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SENSORY SPACES: SENSORY LEARNING – AN EXPERIMENTAL APPROACH TO EDUCATING FUTURE DESIGNERS TO DESIGN AUTISM SCHOOLS

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Abstract

Universities and design schools have a responsibility to ensure that the education of future designers enables design for special populations, in this case specifically children with autism. This paper presents a case study of an autism defined experimental teaching-led design project, within a first-year university Interior Architecture course, on which the author is a tutor. It draws on the author's extensive working knowledge of autism issues, incorporating mediation between SEN schools and design students, and employing research informed teaching. The project involves a new local free school for autism, at a temporary site. The experiment is designed to challenge students, emphasising the importance of understanding how primary research, accessed directly from the end users, informs progressive design thinking. It attempts to influence their design work in subsequent years at university and in practice, and facilitate bridging the gap between academic research and real-life application. This paper seeks to identify how an autism defined project, focussed on student-centred learning and encompassing choosing sessions with children with ASD, can be taught in the first year of undergraduate study. Further, it aims to analyse how the teaching styles and content of a partially 'live' community design project impact on the participants. This is achieved by describing the details and challenges of the project together with the interactions between the students and the school. It concludes that the project adds value to the student experience, builds student confidence and eliminates pre-conceived ideas surrounding autism. It shows that design can be an interactive process between university and special schools. Equally, the pitfalls of a live project of this nature are highlighted, as is the need for modification before similar projects are reproducible as viable educational models.

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INTRODUCTION

The government has published design guidelines encompassing the environment within schools (A&BB, 1992, 1999, 2001, 2008, 2015) for those with autism (also known as Autistic Spectrum Disorder or ASD). However, particularly in respect of earlier versions, these have been challenged as inadequate, and alternative approaches have been proposed or endorsed by the NAS (National Autistic Society) and by architects Vogel (2008), Scott (2009: 36-51), McAllister & Maguire (2012:103–112), Mostafa (2008: 189-211, 2014: 143-158). The latest version (A&BB, 2015) recognises the needs for alternative spaces for autism to some extent, but is still limited in its advice for designing autism environments, concentrating on provision for general special needs and net areas of buildings. This paper does not seek to augment these developing approaches. Rather, it explores and champions an experimental teaching-led design project which discourages any preconceived ideas on autism and transfers knowledge to design students who have an important role in the future of designing for people with autism.

The first year of study provides educators with the primary opportunity to mould and stimulate creativity (Saxton, 1981) and for early intervention in design thinking (Temple, 2010) as part of the design process. Inspirational teaching from day one is essential to hold interest and set a pace, allowing core skills and the design process to feed subsequent years. In the project described, first year university design students learn about pedagogy informing the design of space which, in turn, enriches shifting sensory environments through their proposals. This project responds to the call for a 'trans-critical' pedagogy in design education, applying knowledge found through real social issues (Salama, 2015). Centrally recognised is that 'reliable and unbiased knowledge about client requirements, along with user needs and behaviour, are also important in improving design quality and performance. A structured process (i.e. a research process) is most effective in gaining this knowledge' (Collins, 2014:3). The need for integrated evidence-based live projects is discussed by many (Kolb, 1984; Harriss & Widder, 2014) but more complex problems within our marginalised contemporary societies (Salama, 2015) demand further investigation.

The primary goal is to enable the students to explore different types of design thinking by investigating all options and reconsidering possibilities regarding the way schools for autism are designed. This exposes them to a deeper understanding of a design brief as well as forming a real connection and sensitivity towards inclusive design (Scott et al, 2018:9-22) and the end users. The research places a greater emphasis on the individual (Williams, 1996) in our growing autism society (NAS, 2018), with the aim of helping these children to access learning more effectively, having their voices heard and eventually improving integration with the world around them (WRD, 2011). The requirement for community engagement to establish a two-way collaboration (Sara & Jones, 2018; Bernardi & Kowaltowski, 2010) is paramount if we want to understand the true needs of users. This subsequently communicates to students the importance of re-evaluating any preconceived design histories, enabling students to unlock first-hand information.

This paper describes a case study of an experimental teaching-led design project, evaluating its methodology and the challenges it presents. A future paper will review how those challenges were addressed in four subsequent projects based on the design of an autism school together with the design outcomes of all five projects.

