
Theme 2:Teaching Methods for Architecture Universal Design in Education Conference, 2015

2015-11

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Recommended Citation

Harrison, J. et al. (2015). Promoting universal design in architectural education. *Universal Design in Education*, Dublin, Ireland, 12-13 November, 2015.

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Promoting Universal Design in Architectural Education.

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Abstract

Although Universal Design is an internationally recognized way of thinking about the built environment, there is still a long way to go before user inclusion becomes a fundamental principle in all design. Education of future professionals is obviously one effective way to achieve this, but might be frustratingly slow if this is to take a new generation to become fully established. Identifying and finding ways of removing the barriers, attitudinal as well as physical, is then a priority area.

The presentation introduces the authors' collective teaching experiences on ways of sensitising and raising students' awareness of the barriers and hazards that users face, through observation, simulation or experiential exercises. In order to recognize, in everyday environments, design solutions that are well-integrated and therefore less apparent, techniques to develop both a 'Critical Eye' and an 'Appreciate Eye' are discussed. Students are widely receptive to such challenges, but some reluctance remains amongst tutors, where UD may be perceived as an impediment to 'good design'; this may be attributed to aesthetic limitations of many accessibility and safety features, which are difficult to integrate effectively. Since universal design may be difficult for anyone without an experienced eye to recognize, a positive proposal would be to develop a better reference source of good exemplars, with technical explanation and comments.

Although based on the principles of accessibility and the reduction of barriers and hazards, Universal Design goes further to provide for the widest range of users 'to the greatest possible extent'. But such ubiquity makes it more difficult to legislate for. Regulations generally deal with one element at a time whereas, by definition, UD requires a 'joined-up' approach. Most architecture courses teach the importance of building codes in construction design, but the challenge is how to go beyond mere compliance with 'Part M' and involve students in really inclusive solutions. Various ways to achieve this through legislation, such as Access Statements, have met with limited success, so as well as the 'box-ticking', approach to elemental design, other more positive forms of encouragement are vital: 'carrots' rather than 'sticks'. Initiatives such as the NDA's Universal Design Challenge are positive steps towards achieving this seamless integration in design.

Proposals to develop full Teaching Modules in Universal Design may seem to be a good idea in principle, but the writers believe that singling out this aspect of design may seem to imply that it can be regarded as an 'add-on' rather than an integrated aspect of design. Architecture courses are primarily based on design projects, so that the writing of briefs can discreetly require students to address the real needs of whole populations, from Level One to doctoral research. More optimal ways to inculcate UD would be to include projects with stronger social significance, or focusing on aspects of disability and how designing for users can be mainstream, rather than for special needs.

Pioneering work in Ireland and Asia to establish integration of universal design into the curriculum in schools of architecture will inform the discussion, including techniques learned from professional 'Training the Trainers' workshops and the development of accessibility codes, as well as identifying and working with partners in allied professions. At UCC the development of reciprocal teaching arrangements with Department of Occupational Therapy has proven a fruitful field, apprising OT students of ways of working with architects in designing for special needs whilst highlighting their creative abilities; reciprocally, architecture students learn from the experience of OT lecturers in functional ability. Ongoing research into the effectiveness of such enterprises is further detailed.

Based on these precepts, the presentation seeks to stimulate discussion in the workshop, share experiences and elicit positive proposals to integrate UD into architecture courses, on topics to include:

- *Teaching techniques, curriculum and appropriate project topics, including devising access audits and the holistic appraisal of complete life-zones;*
- *Practical exercises and experiences in working with user groups;*

- *Continuing professional development, including topics of use for educators (which include many part-time tutors) to pass on to their students;*
- *Aesthetic barriers and misapprehensions, through exemplars good and bad,*
- *Dissertation topics or electives at Masters level;*
- *Landscape and conservation issues architecture, pedestrian access and street furniture: working with engineers and planners;*
- *Developing Access Champions – individuals sensitized and motivated to promote UD;*
- *Thesis and Research topics; two-way exchange between teaching staff and students;*
- *Current and future trends in design, such as Lifetime Home concept and future developments in housing provision, the Shared Space concept, adaptive and sensor technologies;*
- *Schools of architecture as resource centres (e.g. providing advice on building adaptations).*

