

TY GWYN: DOCUMENTING THE DESIGN OF A SPECIAL SCHOOL IN WALES

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This design case describes the design process used for the development of new special school facilities for children with severe disabilities in Wales, United Kingdom. The lived experience is described from the interior design practitioner perspective. The background to the design of the school is outlined, and the design process and design changes that were made during the build process are detailed. The main features discussed are the toilet areas, hoist lifting system, the wayfinding and signage system, the hydrotherapy pool, and the wheelchair storage areas. Working relationships with key stakeholders involved in the design process are documented, including the Head Teacher, the staff, students, health professionals, service providers, and suppliers. During the build process, additional examples are provided of positive working arrangements between the project manager and the contractor to resolve design issues. The design case concludes by suggesting that, in this particular case, constant dialogue between all parties involved was a key component of this successful design outcome, in addition to obtaining design input from a variety of sources and flexibility to overcome issues on site.

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INTRODUCTION

"Start with the toilets." Not a very prepossessing beginning to the first meeting with the client. Only as the design of this project progressed did the significance of this statement become apparent. This design case describes the design process for the facilities of a new special school in Wales, United Kingdom. Its unique nature is due in part to the significant requirements of its students. In the United Kingdom education system, children with disabilities are integrated into the general education system. However, where children are diagnosed with more significant physical, mental, or emotional needs, it is common that they attend "special schools" designed to provide a specialist education with small class numbers in a supportive environment. Indeed, many parents want their child to attend a special school to benefit from the individual attention and specialized facilities. This case details the contextual background for a particular new special school and provides an overview of the design process, focusing specifically on the interior design aspects of the building and the need to accommodate its students. The design case concludes with some key points that emerged from this design process.

Background

Ty Gwyn, Welsh for "white house," was an existing school located in an affluent suburb of Cardiff, the capital city of Wales, in prime real estate. It was owned and operated by Cardiff County Council, and more specifically, the Schools Department—the equivalent of the school district in United States terminology. The school had been designed in the 1960s as a teachers' education center, later becoming a school for students with disabilities. Over the years, larger numbers of students came to the school with increasingly acute physical and learning disabilities. By the 21st century the building was clearly not fit for its purpose in size or availability of modern facilities. Under the education system, parents could petition for their child to attend a school in a neighboring school district if they could demonstrate that Ty Gwyn did not have adequate facilities. This cost the Schools Department substantial sums because they were obliged to pay for this out-of-area education. With these pressures on

funding and the desire to improve special school educational facilities, Cardiff County Council made the decision to fund the building of a new school for Ty Gwyn with assistance from the Welsh government. The funds provided were generous to meet the standard that the client aspired to, namely that Ty Gwyn would be designed as a flagship, purpose-built school with every modern amenity to benefit students with severe disabilities. A site for the new school was identified several miles from the existing school on land forming part of the playing fields of an existing high school for children with learning disabilities. The new school would form part of a campus between the high school and an existing elementary school for children with learning disabilities. An eight-bed respite care unit for children with disabilities was also proposed as part of the campus.

Before describing the design process for Ty Gwyn, it is necessary to describe the school population. According to a review of the existing school in 2008 by the Council of the City and County of Cardiff, the school catered to 86 male and female students aged 3-19 years, and students had profound and multiple learning difficulties (PMLD). Most of these students were non-ambulant, had no speech, and frequently had additional sensory impairments alongside complex medical needs. In addition to students with PMLD, Ty Gwyn accommodated students with autism spectrum disorder (ASD). ASD describes a spectrum of disorders characterized by difficulties in communication, lack of interactive social skills, and restrictive, stereotypical behaviors (APA, 2000). Students at Ty Gwyn were typically at the lower end of the autism spectrum with severe learning disabilities and challenging behaviors. The majority did not have speech or language skills. Students with ASD were generally ambulant but could have hearing or visual impairments.