Orchestration

The paper is split into four key sections:
Part One: Scope of project.
Part Two: Direct participation, working alongside children with autism undertaking "choosing" sessions.
Part Three: Presentation of the design outcomes to the children and SEN (Special Educational Needs) teachers. A critique of this educational model through feedback.
Part Four: Teaching reflections, recommendations and conclusion.

PART ONE: SCOPE OF PROJECT

The vehicle and evidence for this research is a studio-based project to design a small school for autism, for children aged 11-19, attempting to integrate adaptable sensory spaces. The part 'live', part 'hypothetical' project nurtures creative thinking and targeted research, under the close supervision of an art-school trained design tutor, who has a working knowledge of autism, and a tutor who has experience of school design within architecture.

Designing spaces appropriately for people with autism has many challenges. This paper takes the teaching stance that students of art and design are recommended to adopt a flexibility of thinking in their design proposals and consider them as fluid, 'work in progress' rather than as a fixed definition or destination. This reflects the early stages of professional design practice and the ever-changing knowledge base (NAS, 2018) of this highly complex, forever diverse condition.

The main springboard for the student design projects has been ASD children, the knowledge of people with autism, primarily Grandin (2008), Lawson (1998), Blackburn (2004), and the valuable knowledge of SEN teachers. The focus is on sensory processing issues (Bogdashina, 2003), (Biel and Peske, 2005), and how designers can be responsive to these disorders through exploring and interpreting the design of spaces. This encompasses the balance of knowledge-based concepts with an open-ended creative approach to process, expressed primarily through drawings and three-dimensional model making.

Teaching methodology: a design project as a case study

The part live project sidesteps the 'traditional approach to studio teaching' (Salama, 2015:75). It demands a focussed, deep level of critical thinking, research and understanding of a complex social issue, exposure to users, prioritising real human needs, 'learning through discovery' (MacDermott et al, 2012:77), and merging knowledge with application, to avoid possible contradiction between theory and practice. The students see first-hand that the design process shifts and changes owing to external factors, some of which are controllable, some not.

Various constraints determined how the project could be implemented. It was to be a teaching led research project with a real focus, and with design students visiting autism schools, without causing sensory overload or disturbance to the children. To be manageable, only a small group of students could be assigned to this particular brief, but equally it had to fit in with the staffing, number of tutorials, module outcomes and supporting lecture series in the existing course. To achieve this, an overarching brief used the same building and the

same time span, but was divided into 8 main briefs, 4-6 students per group, one of these groups being carefully selected students to undertake the design for autism brief.

Selection of students to undertake the project

Four design students from 40 were selected for the autism project, to be run in Semester 2 of first year, their suitability having been assessed in Semester 1, when fundamental design skills were being established. Their strengths, weaknesses, and 'fit' could be ascertained from the presentation of the students' second design project which used an existing building. The autism project requires a high level of commitment, a strong work ethic and a desire to be challenged. Its success is founded on students not falling at the first fence, but there is limited time to evaluate their track record. Two of the four students proved to be very strong and this was enough to enable the project to flourish.

Effective ways of knowledge transfer to the students:

1 **Briefing.** From day one, it is critical to undertake a full and detailed briefing to kick start the design process including an introduction to autism. Although given autonomy, students were encouraged to focus on the areas of hypo and hyper sensitivity, i.e. acoustics, light, touch, proprioception, vestibular, and transitioning between spaces. This fast track approach is required to accelerate student understanding in a complex project requiring major tutorial support and no time to waste.

2 **Using film to engage.** Temple Grandin's film 'Thinking in Pictures' was issued in advance of the briefing to assist in giving the students a grounding prior to the start of the project. Understanding how a narrative relates to travelling through interior space is a vital part of the course, and this film is an ideal example of how environments affect how people feel and can help to inspire a design approach.

3 **Accessing research.** Varied research recommendations were issued, to respond to different learning styles; for instance, in addition to books authored by people with autism such as Grandin (2008) and sensory expert Bogdashina (2003), online resources were suggested, which can be more accessible to visual learners. These include Lawson's website (2018) and Bogdashina's online PowerPoint (2014), both of which provide clearly defined information. A key breakthrough was introducing the YouTube clip with Amanda Baggs' 'In my own words' (2007), communicating an understanding that non-verbal does not necessarily mean at the low-functioning end of the spectrum. The clip also illustrates that the most informed research is from those with autism, and how, as designers, students need to try to understand the world from their viewpoint.