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Introduction

Attitudes to disability have changed significantly in recent years, both in the public and professional domains, and continue to improve. But there can be no cause for complacency, especially in the design and provision of built environments for an inclusive future. Whilst product design and ICT can respond rapidly to such change, where products can be chosen to suit the individual user's needs, the built environment is more permanent and slower to evolve as well as having to provide for a much wider and general range of users, with differing skills and abilities. Universal design, although an internationally recognized way of thinking about the built environment, is not yet regarded universally as a fundamental principle in all design. Educators in courses for future construction design professionals thus have the responsibility for ensuring the continuing increase in standards of user-friendliness and safety, not only for future generations but in effecting such improvements now. Where this is not already happening there is a need to identify the barriers, both physical and attitudinal, and remove these as a matter of priority.

Schools of architecture and other related design disciplines are one of the main organs by which standards can be improved. This can be at all levels, from basic design modules through to continuing professional development courses. Upstream of these initiatives, research, publication and consultation can have a positive impact on the built environment in many ways. Universal design should, by definition, be such an integral basis of any project, of any scale or purpose, that it would not need to be demanded. In order to achieve this happy state, design education will have to re-examine its teaching techniques and make improvements at appropriate levels. The possibilities that these present in various ways will be examined in more detail.

Universal Design beyond Accessibility

Historically, design has moved from complacency, through worthy attention for 'special needs', to accessibility and regard for barrier-free environments. The breakthrough that universal design has brought about in changing attitudes and realizing 'joined-up' thinking is remarkable, but it is really not 'rocket science' and hence should be understandable by everyone – as the basic principle states. Universal design goes beyond removing barriers and hazards to provide for a disparity of users 'to the greatest possible extent' and this may, at first, seem to be a greater challenge than just solving each access problem one at a time. Welch (2002) emphasises the importance of differentiating between universal design and accessibility in "Strategies in Teaching Universal Design". Although now 20 years old, this publication is still probably the most comprehensive work on techniques of teaching the subject.

Bringing about any improvement in standards usually requires 'carrot and stick' approach, where awareness-raising needs to be backed up by mandatory codes. The 'stick' element would consist of legislation and 'deemed-to-satisfy' standards, to which the designer must adhere. In applying accessibility codes the barriers are removed through requiring individual elements to be constructed to given minimum standards, usually in the form of dimensional criteria. While this approach goes quite a long way to reducing barriers and hazards, it cannot legislate for good 'inclusive' design. An example of this would be a typical building entrance; here Part M of the 2010 Irish Building Regulations would stipulate that, if there is a level difference at the threshold, that both a ramp and steps should be provided, with given gradients, dimensions and parts such as handrails specified. What the Regulation does not do is question whether or not a change of level was necessary in the first place, or that a simple matching of floor levels to ground level could achieve a better solution.

Factual topics such as Building Regulations are naturally taught in construction lectures, but if simply memorised by the student, without learning how and where these are applicable, the course is lacking in educational challenge. Universal design has ubiquitous application, but this in itself makes it difficult to legislate for, since it requires the kind of 'joined-up' approach that legislation on its own cannot give. Positive initiatives in the UK and Ireland, to require an 'Access Statement' as part of planning applications have proved limited in success; similarly the use of access audits, whilst able to measure accessibility, are difficult to design to really quantify inclusion of the complete built environment through a 'box-ticking' approach.

So, if legislative 'sticks' cannot beat good design into designers, what form of 'carrot' can be used instead? Clearly this is where the role of information and education becomes important. Initiatives aimed at the design professions, such as the NDA's 'Building for Everybody' go a long way to coating the pill of good design through explaining the logic behind many of the standards with which designers are faced (NDA, 2013). Further positive examples of encouragement may be seen in design awards and competitions, such as the annual UD Challenge.

As we have seen, one of the key points that differentiates Universal Design from Accessibility is that whereas the former is seamlessly integrated into the fabric of building or townscape, accessibility only provides an individual solution to each problem, rather than asking fundamental questions such as to the necessity for a flight of steps in the first place. Perhaps one of the most convincing arguments for teaching UD is that, if this is not seen as fundamental principle of design, buildings will continue to be scarred with insensitive add-on elements such ramps and handrails, where these are not properly integrated at design concept stage or supported by informed detailing.