The new school was designed to accommodate an additional 64 students—150 in total—and around 160 staff (Cardiff County Council, 2010). Classrooms for children with PMLD were designed for a maximum of eight students, and classrooms for children with ASD for a maximum of six. Accommodation was required for a teacher in each classroom supported by paraprofessionals. The numbers of paraprofessionals varied in each classroom depending on the needs of the students. For students with most need, this could be one-on-one. In addition to general education classrooms, specialist classrooms were required for art, food technology, and music. Due to the health problems of many of the students, a suite of accommodation was needed for health professionals based at the school, nurses, physiotherapists, and occupational therapists. Accommodation also had to be provided for traveling health professionals who regularly attended the school, including educational psychologists, speech and language therapists, and doctors.

This unique population of students, teachers, staff, and health professionals required many complex design

solutions and specialist design features, some of which are described below.

DESIGN PROCESS

Overview

Before outlining the design process, a brief overview of the personnel involved provides some context for the reader. Cardiff County Council made the decision to appoint a design and build contractor by a competitive bid process to complete the project. The Council's in-house design team was appointed to prepare the tender documents—or construction documents in United States terminology. Unusually, because of the high level of specialist equipment and fittings required, the plans and specifications produced for the tender process were highly detailed. An architect led the in-house design team which included several architectural technicians and this author as interior designer, in addition to electrical, mechanical, and structural engineers. Outside of the design and build contract, the interior designer was also responsible for procuring loose furniture, fixtures, and equipment for the new school, from televisions to toys to teaspoons. Post tender,—or, awarding of the bid—one of the Council's project managers was appointed to ensure the project was completed on time and within budget and to resolve design issues on site. An officer in the Schools Department was responsible for monitoring the budget and overseeing strategic issues concerning the creation of the overall campus environment. Regular meetings were held with this officer to provide an update on progress, but the minutia of the design decisions discussed with the design team were deferred to the users of the school.

The client, for practical design purposes referred to in this design case, are the staff and pupils of Ty Gwyn School, and as will be discussed below, contributed much content that shaped the design. During the design process, the design team also gave periodic updates to school governors and parents as stakeholders in the new school. A recurrent theme unites the various facets of the design process described below—that communication amongst all parties was key to the project's success. In order to provide privacy and parity for all individuals involved, no names have been used in this description.

Client Input

The key point of contact for the design team during the design process was the head teacher at the school. Initially meetings tended to be held with the architect, the interior designer, and sometimes other architectural technicians where there were broader issues to discuss, such as deciding on the initial plans and layout for the school. However, this design case will concentrate on the detailed decisions that were encountered after these foundational decisions were made. Once the plans were broadly agreed upon, meetings



FIGURE 1. “Start with the toilets.” A partial view of one of the toilet areas for children with PMLD.

were held solely to discuss interior design issues. As the design process reached the critical end, meetings could be held two or three times a week to clarify issues and ensure that the final design would meet the clients’ expectations. Many emails also passed between the interior designer and the Head Teacher seeking clarification, explanation, or approval. This mode of contact was particularly useful when an urgent response was required.

Toilet Areas

This description began by alluding to the design of the toilets. The Head Teacher actually advised the design team to start with the design of this element because if they were right for the staff and the pupils, all other aspects of the design would fall into place. The reasons given for this were because nearly all the children with PMLD were incontinent. Some children were able to be assisted onto the toilet but the majority required nappy—or diaper—changing on a changing bed. Such was the detail required for these areas that the Head Teacher set up a “toilet working group” comprised of various staff members. It took several meetings

between this group and the interior designer to establish a protocol for toilet areas, to draft layout plan proposals, and discuss details until the designs met with approval. Changing beds were specified with an electric rise and fall mechanism to ensure that staff of different heights could comfortably work at the changing beds, easing potential muscle strain. A shower was attached to the changing bed so that children could be washed as necessary. Therefore a suitable drainage system needed to be incorporated. A sluice sink was provided as well as adjustable height hand wash sinks suitable for ambulant users or users in a wheelchair (Figure 1). Copious amounts of storage space were required for nappies, as changing could take place several times a day. Nappy disposal was a major topic of discussion. A decision was needed to choose between a nappy macerator in each toilet or to arrange collection of soiled nappies by a disposal company. Ultimately it was agreed to provide collection of soiled nappies, as some teachers related experiences of macerators which showed them prone to mechanical failure. A regular collection was deemed more reliable. The toilet area also provided a design challenge for students with ASD

who, whilst ambulant, had various issues with toileting. One interesting design feature to come out of the discussion was the provision of different styles of faucets. This is because many children with ASD learn by rote and if they learn that one design of faucet dispenses water they may not recognize that another design of faucet dispenses water if they went elsewhere.