4 **Peer to peer learning.** This is critical, as the subject area of autism is too large to cover in a short time. Students focus within specialisms and bring acquired knowledge to tutorials for discussion and feedforward, followed by fortnightly studio group pin ups for formative feedback. Sharing the information with the group also enhances an appreciation of diversity in the ASD children.

5 **Online working group.** This enables sharing of ideas, design precedent images, references, trouble shooting, and general communication. Subject specific reading

and research material is targeted at individual design students, and 24/7 access assisted with the time limitations.

The site

The chosen (hypothetical) project building is sited adjacent to Leeds Bridge, where, in 1888, Louis Le Prince is believed to have filmed the first moving image using his single-lens camera. The overarching brief was inspired by film and, to link site with brief, each design student was given a film to research, each of a different genre. The only difference with the autism group's project was that they were given the focus for their brief. This autism brief had already been extensively researched by their tutor; if the students were going to tackle a more complex design project than the other students in the year, then they required extra help in return.

A design research report

Students were required to produce a detailed illustrated Design Report covering: individual brief, site and building analysis, film research, re-evaluating the design of spaces for autistic individuals, case study, precedent studies, conclusion, and proposing a way forward. They were asked to look at The Government Building Bulletin for Designing for disabled children and children with special educational needs (A&BB, 2008), but to question this throughout. A key driver is the desire to question the "one size fits all" approach (Williams, 1996) within the design for autism in schools.

Specific design requirements

The individually negotiated student briefs evolved and developed as the research emerged. Nonetheless, all spaces within the project were to include:

1 Clarity of purpose (no mixed functions, so as to avoid any confusion of use). In a conference discussion with Ros Blackburn, an adult with autism who is an international speaker, Blackburn noted that the key improvement to be made in the design of interior spaces is increased clarity of purpose (Personal conversation, 13 July 2012). For Blackburn, entering a space with both a bed and a computer could prove perplexing; should she go to sleep or work? To her, 'the outside world is a confusing mass of sights and sounds. It is totally baffling and incomprehensible' (Blackburn cited by Bogdashina, 2014). Likewise, Blackburn argues that spaces should clearly communicate the direction people with autism should be walking, in order to prevent collision with walls, using the example of a hospital designed for wheelchair users, with straight corridors and red lines on the floor.

2 A low arousal environment. Blackburn also picked up on visuals in the conference lecture theatre, which appeared insignificant to the neurotypical observer: how light created rainbows on chairs, a pink jumper on the back of a chair, and the specific arrangement of three coffee cups. Therefore, environments which may appear at first sight low arousal, and therefore non-distracting in an educational setting, can actually be distracting to people with autism. Similar views on environments have been corroborated by many in the field of autism (Mostafa, 2008).

Community engagement and collaborative learning: the school

The local school, which became part of this project, was in temporary accommodation, sharing some spaces with a local college, in a far from ideal situation. It is a Free SEN School, initially started with just 5 children, but with a plan in place to increase in size to 50 pupils, over 5 years, and to move to purpose-converted accommodation within 2 years. Their initial small class size worked out well with the project, as 1:1 sessions with each child were easily facilitated.

The project required a sensitive approach, working with children ranging from non-verbal and severely affected, to verbal and high functioning. The head teacher assisted with Project Ethics and an internal code for the names of the students was implemented to avoid any breaches in confidentiality. All of the "choosing" sessions were approved in advance by SEN staff for appropriate content. Use of the term 'autism' was avoided in the presence of the children, as the Head advised many of them do not know that they have this condition and they could find the term confusing. The teachers provided a short profile on each of the children and their sensory needs, to help in understanding them individually, and to help pre-empt any behavioural triggers.

The design students met with the Chair of Governors for a briefing on the plans to move to their new building, giving an insight into the context and complexity of a design project, and a connection to the real world. The Chair had just returned from a visit to Forest Way, Leicester, a new build, mixed special needs school with 30% ASD children. On her recommendation, the students visited this building later in the project, to understand the preferred approach for the new school.

PART TWO: INFORMATION GATHERING - A SERIES OF INTERACTIVE SESSIONS BETWEEN THE SCHOOL CHILDREN AND THE DESIGN STUDENTS

Ice-breaker

This involved all of the children, staff and design students, held in the main classroom. It commenced with the students showing a stop frame animation which they had produced in response to the Temple Grandin film, primarily describing crossing over thresholds and journeys between a series of spaces. The students then showed pictures of their pets, which opened up communication between the whole group in a more successful and personal way than purely speaking about the animation.