"Why Universal Design?"

Perhaps the most obvious question that we might then ask is "Why Universal Design?" If we can define the merits – and demerits – of the approach we might be able to understand better what these are, and in order to convince our otherwise skeptical colleagues, it may help to provide a convincing case. And there are still skeptics and those who deny the value of UD or even accessibility; not so long ago well-known art critic Brian Sewell is quoted as saying, "Had the disabled of the past been as noisy as the disabled of the present, none of the temples of ancient Greece and Rome would have been built... I am convinced no worthy building of the past should be altered to ease the passage of the rare disabled visitor, nor any of the present be designed specifically to accommodate the wheelchair." (Sewell, 1997)

And he was not alone. More recently architect Richard Weston, commenting on changes made to the Welsh Assembly Building in Cardiff to improve accessibility, described it as "'horrendous and politically correct... a major loss to the city. It's hugely compromised. And the implications of this are far reaching". He believed that the 1995 Disability Discrimination Act would adversely affect buildings, as the disability lobby grew more powerful, and he speculated that the Spanish Steps in Rome would never have been built if the Act was live then. He then compared it with energy legislation. "It's like energy was two or three years ago – now you've got to put it up front or you won't be able to make the building work. We're so obsessed with regulation – it's tragic." (Weston, 2000)

What reasons can lie behind such antagonism for inclusion? It may well stem from the fact that the examples that they have seen are high profile: ugly either because they are not well designed, or because they have been added after the event, which is always a more difficult design problem to solve either effectively or aesthetically. In the writers' experience, there are some design tutors who perpetuate such attitudes and hence inevitably influence their students. It would, of course, be interesting to know if these critics would still take this stance, being now some 18 years older and probably less able than before. Admittedly, having to design to any standards may be seen as a hindrance to creativity; but this is the nature of architecture and without these constraints the built environment would be a dangerous and inhibiting place. Access legislation is but one more hurdle that the designer has to go through, as well as regulations on fire, energy conservation and other factors. But, whereas we hope that there will never be a situation to test fire safety, the application of universal design will be of immediate benefit everyone.

More significantly, these negative comments highlight the "them and us" attitude that accessibility provokes when seen as being only advantageous for people with disability; once universal design, as 'design for our future selves', is understood such division is less likely to be expressed. Now that we are all joining the "them" group by the fact that we are aging, we might take more cognisance of the fact that one of the major determinants of health is the built environment. This is not a new concept, Hippocrates described swamps as unhealthy places and sunny breezy hillsides as healthy places. The World Health Organisation have further developed this to include our rate of participation in the environment where we live as one of the two major factors of the quality of our health and lived lives (WHO, 2015). We may be in possession of some limiting conditions but at the stroke of a pen or the click of a mouse, an architect can determine level and quality of our participation in society. Architects are in a very powerful position and their awareness of their power over the quality and health of the population is little realized.

It is often cited that the Modern Movement idealized the perfect human being (Man rather than Woman) to the exclusion of anyone less able. Le Corbusier is now notorious in some circles as designing for the idealised Modulor man, and some of his designs for ramps are quite terrifying to use; but there are surprising insights about inclusion further back in the history of architecture.

Leon Battista Alberti, in the influential 'Ten Books of Architecture' (1955) criticizes architects for "...choosing a platform not proper or convenient, without constant regard to the accommodation of the inhabitants, and not providing fit and suitable conveniences for every rank and degree of them, as well master as servants, citizens as rusticks, inmates as visitants: making your building .. too small and narrow; too open and naked, or too much shut in and confined; too much crowded or too rambling with too many apartments, or too few." Elsewhere Alberti goes as far as to specify appropriate standards for both staircases and ramps!

Some of the blame for the lack of consideration for the real needs of the users of buildings might be ascribed to the glossy journals that continue to influence designers. Rarely if ever do we see real people inhabiting the beautifully photographed spaces of the examples illustrated, let alone discussion of functional needs, rather than pure aesthetics. Even in other publications the editors seem to prefer the most uninhabited views of interiors. The trend for Minimalism must take some of the blame, so that even in publications on the work of Peter Zumthor, often cited for his writings related to sensory rather than visual architecture, his design for a residence specifically for the elderly illustrates a staircase without handrail or contrasting nosing – hardly an enticing experience for an older and less-able user.