Full Hoist Lifting System

One of the main implications of the nappy changing requirements was the health and safety needs of staff when lifting children from their wheelchair onto the changing bed, especially considering pupils were up to nineteen years in age with possible bariatric issues. To support the staff, a full hoist lifting system was installed not only in each toilet but also in classrooms and general spaces. This ensured that staff could safely and easily lift children in and out of their wheelchairs and were less likely to suffer manual handling injuries (Figure 2). A bonus of designing a comprehensive hoist system was that it enabled children to spend more time out of their wheelchairs. For example, in the classroom children could simply be lifted onto a soft play mat to enable them to experience enhanced movement, and in the hydrotherapy and paddling pools, children could safely be lifted into the water. Similarly, in the physiotherapy area therapists could easily transfer children to mats and beds to work with them.



FIGURE 2. Classroom view showing the hoist support beams overhead and the lifting mechanism on the right hand side rear wall.

Age-Specific Requests

In addition to meetings with the Head Teacher, the interior designer was also given rein to interview individual teachers to find out the particular needs for children in the age groups they taught, whether kindergarten, elementary, middle, or high school aged children. For example, kindergarten teachers asked for a sand box for children to play in and the interior designer was able to source a type

suitable for wheelchair users. Elementary and middle school teachers of children with ASD were particularly concerned that their pupils became distracted and fixated by computer equipment within view in the classroom. To counter this, the interior design proposed a computer desk with a pneumatic monitor holder which could be dropped down to conceal the monitor so that it would not be a distraction to students. The Head Teacher was later briefed on the outcome of these meetings to ensure that staff were making reasonable requests and that design was consistent across age groups and needs of pupils.

Meetings were also held by the interior designer with specialist members of staff, such as food, technology, art, and the resource librarian. One feature requested by the school was the design of a coffee shop to be run by older students to teach them job skills. Pupils would sell beverages and cakes to the public to raise funds for the school. The area was designed with a range of amenities including a microwave, cake display unit, coffee maker, cash register, crockery, and cutlery to enable students to learn a range of skills. The library proved a particular design challenge. Not only did books and magazines have to be stored, but also a range of additional materials such as games, toys, and teaching resources that were often large, irregularly shaped objects. Several meetings and revision of plans took place before a satisfactory design was reached.

Specification of Equipment

Exchange of information and the specification of fittings and equipment was a two-way dialogue between the client and the interior designer. Sometimes the client proposed equipment which the designer was not familiar with. The request for “rebound therapy” equipment was one such example. In discussion, this was found to be a trampoline inset into the ground with a harness suspended from the ceiling above it which could support children, enabling a therapist to provide movement therapy (Figure 3). A suitable supplier had to be sourced and the equipment specified. This had implications for the architectural design as the trampoline needed to be flush mounted at floor level and a pit created at a certain depth to allow for rebound. At times the interior designer was able to propose fixtures and fittings that the client was not aware of. The computer desks with concealed monitors described earlier are one such example. This mutually respectful approach helped to ensure that expertise was pooled to obtain the best products and design ideas available.

In addition to the information provided by staff which shaped the design, additional investigation was carried out by the interior designer to find suitable suppliers of specialist equipment. Suppliers were contacted to provide information, specifications, samples, and costs to provide the best quality equipment at the best value. Sourcing a suitable