The children then served tea and cake in their temporary dining room, as part of developing social skills but also an ideal opportunity for the students to be introduced to the children and to help gain their trust. A natural pairing occurred; certain students engaged more readily with certain children and vice versa.

Linking learning

In the interim, the main class teacher started to link the sessions with some of her school sessions, as part of discussing the move with the children to a new school. She provided us with the following information, which went on to inform the first "choosing" session:

Classroom design requirements suggested by the class of children and gathered by the class teacher: 'Chairs – red, fabric, soft, Reclining chairs, Small round windows, Thick

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carpet – blue, Not like a classroom, Small, coffee type table, TV/music centre, Brick - grey walls (they had breezeblock for walls in their temporary classroom), Spot lights – dimmer switch, Fish tank, No camera zone, Nothing on the walls, Projector to do pictures.' (Personal note from teacher). The most interesting comment was 'Not like a classroom'.

Design requirements for a classroom by one of the children who was not available for the above session, but compiled this brief himself: 'I would like a big classroom because I feel claustrophobic. I don't want a small classroom with lots of people in it. It makes me feel frustrated and angry and I feel like I want to run out the room to get away. I would like a big play area to play basketball. It would be nice to have a quiet area in the playground with a few benches to sit on to talk and relax. I would like a separate room for play and activities like playing Lego or reading a book. It would need to be a quiet room with bean bags or comfy seats with soft material like cotton or fake leather. The classrooms could be painted green and blue because they are my favourite colours.' (Personal note from child).

Based on an understanding that a high proportion of ASD children are visual learners and learn more effectively through direct participation (Scott, 2011), a series of hands-on "choosing" sessions with the design students were arranged. These centred on choice, by the children, of one two-dimensional image in favour over a second. To help source images, the students were introduced to the following information: children's likes and dislikes; issues within their current building; selected writings by people with autism; and the film Temple Grandin's 'Thinking in Pictures'. The tutors and design students then debated the strengths and weaknesses of the images. It became evident that the staff needed control of the final choice of images as the students were finding it difficult to undertake both this and their design reports.

Child to design student learning, and vice versa, via a choosing session in the classroom

The students were each paired with a child, working on visual choices, led by teachers and teaching assistants, primarily using the Applied Behaviour Analysis (ABA) reward-based teaching method. This was useful for the students, as they could learn how the two temporary classrooms functioned on a 1:1 basis; workstations were utilised for choosing and a quiet corner for individual reward activities, such as listening to favourite music on headphones. The session highlighted many of the problems within non-purpose-built classrooms, which the students analysed in their extended design report, in an attempt to identify key design issues.

Two-dimensional image choice

For each child, a pack was prepared of an extensive series of A4 colour, photographic images describing internal spaces, with obvious, differing qualities. The groups were split into two, one of higher ability than the other. One group coped with longer sessions and less frequent breaks, the other shorter sessions with more frequent breaks. The images were presented as a contrasting pair, always with the choice between two images, and then the child decided which of the two images they preferred. The students asked 'Do you like this, OR this?' The children with speech sometimes gave a reason for a particular selection. Key spatial options included:

- Looking out of a space into a landscape or looking into a space: designed by Carlo Scarpa;

- A dark corridor with a light at the end and vice versa: spaces designed by James Turrell and John Pawson;
- A straight corridor with or without a door at the end: spaces designed by Claudio Silvestrin;
- Soft spaces, designed by Ernesto Neto or hard spaces, designed by Richard Serra;
- Simple off-white grounded spaces, designed by Hiroshi Sugimoto or complex suspended spaces, designed by Cristine Iglesias;
- Contained curved or contained linear spaces: Dan Graham's sculptural optical installations;
- Warmly lit interior or cool lit interior: designed by Maria Nordman;
- Spaces constructed from textured timber or those constructed from hard stone materials: designed by Peter Zumthor.

The children who could concentrate for longer periods were shown further image choices, which grew in detail depending on their earlier selected preferences. This process means that the design students have to think on their feet, to reflect design in action (Schon, 1987), pulling out more paired images depending on each child's feedback.