Alexander and Pallasma, amongst others, cite related drawbacks in modernist design: the house as a machine for living rather than human-centred approach to design. There are, one would imagine, examples of modernist design that are accessible and could be studied in that context. A study of these would help to break down the misgivings that some of the academic staff may have about universal design. Aalto is a good example of a designer who could be said to advocate democratic design for all. The 'little man' was the term he used to describe the person who would inhabit and use his buildings and designs. "We want to build up a social world where the 'little man' can have the highest possible qualities we can give him" (AA, 1950)

Although in many cases we may be preaching to the converted, we still need to widen the circle of those who think positively about inclusive environments. Reference can be made to the growing needs of an ageing population, as well as to people with disability showing an increasingly positive profile through media coverage and events such as the Paralympics. Obviously the notion of designing "for our future selves" (Coleman, 2001) should inspire a 'need to know' approach about how to do this more effectively in any active mind.

Getting Universal Design into the Curriculum

It may seem obvious that there is a need to present teaching modules devoted to universal design as part of any design course and, although well-intentioned in principle, there are, the writers believe, good reasons for not doing this. Perhaps the strongest argument for this is that, in singling it out as a specific topic, it will tend to reinforce the attitude that it is somehow separable from regular design. Although there are advantages in modular courses for many disciplines, it is counter to the way in which architectural design is best taught. Singling out such a fundamental and obvious principle in design is likely to have the negative effect of making it appear to be an add-on, which could just as easily be left out. Technical topics and aspects of the Humanities have both to be rolled into the design course in an integrated and seamless way if the "been there: done that" attitude is not to prevail, defeating the nature of holistic thinking

Rather than such a head-on approach as the UD module, a more effective way to inculcate inclusive thinking into the student mind is by a more subtle and concerted approach. Both Welch and Preiser refer to this as "infusion" (Welch, 2001, Preiser, 2001). Remembering that most courses in architecture and related disciplines are based largely on project work, the way that briefs are formulated is hugely important in teaching universal design. Briefs at all levels, from Year One to taught Postgraduate level should introduce aspects user-needs and inclusion as a design requirement, discreetly or overtly, depending on the design vehicle. Challenging students to formulate a visual and functional profile of the general population and the specific population of users will equip them with more information on designing for function. Challenging them to define disability and difficulty may

widen their visual lens and they may discover that many of them fall into that bracket. For instance, how many of the class wear glasses, but can they work without them? More overt ways to inculcate UD would be to include projects with stronger social significance, focusing on how design can benefit the widest range of users, rather than just for special needs.

An over-enthusiastic crusading approach to promoting universal design could be counter-effective and turn other staff members off to the idea. By reappraising the teaching methods/techniques currently in use in the school, and working with colleagues who are like-minded, tutors can identify points at which emphasis can be made to universal design/inclusive design, infusing the topic in appropriate degree. Where construction modules include Part M of Building Regulations, for instance, studio project work could be formulated in parallel to require evidence of its application in individual designs and then discussing the limitations of regulations against more holistic approaches of universal design.

Raising Awareness on Universal Design

Students in their late teens and early twenties are often unaware of the level of disability in society as the user groups are often an invisible population in society. A walk around the centre of Cork at lunchtime would suggest, mistakenly, that disability figures are greatly exaggerated. A contributory factor to this poor level of participation is the design of the physical environment. (WHO) This level of invisibility is a direct result of inaccessible public space. Engaging the students with user groups particularly within their own age bracket, through design projects or research, will increase their understanding of the challenge of designing for all.

In embarking on any awareness-raising exercises. It can be telling to ask students to state their preconceptions of UD, access and disability, before embarking on any activity or discussion. Then, at the end of the course, this is re-opened and the participants can see the extent of their learning in the intervening time. This opening and closing is essential to ensure ethical considerations are covered when discussing particular groups and how they are considered in design research.

From the authors' collective experiences, teaching at tertiary and professional level, working with 'Training the Trainers' workshops, and in design consultation and practice, the following suggestions are given on some possible ways of sensitising and raising students' awareness of the barriers and hazards that users face, through observation, simulation or experiential exercises, as well as integration into project work at different stages in their education.

