

Examining Supportive Educational Environments for Young Children with Autism Spectrum Disorder (ASD)

Project and Result Summary

The Centers for Disease Control (2012) reported a 1,600% increase in the number of individuals ages 6-22 with Autism Spectrum Disorder (ASD) between 1993 and 2010. Clearly, ASD is growing at alarming rates, yet little information exists as to how the environment affects these children, specifically in learning environments. This information is vital to the future success of the 14,646 children with ASD in Minnesota's public schools as of December 2010 (Autism Spectrum, 2012). Research is necessary to determine appropriate design interventions in learning environments as they pertain to the needs of children with ASD so that they will be educationally, psychologically, and socially supported. The goal of this research project was to identify and document evidence-based design approaches to accommodate children with ASD in the school environment, involving sensory-related elements, visual cues, and other environmental features.

My UROP project was an iterative process in which I was given information to learn how to conduct a literature review and, more broadly, how to conduct research. I would complete a portion of each phase, then meet with my sponsor, Dr. Caren Martin, to discuss my work. She then provided me with feedback so that I could make the necessary changes and return the documents back to her. In this way, my UROP experience was a learning process as much as it was a research project. Overall, my tasks for the project were the beginnings of a larger study which will be carried out by Dr. Martin.

My project began with an introduction to the literature review process and research terms, largely from reading InformeDesign's "Research 101" tutorial (www.informedesign.org). After reviewing these documents, I began the largest portion of my project: searching for and gathering literature. I spent approximately 22 hours searching for pieces of literature concerning how the learning environment affects the behaviors and well-being of children with ASD. Throughout my search, I used consistent search terms which we had previously selected in electronic databases, including: autism, Autism Spectrum Disorder, classroom, school, learning, design, environment, light source, and color. I limited the search to sources published during or after the year 2000 that addressed ASD and the physical educational environment. I began my search in peer reviewed academic journals, where I found 21 pieces of literature. The *Journal of Autism and Developmental Disorders* and the *International Journal of Architectural Research* were the most fruitful journals. I then expanded my search to refereed conference proceedings, from which I found two more sources. I then searched all governmental publications for relevant literature, which did not result in any sources. The government publications, specifically through the Department of Education, typically only discussed the medical and psychological aspects of ASD or instruction for teachers of students with autism. These sources were not relevant in examining the learning environment and building design factors affecting children with ASD. Finally, I did a general search for any relevant literature, resulting in four articles from trade publications, and an additional 10 from "other" sources (such as

earlychildhoodnews.com or papers from institutions published outside of journals). In total, 37 pieces of relevant literature were found.

After gathering as much literature as possible, Dr. Martin and I selected the most relevant sources for me to read, review, and summarize. Articles were chosen based on relevancy to the project proposal in terms of child's age, environment, type/degree of disability, and focus on the built environment's impact on students with ASD. In total, I completed six summaries in the form of an extended annotated bibliography. We selected three pieces of literature from refereed journals, one from refereed conference proceedings, and two from trade publications. While many of the sources were varied in their focus, there were some commonly cited design criteria, such as:

- Provide generously sized circulation spaces (e.g., ample space between activity areas)
- Clearly define spaces with visual boundaries such as storage units, screens, tape on the floor, etc.
- Minimize distractions especially in the individual workstations by ensuring that the student in the workstation faces a blank wall or corner when there or provide screens around the desk
- Provide blinds or draperies for the windows to minimize distractions, but include clerestory windows whenever possible to retain some natural light
- Allow for direct sight lines between the teacher and the students within the classroom
- Include transition areas between areas of high stimulation and those of low stimulation
- Include a separate quiet area for over stimulated students to calm down
- Incorporate visual schedules (e.g. daily activities) into the design in highly visible areas
- Place classrooms with direct access to restrooms
- Provide for ample storage into the design

While the literature identified potential design criteria, a limitation that we discovered is that the design criteria were derived from observations or suggestions made by researchers, teachers, or architects, using limited time frames and small sample sizes (e.g., less than 10 students). The studies ended with the offering of design criteria, that were not tested or measured with use by children with autism.

How the Objectives Were Effectively Accomplished

My primary objective was to identify relevant sources of literature. This was accomplished in that over one-third of my time was spent in this phase. I exhausted as many resources as possible locating these articles and identified 37 pieces of relevant literature, many of which will be used to further Dr. Martin's research. My next objective was to review the literature. Due to time constraints, I was only able to review six of the articles; however, these articles were carefully chosen, so this objective was met. Again, articles were "relevant" if they addressed autism in our target age group (preschool-6th grade) and the effects of the built environment on students' behaviors and well-being. Next, I was to create a matrix addressing the various interventions relative to

measurable outcomes, categorized by variable. The matrix I produced was based on the information available, as there were not nearly as many experimental studies as we had predicted. Also, the matrix only includes information from the articles I was able to review, so it is not as comprehensive as we initially thought. The matrix identifies the type of literature source, type of study conducted, sample description, variables studied, outcomes measured, findings, and design criteria for each reviewed article. The matrix presents the most pertinent information gleaned from each article in a clear, organized manner.

My fourth objective was to develop an annotated bibliography for the identified pieces of literature. The annotated bibliography for the six articles is comprised of extended article summaries, providing a basis for the remainder of Dr. Martin's research. My final objective was to create a poster to be posted in the interior design classrooms. A poster was created detailing the research topic, process, and results, and was submitted to the University's Digital Conservancy, where it can be accessed by all students and faculty.

A Reflective Statement on Your UROP Experience

My UROP experience provided me with an invaluable supplement to my education through which I gained knowledge about the research process and methods and engaged in a literature review. It provided a hands-on and in-depth research experience I otherwise likely would not have gotten from my education. It also allowed me to go through this learning process one-on-one with an experienced sponsor who could guide me through the process, providing feedback and constructive criticism every step of the way. It taught me the important concepts of finding reputable literature sources, reviewing and summarizing them, creating an annotated bibliography, and extracting pertinent information into a matrix. I learned a great deal about how evidence-based design may function in my future career, and I feel that this UROP experience will prove to set me apart as I search for jobs. The knowledge that I have gained will also be an invaluable help next fall during my thesis research class, IDES-4615W, during which my classmates will likely be learning many of these research concepts for the first time.

On a personal level, my UROP experience taught me about autism spectrum disorder (ASD). I learned not only about ASD-specific design, but about universal design in general. It taught me about truly getting to know my clients and understanding their individualized needs. This was a much more thorough "programming" process than I have ever experienced during my education, and demonstrated the level and depth of information about specific clients that I should be attaining before beginning any design, especially those for sensitive users.

Overall, I would recommend participating in a UROP to any of my peers. I now feel much more confident entering into my profession knowing that I understand the basic concepts, terminology, and processes involved in conducting research. I know that the lessons I have learned will be relevant to many aspects of my life, not just a formal research project.

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