The process encourages two-way learning as the design students are introduced to exemplar precedent, by architects and designers, potentially inspiring their design work. The sessions also helped the students to make the connection that 'any object or built environment embodies human choices and preferences' (Salama, 2015:268).
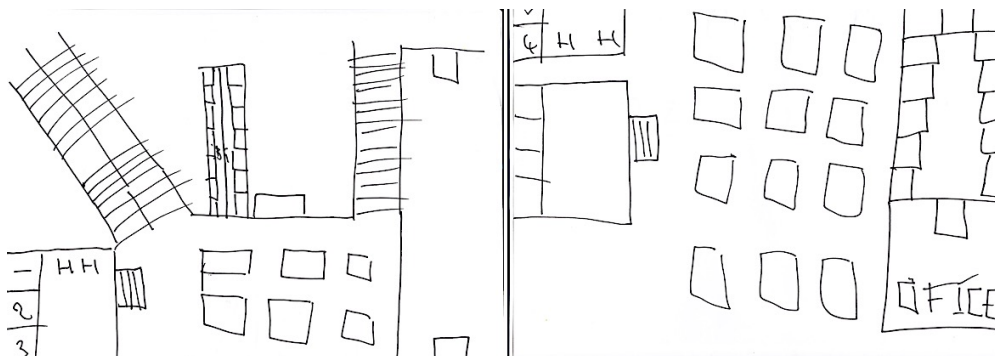

Figure 1. A child's two drawings of a preferred classroom layout. (Source: Child).

Outcomes: In hindsight, the simple shapes and forms which were presented as choices - large circles and angular lines - were actually too simple and came across as abstract, rather than purposeful, confusing the children. Better were photographs of spaces which were deliberately uncluttered, so as to be clear in their intentions, with images of real spaces being more easily interpreted by the children. There was no significant preference for any particular space across the group, although the exercise did encourage conversations about likes and dislikes. One boy started to draw plan layouts of very ordered linear, desks, chairs and circulation routes set up within a grid (Figure 1).

Another child was particularly interested in stairs and balconies and would draw pictures which included many stairs and viewing points from above. When asked why he liked stairs so much, he responded that he enjoyed looking at them and the motion of walking up and down, information utilised in the student's project.

Two-dimensional colour choice

This was a choice between a series of contrasting plain, flat, bright and soft versions of the same colour, and neutral light and dark versions of a colour, printed onto A4 paper. 10 combinations in total.

Outcomes: There was no discernible pattern of selection of colour; the children liked different colours and each child made different choices. Some children gave reasoning for their choice, particularly if they could relate it to something they knew. In one instance, red was interpreted as fire and burning, so this was not selected. Blue spaces were interpreted as water by two children, yellow as sand by one child, so these options were selected. Green space was associated with a jungle, while another connected it to the grass outside, again the selection being made.

Three-dimensional texture choice

For one child, with complex needs, use was made of a sensory box incorporating a series of interior material samples, instead of 2D images. The session was as interactive as possible; the teacher sat opposite the child and gained eye contact while presenting the choices verbally, lifting up the samples so that the child could touch and experience the texture.

Outcomes: In this box of textures was a grey composite tile which the child touched regularly. This was a new texture to her, so generating a particularly interesting sensation. There was not enough textural difference between the two smooth timbers presented, one dark and one light, to make a choice. Two materials were touched extensively: textured ribbed paper (orange) and heavily textured light stone. The teacher commented that this was a very successful session with the child concentrating for good periods of time. Utilising alternative methods of extracting information is a key design skill, as recognised by the 'tactile maps' produced for the participation of the visually impaired (Bernardi & Kowaltowski, 2010).

When presenting the A4 plain coloured sheets, it was much harder to ascertain a definite choice as the child was looking to the left each time and was not as engaged with the feeling of the flat smooth paper.

Spatial choosing session in the dark room/photography space

This room was selected on a pre- visit to the school as an ideal 'control' location to insert a series of spaces; acoustically and visually quiet, in an undisturbed location, it also had many variations of artificial lighting. A series of 4 environments were installed as options, which came in the form of pop up tents of varying size and shape (Figure 2). Additional options included a weighted blanket, a Pilates ball to sit and possibly rock on, and a static bean bag. Again, choices were always between two items, and the options offered were varied depending on the ability of the child. Once the optimum learning environment was established, a learning activity was undertaken, set on a light box (choice of 'on' or 'off') with options of coloured Irlen overlays (Figure 3), which can minimize or eliminate glare (Lawson, 1998). A light box was selected, as glowing with upward light has been identified as beneficial for some people with autism (Bogdashina, 2013).