The 'Critical Eye' and the 'Appreciative Eye'

Even as experienced educators we should be constantly learning new and useful ways to teach, to pass on information and to inspire change of attitude. In a recent experience of working with a group of design professionals in China, one of facilitators passed on a useful method of enquiry, which this author found appropriate; although not a designer herself, the facilitator encouraged the participants to see the built environment with both a 'Critical Eye' and an 'Appreciative Eye' (LIOS, 2013). This might be for an individual element or for the wider connection. This technique, used in management training, refers to 'critical learning' in much the same way as designers work, often intuitively. As its title suggests the technique is simple but effective in that it allow us to see anything in a variety of ways. In awareness-raising in inclusive environments this is especially important; too often in examining a particular environment we only see the barriers or poor or missing design features, as these stand out. Although by using the 'Critical Eye' we may learn what NOT to do, it is less helpful to us in shaping a better design strategy. But now we are required to counter the negatives, using our 'Appreciative Eye' to identify the positive aspects, which can be instructive and provide good examples to develop.

But herein lies a difficulty for the uninitiated; one of the great virtues of good inclusive design is that, when done well, it is inconspicuous and so needs a more trained eye to identify it. Often this is a statement of the obvious: we may not feel we need to comment on the walkway that is flat and barrier free, but that may actually the great virtue of the environment and, although we cannot necessarily know how it was achieved, it may have taken quite a lot of hard work on the part of the designers to make it look so natural. It may also take an experienced eye to 'see' what is NOT there: the missing handrail or visual contrast on a step, for instance.

In order to develop the critical/appreciative eye (which incidentally is a valuable tool in all other aspects of design evaluation) some degree of guidance is necessary. Someone with an experienced eye will need to start the ball rolling by pointing out these discreet things. This could be done through an informed tutor or activist who has the first hand experience of disability.

Experiential and Simulation Exercises

Simulation exercises involve the placing of subjects (in this case students of architecture) into situations where they have to face barriers and inconveniences at first-hand, by equipping and restricting their movements and/or senses by various means. By being obliged to wear, for example, a blindfold, noise defending headsets or a leg-splint, coupled with the use of the appropriate assistive device(s), the participants gain some insights into the particular difficulties encountered by a person who has such impairment. In order to be effective, the exercise should be sustained over as long a period as possible, with a planned route or set of objectives. Typically a group of 3 students would work together, one experiencing, one recording, photographing and taking notes, while the third member acts to guide and ensure safety.

A number of the studies have been undertaken about disability simulation exercises. The benefits of engagement in such exercises has had variable results. Some research criticizes their use as unethical (Kiger, 1992). What is consistent is that for simulation exercises to be successful they must be well designed with the risks and benefits weighed (Kiger, 1992). A critique of the scarce literature in this area highlights that disability simulation exercises made design professionals more confident when identifying usability problems with different environments and products (Pastalan, Mautz, Merrill, 1973; Lewis, 2009; Dong & Spiliotopoulou, 2010; Cardoso & Clarkson, 2012; Watchorn, Larkin, Ang, & Hitch, 2013). The use of simulation exercises gave the participants a personal experience of what it is like to have a physical or sensory impairment. It is this personal experience of impairment that gave the participants the confidence to identify usability problems and barriers to participation. The involvement of end users gave architects and designers an understanding of the difficulties experienced by people outside their own physical, social and economic background. (McDonagh & Denton, 2006). Significantly, Cardoso & Clarkson (2012) found that simulation exercises identified usability problems that would normally be overlooked if the designers only engaged in observation exercises. The experience was made more efficient by the presence of occupational therapy students during the simulation exercises; usability problems were identified more quickly as these students have a greater understanding of users' needs (Dong & Spiliotopoulou, 2010). In the case of architectural students there was evidence that they thought more deeply about the design of specific products after participation. Universal access in future designs was not an afterthought but more a priority. (Watchorn et al, 2013).

Horgan & Mahon (2015) in an undergraduate study found that overall review of the literature highlights that it is not about doing or not doing simulations, but 'how' you do them which will determine how effective they can be (Lewis, 2009). Simulation exercises must be planned carefully and well-designed in order for them to be effective learning tools (Lewis, 2009). Proper briefing and debriefing sessions, both on the correct use of assistive devices and on the experiential and ethical aspects of the exercise are important (Harrison & Parker, 1997).