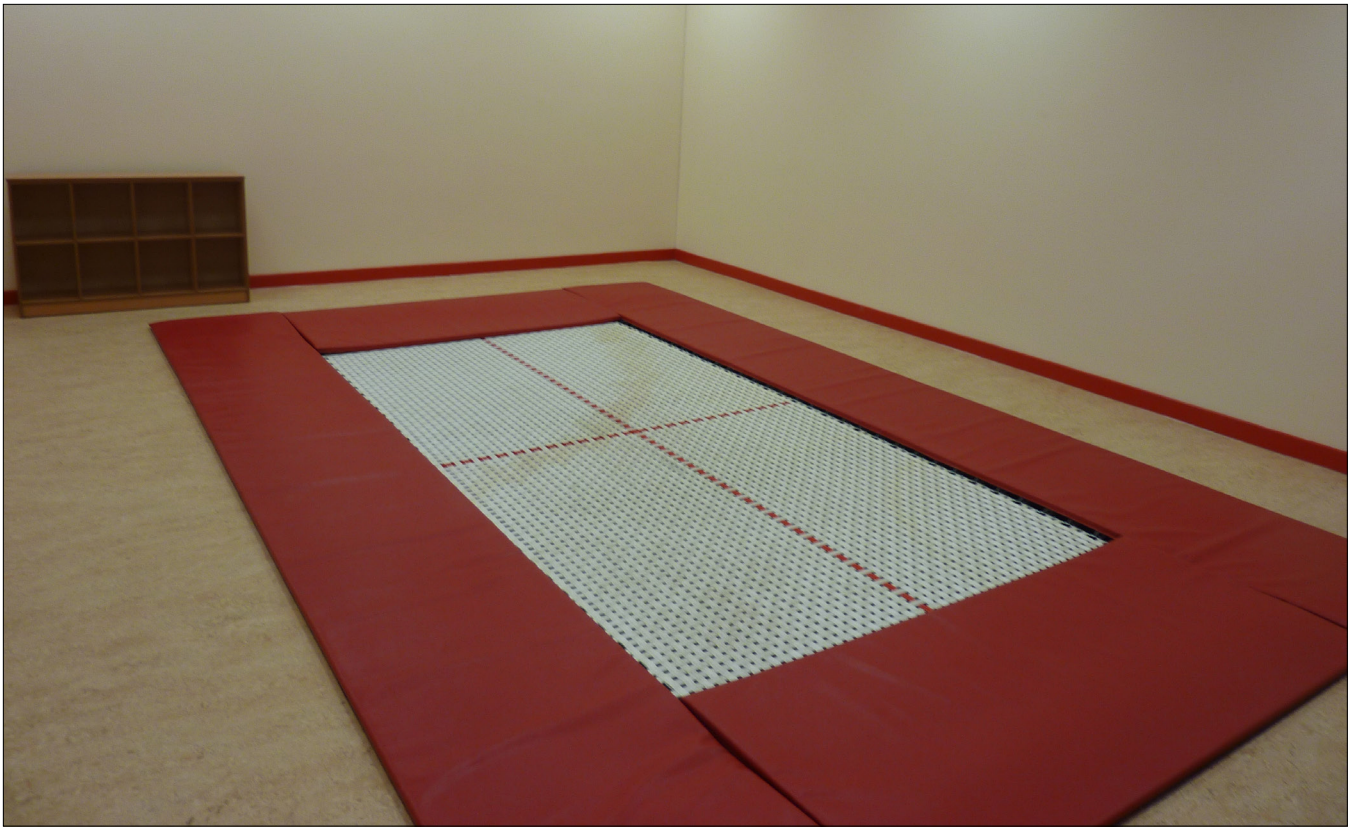


FIGURE 3. The rebound therapy room.

hoist system, mentioned earlier, was one such example. Sourcing furniture robust enough for children with ASD was another. Sometimes the client knew of a specialist supplier they had reliably used before, or the interior designer had prior knowledge through previous design work. Sometimes it became necessary that the interior designer located a new supplier.

Wayfinding and Signage

One key area that required design investigation was signage to help students, staff, and visitors navigate the learning environment. Although the students did not read Braille, as it requires a relatively high IQ level, it was considered important to provide this capability for staff or visitors who might read Braille. Providing this signage also supported the principle of universal design, in which an interior accommodates persons of diverse abilities. In addition, Wales has its own legislation which dictates that if a public organization provides written information in English, it must also be provided in Welsh. Signage therefore had to be bilingual, including English and Welsh Braille. Even further, pupils at the school were educated using a system of pictograms, so graphic symbols were also required to help transfer learning from the classroom to the hallways. In short, instead of designing one sign per room or area, five signs were incorporated into one homogenous design, which took much coordination and



FIGURE 4. Example of signage with pictogram, English and Welsh text, and English and Welsh Braille.

discussion with the school, the signage supplier, and Welsh translators (Figure 4).

The detailed investigations described above helped to ensure that the school environment would have the most up-to-date and suitable equipment to support the learning needs of pupils.