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Figure 2. (Top) Four low tech, alternative pop up environments with options for how to sit, set within a photographic studio. (Source: Author).
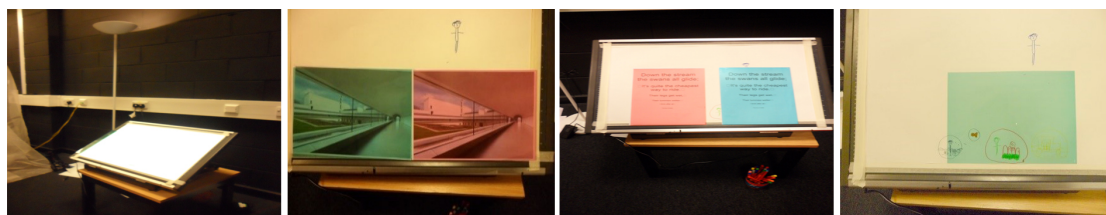

Figure 3. (Bottom) Light table options with Irlen overlay choices (Lawson, 1998): image choices, text choices and hand drawing choices. (Source: Author).

Ambient lighting to room choices:

These options were presented to each child: Full fluorescent ceiling lights on or off; Half fluorescent ceiling lights on or off and/or Up light full on; Up light half on, Up light low on? The general lighting options varied per child, with a variety of combinations, including totally off for both ceiling and Up light in one instance.

The chosen light intensity was then used throughout the exercise.

Space/Positioning Choices:

These options were presented to each child:

1. (White Cube Tent): to sit in the open space outside the cube, or inside the cube and to sit on cushions, the floor or a bean bag:

- 4 out of 5 children preferred to be inside the white cube tent.
- 3 of the children preferred to be on the beanbag, rather than on the cushions or the floor.
- 3 of the children preferred to recline rather than sit.

2. To be in the Cube with seating of choice or in the White Suspended canopy/enclosed in sheer fabric with seating of choice:

- 3 of the children did not want to sit under the sheet canopy. The others did not take part in this option. One child commented that it reminded him of a wedding dress and the other of a hammock at his grans.

3. Coloured tepee (child sat on the floor - with cushion) or Dinosaur tent (child lying on the floor - with cushions):

- Of the 3 children who took part, all 3 liked the dinosaur tent over the tepee, which was rather small.

Overall preferences: 1 liked sitting in the white cube and 2 liked to lie down in the dinosaur tent.

Touch/pressure/hug:

Choices: In the favourite setting, with or without the weighted blanket providing gentle, deep pressure, possibly useful for sensory-integration. Analogous to Grandin's hug machine, this illustrated to the students an alternative way of addressing sensory pressure.

- out of 5 children, 3 preferred the weighted blanket over their knees. 1 preferred to lie on it.

Proprioception and Vestibular: Balance/Movement:

Choices: Pilates ball: kneeling on the floor and leaning over the ball OR sitting and gently rocking on top of the ball. The ball was selected as some autistic people think better when they are moving (Grandin, 2008).

2 of the 3 children liked to sit on the ball and move slightly. The 3rd found that it had too much movement and from then on stopped the exercise, he was at his limit. He had a strong reaction to feeling unbalanced and unstable. The Pilates ball was too unstable, and something which only offers slight movement might be a preferred option.

Light box on or off?

There was a preference (4 out of 5) for the light table to be switched on whilst looking at the images. A choice out of up to 10 Irlen overlays were presented, two at a time in contrasting coloured pairs. Once the most favoured of the 10 overlays was selected, the overlay was placed over a picture of the same interior space selected in the previous exercise (a Corridor with or without view, depending on preference). A text-based choice, with different coloured overlays, was also presented, aimed at selecting the clearer image. Additionally, an opportunity to freehand draw was given, followed by looking at the drawing with the Irlen overlay demonstrating how it readily changes the whole colour palette of their work.

Outcomes: There was one clear outcome: all the children made different choices, each with their own individual views and sensory needs.

It was evident that the children did like to be given a choice of tent, to sit or lie in, and many liked the option of a weighted blanket to sit on or under. They appreciated to be able to choose lighting from up lighting, to a general over light, to light from a light box, with light from below. They responded well to selecting their own immediate environments and

focused on task when the fit was correct. One child loved to draw, so this session went on for a longer period of time, as he communicated fluently through his drawings. Another child was so relaxed that he expressed a desire to have a nap. This highlighted the need for learning spaces to be adaptable and responsive to the individual.

This collaborative research study, although limited in nature and not meant to be of scientific importance, provided useful knowledge to inform the student design projects. However, the research needed to be backed up with a visit to a fully functioning SEN school, so that the students could gain an overall picture of how a whole school operates.