Even where a full simulation exercise is not undertaken, having a simple self-propelled wheelchair in the studio may help students to see this as an everyday piece of personal equipment, to use it and experience the need for adequate space in planning any building.

Teaching and Learning: Project Topics

Design Project work is the mainstay of architectural design education and if this is to rise above conceptual thinking there may be requirements in certain key design projects for students to provide evidence to explain design decisions related to technical issues such as construction, specification and detailing, or energy and sustainability matters; the requirement to demonstrate an access strategy, no matter how simple, should be a prerequisite.

In both CCAE and CIT architecture and interior design courses Universal Design is introduced to students in the early years of the programme through design projects in the Design Studio module. The projects are generally based around the domestic environment, from individual apartment spaces to multiple housing units. Technical aspects such as Building regulation compliance are covered in cognate modules in Applied Technology. As a primer the students research the anthropometrics around the variations of the physical body within their class group and the ergonomic factors that are influenced by the space

and objects around them, leading to a human-centred design approach. The students are encouraged to look beyond the basic requirements of Part M and are introduced to lifetime housing standards.

Such projects tend to be seen as unrelated to the student's own experience, sometimes simply as exercises in geometry and space planning. To counter this year 2 students in Architecture are asked to consider their own family home from a number of viewpoints. In particular they are asked to investigate how the network of relationships and patterns of behaviour that make up the 'family,' affect and are influenced by the nature of the dwelling spaces that are described as 'home'. They are asked to comment graphically on a number of criteria such as: comfort and necessity; security and vulnerability; interaction and retreat. From analysing how finite space is adapted over time with the changing needs of the family, the students are then asked to propose adaptations and re-use of the home.

In Year 4 students undertake a dissertation which is preceded by seminar groups where related texts are read and discussed. Universal Design related themes are included within a wide ranging architectural discussion and tend to be at a more informed level.

Teaching and Learning: the 'Crit'

The 'Crit' remains one of the key teaching tools in any design course, but its application is often limited to short critical commentary on each individual's pinned-up drawings. At worst this can become merely a tutorial in public, and it will only be as useful as the experience and sensitivity of the crit panel members. By including panel members who are not necessarily designers, but rather people who have particular personal experience, such as spokespersons for disability user groups, a fresh and focused view will be introduced. In the authors' experience, applying different ways of critically appraising student work can be a useful learning experience, focusing on particular aspects of the project; for a housing project, for instance, this could include aspects of inclusion.

One memorable 'crit' experienced by this writer was when a visiting academic came down heavily on a student's poorly-considered plan: "Who do you want your building to exclude?" he asked, pointedly.

Role Play

As an alternative to the regular crit, the value of student role playing is worth experiencing; each student (or groups of students) is given an outline of a character. The character is described in general terms (e.g. "Mrs Smith, 82 years old, with failing sight and typical range of physical limitations for her age; she lives alone and values her independence"). Often students are able to grasp such concepts more concretely by referring to extended family or community members, grandparents etc, in developing observational skills. Students are further required to investigate (often through brainstorming) the particular needs of their allotted individual and the way that the built environment may help, hinder or endanger them. They are then asked to play that role as members of the crit panel in order to highlight the pros and cons of their fellow-students' designs. In this way, an exchange of experiences, observations and imagination is exploited, allowing students to see their work in a fresh light.

"Playing Doll's Houses" is a simpler version of this exercise; again, students investigate individual needs of characters and make critical comments from this point of view on their design project proposals, both their own or by exchanging drawings with another student. In design studio projects, for example, students may present designs that have unnecessary changes in floor level, arguing for a prevailing notion that space can only be definable by changes in floor levels, without reference to accessibility. Both this and the previously-described role-playing 'crit' can be particularly effective at 'interim' stage, allowing for improvements to be made before the final hand in.