Input of Health Professionals

Another key group whose views were sought to provide input into the design were those of the health professionals. Given the medical issues of many of the children at the school, it was necessary to have a permanent health service presence. Design of specialist areas was important to the health and well-being of pupils, many of whom received medical and therapeutic treatment alongside their education. The school aspired to move beyond the traditional concepts of learning to provide children with physical and health care to improve their lives. Interviews were held with nursing, physiotherapy, and other health related staff to establish their requirements. Again, this brought to light unexpected needs. For example, many of the children at the school were fed through a tube in their stomach via an enteral pump, a mechanism that provides continual feeding or medication. In discussion, it became apparent that the batteries in these enteral pumps needed to be charged regularly, so thirty electric sockets were required in a bank in the nurses' room. This had implications for the electrical design. There were many similar cases where the design of the interior impacted other members of the design team. Another example is the design of an appropriate hearing

amplification system in classrooms for students with a hearing impairment. This again had significant electrical implications. Meetings were held between the speech and language therapist, the electrical engineer, the interior designer, and a supplier of hearing enhancement equipment to discuss how this system should be fitted throughout the school.

In another discussion with health professionals, a therapist asked for some sensory integration equipment to be fitted. This request included a ceiling mounted swing to enable children to receive movement therapy. This innocuous sounding request had wider implications on the structural integrity of the building because, on further investigation, it was found that the particular therapy swing requested required a substantial point load fixing, as it was designed to support not only younger children but older students with potential bariatric issues. The structural engineer, therefore, had to ensure that the ceiling was strengthened at that point to provide a suitable attachment point.

Requests from Students

One of the most poignant requests during the design process was a handwritten note received by the interior designer from the school's Student Council asking for a crocodile in the hydrotherapy pool. After discussing this request the mechanical engineer sourced a large plastic crocodile fountain which was subsequently designed to fit at the side of the pool (Figure 5). In this way the children themselves were able to have a say in their new school. It was important to remember that though these students had disabilities,

they also had opinions. Another example is the request by high school students for a television and Wii console in the student lounge. This request seemed frivolous but teachers explained that it was often hard to motivate students to exercise and the Wii with appropriate software was a popular way of providing it.

To summarize the design input, information was sought and obtained from all involved parties based at the school including: the Head Teacher, school staff, pupils, and health professionals. This provided a rich source of information to enable the interior designer to produce designs suitable for the client and their aspirations for a flagship school. In these discussions and through further investigation, the interior designer



FIGURE 5. The crocodile fountain in the Hydrotherapy Pool with underwater friends.



FIGURE 6. A typical wheelchair storage area, with sliding/folding doors to conceal the equipment.

was also able to provide her own suggestions to enhance the scheme. Information gathered was shared with other members of the design team where appropriate to inform their designs, some of which is described below.

Service Provider Input

In addition to school personnel, the interior designer interviewed other service providers for their perspective. For example, given the poor health of many of the students in the school, hygiene was particularly important. The custodial manager of the Schools Department was therefore interviewed to establish materials and finishes that were easy to clean and maintain based on previous experience. Likewise, meetings were held with the catering manager to ascertain the preferred commercial kitchen layout and specification of catering equipment, drawing on past experiences with reliability and maintenance issues.

Site Observations at the Existing School

In addition to gathering information from discussion groups and interviews, valuable design information was gathered by the interior designer through site observations at the existing school. Site observations included: attending the school assembly to observe how students and staff utilized the school hall, being shown the workings of the school hydrotherapy pool, and being given a demonstration of the equipment installed in the sensory room. Sensory areas, fitted with light, sound, and tactile equipment to stimulate and

support children's learning and enjoyment, became an important feature of the new school. It was important to understand how the equipment worked and was used by staff. Throughout these observations the interior designer took notes, photographs, and details of suppliers to provide a record of what design features worked and did not work in the existing school, and what should be designed in the new school. It is important to recall that the existing school was inadequate because it was not a purpose designed environment, so much of what the interior designer observed and recorded from staff were negative design aspects.