In the design brief, the students were asked to consider integrating sensory spaces within their whole project building, to support learning activities, and not just within 'calm rooms', so that a more holistic environment is explored to maximise learning and reduce the opportunity for sensory overload in every space.

PART THREE: AN OPPORTUNITY FOR THE STUDENTS TO PRESENT THEIR INDIVIDUAL DESIGN PROJECTS

Preparation

As part of the design process, the children came to hear the students present their work in the University studio. In advance, to assist the children cope with the visit, a series of photographs were provided of the journey from their school, to the exterior of the building, and then the interior route to the studio (a working studio, a section of which was screened-off to provide a non-distracting area with any potentially hazardous materials removed). A detailed risk assessment included options available for the students (e.g. lift or stair), and an adjacent room was cleared as a calm breakout environment.

Delivery

In an informal manner, the four design students presented their design ideas one at a time, placing the work in the centre of the table, with the children and teachers sitting around the table for an interactive approach. 1:50 scale figures were added to the models to help show the children how the spaces could work with the human form, which the children found engaging (Figure 4).

Figure 4. A visual and tactile experience: Photographs of the students presenting their work to the children, at the University, incorporating their ideas for an ASD school through drawings and 3D models. (Source: Author).

The students made a few key points and showed the children their drawings of the spaces, models of their ideas and of the building. The children touched the models and passed them around and many asked questions; this worked well and encouraged sharing and turn taking.

The presentations were deliberately short, visual, highly structured, and with reduced language, to reflect their school lessons. The students went onto present their work again to the tutors as a full and complete design project for assessment utilising multi-sensory learning styles (Flemming,1987).

The children who were able to cope with further environmental stimulus were shown around the working interior studio to broaden their knowledge of university life and to raise their aspirations.

A critique of this educational model

Feedback from expert autism teachers and the external examiner

The senior autism teacher at the School was supportive of the collaborative project, saying that students had helped improve the social experiences for their children, while the children provided clues on how they would like their sensory spaces to be designed in their new school. The teacher thought that the process generated ideas and approaches which they could choose to take forward in their new school and it also gave them an opportunity to explain to their children some of the changes involved with moving into a new building. It would have been of further value to have presented the design ideas to the teachers on a separate occasion, for more targeted design feedback.

The project also received support from the external examiner, who stated 'Design projects across all 3 years are stretching, innovative, and often deliver startlingly interesting results. The live projects and partnerships with Specialist Schools, is to be commended.'

Student feedback

Speaking about the project, a first-year design student said: 'It was a great and exciting experience and I learnt so much about the thinking process which then goes through to design for specific individuals. This is a lesson I would have probably never have learnt otherwise.' The student group believed that one of the most helpful stages was their first case study visit, as it made sense of the needs of the children. In particular, they stipulated that they would definitely benefit from their tutor being present at the case study visit, so that the tutor could ask all the right questions of the autism teachers, which would allow for a deeper connection to the project.

PART FOUR: TEACHING REFLECTIONS AND RECOMMENDATIONS

Realistic goals and clear instructions

Various challenges were presented by the project such as communicating with a temporary school whose headmaster left half way through the project, working with children whose autism spanned a wide spectrum, and gauging how much to expect from the first-year

university design students on a research led project. A balance was required between feeding information on autism to the students to accelerate the design process and leaving space for students to develop alternative approaches for themselves, so their ability to create their own design ideas in response to this information could be tested and assessed.

A key realisation between tutors and design students was that, as a first attempt at this project, there was an element of "breaking in" which comes with its own challenges and rewards. The importance of simplifying individual briefs became apparent, rather than tackling the design of a whole school, as did the need to take control of the planning of content and direction of the choosing sessions. Being in their first year, the students required careful management with clear guidelines. Encouraging them to latch onto one strong research idea, inspired initially by the work with children, and then follow it through by creating one or two strong spatial design responses, became the most effective teaching approach.

Time and organisational management

The small group tutorials were held at the end of a studio day, allowing extendable time not only to advise on the individual projects, but also to set up subsequent choosing sessions. The project ran for 12 weeks, including 5 weeks of research and 7 weeks of hands-on design. Small group tutorials of 4 students, twice a week for around 1.5 to 2 hour sessions, were required to make sense of the moving target, and to give clear responsive direction. Regular deadlines were essential, incorporating flexible minor deadlines to respond to the reality of a live situation.