Working with Occupational Therapists

Useful allies in understanding the diverse needs of users, the profession of occupational therapist remains largely unrecognized by architects, which is regrettable. From the authors' experiences there is much to be learned from a profession that considers the living zones of individuals just as much as do architects. Exchanges of skills and experience can prove beneficial; in the authors' experience the architect delivers presentation to Occupational Therapy students on universal design of built environments, plus inputs on drawing and understanding plans. In return, OT lecturers reciprocate, coming to the school of

architecture at Year 2 level with training in the use of assistive devices and insights into particular aspects of domestic adaptation, culminating in a simulation exercise.

Design Diary and Access Mapping

Where an experiential exercise has been carried out, the impact of this will be sustained if students are required to keep an 'design access diary' – a sketchbook into which they record the positive and negative planning and design features that they are now sensitized to recognise. Other forms of heightening this awareness could be used. Mapping parts of the city is a regular student exercise, to explore and communicate the diverse nature of the built environment, even where we think we are familiar with it. To be able to understand how people with different abilities will experience any environment is surely a requisite skill for designers; projects to identify and map good and bad design, barriers and affordances*, and the connections between these can be a fruitful exercise, potentially with lasting benefits. An example of such work was carried out by Year 4 students at the National University of Singapore. The basis for this was a publication, 'Access Singapore', commissioned by the tourist board to identify accessible buildings for tourists with access needs. However, as this only detailed individual buildings and facilities the students were inspired to identify barrier-free connecting routes and external facilities between these, designing a practical map which was then included in a revised publication (NCSS, 1995).

Exemplars

Well-integrated examples of universal design may be difficult for anyone who does not have an experienced eye to recognize or understand; a positive response to this would be to develop a better reference source of good examples, complete with technical explanation and comments on each one. Here the 'Critical Eye' and 'Appreciate Eye' technique might be a useful approach.

Design and Research Opportunities

Thesis and Research topics demand a higher level of two-way exchange between teaching staff and students. Students in higher years participating in electives (eg Design for an Ageing Society) are apprised of tutors current research work and gain experience by assisting in such tasks as literature or web searches, in exchange for updates on the research project.

Topics for thesis or dissertation could investigate current and future trends in design, such as the Lifetime Home concept and future developments in housing provision, adaptive and sensor technologies, 'Shared Space' in urban design and other topics can provide fruitful fields for investigation. These are topics that can be 'infused' into lecture and project work and suggested fields for Y4 dissertations, where experience shows that a significant proportion of students are interested in topics relating to the non-visual senses and design.

Consultation: Live Projects

Many schools of design include 'Outreach' projects for students, wherein local or social design opportunities are explored. Design studio tutors are often on the look out for meaningful projects with a social purpose. Tutors may use various means to let it be known that their school would welcome requests from agencies, to make imaginative proposals for some aspect of design, particularly where this would be out of the ambit of an architectural practice. Schools of architecture have a useful role to play in the community, acting as resource centres in various ways, such as providing advice on building adaptations. As an example of this, informal liaison with organisations such as the Irish Guide Dogs for the Blind has been established, wherein staff and students from the school of architecture propose design solutions for modifications in buildings and landscapes used by people with sensory impairment. Alliance with the professionals in the field of Occupational Therapy has yielded valuable learning experiences as well as serving the community.

Conclusion

Rather than a head-on attack, a softly-softly approach will probably be the most enduring and effective way to get universal design thinking into all branches of architectural education, no matter how simple. Apprising all fellow tutors, particularly those who are in charge of writing the design programmes, is a key factor and may be one of the more difficult tasks but by attrition or infusion this is achievable. Keeping the topic sustainable is also a challenge, particularly where there is a turnover of staff or re-allocation of studio coordinators. From the authors' experience, the impetus for most inputs related to universal design relies greatly on the enthusiasm of particular individuals, which can be a potential weakness; once this person has moved on, the

momentum may be lost, unless another committed and experienced individual steps in. Thus it is important to 'pass the baton' to like-minded fellow tutors in advance, to give them the confidence and resources to sustain the effort.

Equally, in the wider community schools can make positive moves in identifying and working with partners and personalities in the promotion of UD in education; these could be academic staff members, possibly of different disciplines, such as OTs, and in other schools, as well as articulate members of user groups or NGOs. Informal networks naturally occur, but reinforcing these ties is important to both widen the knowledge base and to diversify the impact to the wider community with any involvement in the creation of the built environment in order to make it fully inclusive.

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