One negative feature in the existing school was the

number of wheelchairs lining the hallways causing obstruction and unsightliness. During discussions it became clear that nearly all the children with PMLD were non-ambulant, and that each child had up to three items of equipment: an outdoor wheelchair, a wheelchair to use in school, and a standing frame. A standing frame enabled some children to stand assisted out of their wheelchair for a period of time. Designing adequate storage for these wheelchairs in a safe and aesthetically pleasing manner was a joint and prime consideration for the interior designer and architect. The solution reached was to design a number of recessed wheelchair bays in the hallways screened by sliding/folding doors (Figure 6).

During another visit, an alarm was activated and staff were heard running along the hallways. Further inquiry revealed that this alarm was installed for health and safety purposes because, due to the severe medical condition of some of the children with PMLD, a teacher could activate an alarm directly to the nurses' room in an emergency. The alarm could also be activated by a teacher requiring assistance as sometimes pupils with ASD could present challenging and potentially dangerous behavior. The alarm permitted additional staff to be quickly summoned. This feature ensured a safer learning environment for pupils and teachers with minimal disruption in a crisis.

In summary, site observations at the existing school were an excellent way to find out how the school functioned in



FIGURE 7. A hallway view showing the trail rail.

practice and how improvements to the design could be made in the new school.

Site Visits to Other Special Schools

Since the clients' vision was for a flagship special school, the design team also undertook several visits to other sites in the United Kingdom to view recently completed special schools. The visits provided some useful information, both from a "how to" and "how not to" design perspective. However, none of the schools visited were attended by students with the same level of disability as at Ty Gwyn; that is, they did not have the high numbers of pupils who were non-ambulant. This meant that significant design elements were missing, such as the design of wheelchair storage and specialized toilet areas. One negative design element that was observed was the fencing around outdoor play areas located outside each classroom. This area was intended as a secure place for children to play, particularly as children with ASD are prone to absconding. However, the fencing used was very obtrusive and gave the impression of a cage, which was not desirable. The design team spent time researching alternatives to ensure that external play areas were secure but aesthetically pleasing. A useful idea gleaned at one site was the installation of a "trail rail" throughout the hallways. This custom made tactile rail was applied horizontally at approximately 90 cm from the floor and used particularly

by pupils with ASD to guide themselves around the school. Contact was made with the supplier who collaborated with the interior designer to design a similar product for Ty Gwyn (Figure 7).

Despite requiring significant time and travel, all site visits were worthwhile. At each site something useful was learned to inform the design of the new school.

Design During the Build Process

To recap, the in-house design team prepared a set of tender documents including layout plans, detailed drawings as appropriate, specifications, and finishes. It is worth noting here that because the school and the design team were both part of the Cardiff County Council, there was no contract between parties as there would be a conventional contract between an interior designer and their client. In the event of a dispute, one area of the Council could not take legal action against another; issues would be resolved internally. As there was no formal contract, approvals usually took the form of an email to the client. For example, an email might confirm an action the designer proposed to take on a given subject, or confirm the drawing numbers that the client had verbally approved. Once the tender documents were ready they were dispatched to several contractors, selected by the Council's rigorous procedures. Each contractor was invited to make a presentation to the Council regarding their bid. Bids were evaluated on a strict basis laid down by the Council. Although cost was an important factor, other factors were deemed important such as how the contractor would achieve BREEAM certification on the project. BREEAM is the United Kingdom equivalent of LEED, helping ensure the design and construction of environmentally friendly buildings.

Through this process a successful contractor was appointed. Cardiff County Council's in-house project manager was responsible for delivering the project post-design (Figure 8). This importance of this role cannot be overstated: the project manager was responsible for ensuring that the contractor met the design standards required in the contract, that the build progressed in a timely manner, and that the budget was maintained. The project manager also directed the clerk-of-works, whose role was to inspect the contractor's work for quality of materials and to ensure that work was completed to a sufficiently high standard in accordance with the contract documents. The project manager also provided the lynch pin for liaison between the contractor, the in-house design team, and the client to resolve issues that arose during the build process. Due to intimate knowledge of the design, at the request of the project manager, the interior designer acted as a conduit between the client and the contractor on many occasions, and as such was included on-site in relevant decision making processes.