Owing to tight schedules and availability of teaching staff within the school, a limited number of face-to-face sessions had to be fitted in at short notice. This included: one introductory meet, to assess if the project was viable; a fact-finding meeting for all; a getting to know the children session, broken into two parts; one choosing session, broken into three small parts; and one presentation and feedback session.

Makers

It would be beneficial if a 'Professional Maker' is available in the research team, to collaborate and help construct 1:1 aspects of the student's design ideas for testing. However, to encompass this, the project would probably need to be run over a longer timeframe. One option would be if the Interior Architecture students could team up with some Furniture or Product Design students.

CONCLUSION

Running a student led design project in a live and professional project setting, collaborating directly with a local school, is an effective way of priming students for real world design and maximising the student experience. Not only does it inform the students about autism and the users, but also helps instil a sense of social responsibility.

A collateral benefit is to the autistic children involved - they are shown university life, which in some instances could raise future aspirations, they have opportunities to develop life and communication skills (turn taking, giving opinions, choosing, coping with different

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environments) and, in this case, the process assisted the impact of the transition of moving to a new school.

The conclusion reached, though, was that this approach was not sustainable and an alternative way of running the project had to be found in future. Issues included:

1   The disproportionate amount of time attempting to organise when the two groups meet, partially owing to the inflexible university 6 module structure: 3 in Semester 1, and 3 in Semester 2, in parallel to the school's fixed daily timetable.

2   Co-ordinating University assessment deadlines with the availability of the school children and staff for feedback. For transparency, some universities require module deadlines to be published at the start of Semester 1.

3   Communication between university tutor and school teacher can be difficult as the teachers are understandably uncontactable during classroom hours and have very full long days supporting school work.

4   The demands of managing a part 'live' project which is a moving target, is all consuming, if it is to be undertaken effectively, particularly with the larger proportion of the year also to teach in parallel.

5   There is no real time to stand back and reflect on a short project, as tutors need to be reactive to the situation. Running the project for a second year would help to address some issues, but this can be problematic; in this case, the school moved to a second temporary location and was under different leadership.

6   All sessions with the school must be deliverable on a realistic basis with no additional budget for staffing or materials, unless these are attainable.

7   Working alongside children with special educational needs is an emotionally demanding undertaking, but it is also highly rewarding. There is a strong desire to provide the children with the best experience possible, to show that designers care.

8   It has been evidenced that having a tutor on the project who has a working knowledge of autism is of real value. This enables the effective transfer of up-to-date, specific knowledge to students as and when relevant information is accessed, such as at conferences and speaking to experts and contacts at autism schools in the local community. A working knowledge in autism also helps to reassure SEN teachers that the project is going to be run with understanding and sensitivity to their children.

9   The adoption of 'concrete material experiences' (Temple, 2010), in this case through autism research, and 'abstract learning' through concept development, has been successful in engaging the students with a complex brief, more complex than their immediate contemporaries on the course.

The process adds value to the student experience, builds confidence by meeting professionals and clients and eliminates pre-conceived ideas surrounding autism. It shows that design can be an interactive process between university and special schools. However, this paper highlights the pitfalls of a live project of this nature, to be of use for current educators. Essentially, the project needs to be contained and more accessible, to reproduce

as an educational model. This is to be explored in a future paper, by reference to case studies of subsequent autism specific projects.

'Industry needs creative workers that can collaborate, communicate and integrate activities and projects.' (Furniss, 2015:5). 'An awareness and understanding of perceived and real environmental effects is critical for students both as users and as future designers and architects.' (Salama, 2015:270). The university module structure can be constraining for 'live' projects, and in order to overcome this, educators need to be innovative with our delivery.

The Spatial Civic Agency model addresses the issue of live projects being criticised 'as working *for* rather than working *with* community groups' (Sara & Jones, 2018:330). A target resolution advanced by this model involves a cross-community approach and consensus. However, when autism is involved, a different perspective and language are required; it is about the autism community as a whole, but more importantly, it is about the individual with ASD. It is almost impossible to find a shared language, as suggested in non-autism specific populations, and maybe this is one reason why limited progress, in the form of design for autism, has presented itself. As learnt in the experiences of a special needs role play model (Bernardi & Kowaltowski, 2010), such a model is no substitute for live research. The taught transferable skill is that each and every community has to be researched in detail to understand their individual identities and actual needs.

To share and collectively create knowledge, as opposed to the knowledge purely being disseminated (Sara & Jones, 2018), is fundamental to teaching if our students are to be prepared and credible for a successful future in design practice.

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