference in interior design student attitudes to disability before and after a six-week universal design education program ($t=-2.24$, $p<.03$) (Chang et al., 2000). Altay and Demirkan (2013) also reported changes in design student attitudes to disability following a semester-long subject relating to diversity and inclusive design via theoretical and practical education. In the study by Altay and Demirkan (2013), 17% of students reported the feeling of increased responsibility to consider the needs of diverse people and people with disability during their design process. However, these findings only relate to changes in attitudes in the immediate aftermath of educational interventions, and the magnitude of the changes are relatively modest.

It may also be possible the IDP was not effective in measuring architecture student attitudes to interaction with people with disability. As discussed previously, the IDP was standardised using samples from health and disability fields. As no research has previously investigated its use with architecture and design students, it is difficult to establish whether it is effective in measuring the attitudes to disability more broadly. The time since publication may also be an influence on results. While extensive research

investigating the reliability and validity of the scale has been completed (Gething, 1991; Gething & Wheeler, 1992), clear changes to society and the related constructs of disability have occurred over the last 20 years. These changes are evidenced through the political and legislative developments including the Human Rights Legislation Amendment Act (1999), introduction of the National Disability Standards for Education (2005), International Day of People with Disability, United Nations Convention on the Rights of Persons with Disabilities and the introduction in Australia of the NDIS in 2013 (Australian Human Rights Commission, 2013). These developments may suggest that further investigation of the IDP's suitability to current social and disability constructs is necessary, as is an introduction to these developments and frameworks for the architecture students. This lack of further updates and understanding of the IDP's current day suitability may also explain why no significant differences on total scores of the IDP were found between groups of the current study. Indeed one may question why there has been so little research in recent years in relation to measuring attitudes to people with disability.

Limitations

There were a number of limitations associated with this study. As the questionnaire was voluntary and participants could choose whether to complete and return it, there was the potential for a self-selection bias where students particularly interested in the topic may be more likely to participate. However, due to ethical issues, students enrolled in the targeted classes could not be required to complete the questionnaire. The completion of the questionnaire within the classroom setting could also be considered a limitation. Due to the nature of the study and the setting it was conducted in, it was not possible to ensure all participants completed the questionnaire independently without discussing with their peers. Therefore it is not possible to determine if leakage may have occurred and how this may have impacted on results.

The generalisability of the study is also limited. Purposive sampling was utilised to ensure participants had received the appropriate education and

were a representative sample for the study. However, this also meant that the sample, which was from one university in Australia, is not generalisable to the architecture student population. The statistically significant differences were identified on only three aspects of the IDP, so further investigation of attitudes and methods that enhance more generalized positive attitudes is needed. This study also cannot be generalized to practicing architects, and this is an important population to include in future research in this area.

Recommendations for Future Research

It would be valuable for future studies to include a qualitative aspect that would allow for greater in-depth understanding of architecture student attitudes to universal design in the longer term, particularly post-graduation and in the context of professional practice. As the small amount of literature currently assesses attitudes immediately following an educational intervention, it would also be beneficial to complete a longitudinal or follow-up study to investigate the retention and application of knowledge long-term. A study comparing the associated costs of designing with universal design in mind and the costs associated with retrofitting buildings at a later stage would also be beneficial. For universal design and visitability requirements to be taken seriously in the building industry and its related professions, investigation on the impact of this on the bottom line would enhance our understanding and potentially move this discourse from a moral and legal imperative to a business imperative. A greater understanding of methods to assess attitudes toward people with a disability and the development of appropriate and updated assessment tools are also necessary.

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Appendices

Appendix 1. Participant IDP Raw Scores (Mean and Standard Deviation).

Item	Arch. Students with UD Education	Arch. Students without UD
It is rewarding when I am able to help	4.72 (± 1.00)	4.77 (± 1.13)
It hurts me when they want to do something and can't	4.37 (± 1.04)	4.45 (± 1.24)
I feel frustrated because I don't know how to help	4.22 (± 1.02)	4.06 (± 0.93)
Contact with a disabled person reminds me of my own vulnerability	3.56 (± 1.00)	3.88 (± 1.09)
I wonder how I would feel if I had this disability	4.06 (± 0.99)	4.51 (± 1.10)
I feel ignorant about disabled people	2.75 (± 1.14)	2.52 (± 1.18)
I am grateful that I do not have such a burden	4.31 (± 1.08)	4.79 (± 1.09)
I try to act normal and to ignore the disability	3.95 (± 1.21)	3.69 (± 1.45)
I feel uncomfortable and find it hard to relax	2.72 (± 1.14)	2.94 (± 1.16)
I am aware of the problems that disabled people face	4.06 (± 1.15)	4.13 (± 0.86)
I can't help staring at them	2.43 (± 0.98)	2.69 (± 1.21)

Item	Arch. Students with UD Education	Arch. Students without UD
I feel unsure because I don't know how to behave	2.96 (±1.07)	3.19 (±1.21)
I admire their ability to cope	4.69 (±1.16)	4.96 (±0.82)
I don't pity them	3.44 (±1.36)	3.56 (±1.36)
After frequent contact, I find I just notice the person not the disability	4.15 (±1.22)	4.31 (±1.14)
I feel overwhelmed with discomfort about my lack of disability	2.61 (±1.15)	2.84(±1.09)
I am afraid to look at the person straight in the face	2.41 (±1.18)	2.54 (±1.39)
I tend to make contacts only brief and finish them as quickly as possible	2.33 (±1.13)	2.69 (±1.32)
I feel better with disabled people after I have discussed their disability with them	3.78 (±1.15)	3.73 (±1.17)
I dread the thought that I could eventually end up like them	3.46 (±1.13)	3.59 (±1.36)
IDP Total Score	65.05 (±8.97)	67.47 (±9.14)

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