Credit should also be given to the contractor who, under the terms of the contract, could have disregarded the



FIGURE 8. Front view of the new school.

design teams' specifications and provided their own alternatives—though they would have had to provide items of similar quality, a task likely involving a great deal of time and specialist knowledge. It suited both parties to keep to the original design. The contractor demonstrated a keen interest in delivering a high quality build and, more importantly, ensuring that they delivered what the client desired. For example, there were issues in the classroom with the layout of sensory areas, described earlier. The interior designer had not taken into account that floor to ceiling height windows were to be installed and proposed fixtures, assumed to be backed against a wall, were in fact against the window glazing. The contractor and the supplier of the sensory equipment took the time to explore other options until a mutually satisfactory solution was found.

Ceramic tiling also had to be re-specified during the build process as the tiling which the interior designer had selected proved to have too long a lead time for procurement and installation by the project completion date. Again, the contractor worked to find a suitable alternative. The contractor also arranged for the tiling sub-contractor to meet

the interior designer to ensure that he understood how the tile designs in the pool areas illustrated on drawings were to be produced in tile format (Figure 5). On another occasion, the interior designer was taken by the contractor to a door manufacturer, as the doors specified to the wheelchair bays had proved unsuitable and the contractor had sourced an alternative for approval. This frequent dialogue between the contractor, sub-contractors, suppliers, and the interior designer, facilitated by the project manager, helped all parties to understand what the other wanted to achieve and what was possible to achieve in the given situation.

Another key aspect that positively affected the build process was that space planning drawings included both fixed and loose furniture items. The contractor could therefore ensure that electrical and mechanical equipment and fittings did not clash with the interior design. For example, the contractor could ensure that electrical computer outlets were installed in the appropriate place above computer desks and that the placement of mechanical vents did not spoil the aesthetics of the ceramic wall designs in the hydrotherapy

pool. This coordination improved the appearance and usefulness of the learning environment.

As described, design did not stop with the production of the tender documents. Through continued discussion, the project manager and the contractor were instrumental in ensuring that improvements in design and solutions to problems occurred throughout the build process.

CONCLUSION

Discussion

This case study explains the design process of a new special school from the interior design perspective. Reflecting on the design process described above, some key points emerge.

- Constant dialogue between the interior designer and the client ensured that the client was able to explain their needs and the designer knew how to meet those needs.
- Moreover, constant dialogue between all parties—client, designer, project manager, contractor, and suppliers—ensured that everyone knew what the other expected.
- Listening to what the client required was important, but so was observation. In observing, the various stakeholders were able to see something that was so obvious to the client that they failed to mention it.
- Gathering information from various sources in the school provided different viewpoints. Catering staff or janitors offered a different design input than teachers.
- Site visits to observe similar installations was useful, not only to emulate successful designs but also to learn from others' mistakes.
- Investigating suitable products in a specialist design field was time-consuming but necessary to obtain the best solution for the client.
- Flexibility and a willingness to adapt were also key components, particularly when mistakes arose on site. The attitude of the contractor was key here. This was because if the contractor was not willing to help rectify mistakes, the client was going to bear the consequences of poor design.
- A reasonable budget to achieve the flagship design to which the client aspired was important. There were few monetary compromises during this project,

which is not the case for many projects, especially in time of recession.

- Pride also seemed to be a key factor in this project—the pride of the whole design team, the project manager, and the contractor to achieve the best result that they could. This was surely largely motivated by the client and also the end user—that is, the vulnerable children for whom the school was ultimately designed.

Finally, perhaps for all of the above elements to come together to produce this successful design, the author senses one also needs a little bit of luck. In this period of economic downturn, the budget for the school could easily have been cut causing the omission of key design features. The contractor, to save time and money, could have been uncooperative at accommodating design changes after the bid process and, as a result, the design would have been weaker. Personalities could have clashed, egos become apparent, and staff turnover weakened relationships between client, designer, and contractor, marring the end result. Luckily none of these issues occurred.

To consider the final design from the end users' viewpoint, did the design process facilitate the clients' vision of a flagship special school, and did it change lives? The Head Teacher suggests that it did, saying "there are so many smiling faces and so many opportunities we could only have dreamt about in the last school" (Waldran, 2010). As the interior designer, this project did change the author's life. Based on this experience the author is currently studying for a doctorate to investigate the design of educational environments for children with ASD.

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