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Empowerment through Participatory Design Process

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Abstract
This case study describes the methods and outcomes of a participatory design process to maximize student learning in a specialized program classroom. The participants (neurodiverse students and their intervention specialists) were given control over the research agenda, process, and actions. They were able to analyze and reflect on the information generated, to obtain the findings and conclusions of the process, which resulted in the design of the prototype for their classroom.

Introduction
Participatory research comprises a range of methodological approaches to hand power from the researcher to participants and end-users (Leavy, 2017). The case study presented in this article focuses on the research and design of a classroom in an alternative school in a Midwest town in North America. The alternative school is structured to ensure that each child regardless of their ability can complete the specified core curriculum. Parents and teachers help students develop their interests and learning proclivities (School Messenger, 2022). The article describes the methods and outcomes of the participatory research and design processes for a prototype of the specialized program classroom in this school. The researchers and authors of this study are two interior design professors in higher education who focus on addressing neurodiversity in educational settings. They noted critical challenges and risks of dominating the design process as designers. There was a precarious and fine line between steering the design process and dictating it. The balancing act was important, and the researchers tried to be cognizant of it from the beginning and used different strategies to involve and empower participants. The participants in this project were neuro-diverse children, who were given control over the research agenda, the process, and the actions.

The theories that formed the basis of the project were neurodiversity studies, highlighting that neurologically humans are varied, and the variations should be acknowledged and celebrated. The participatory process to design the physical space becomes a demonstration of how

learning can happen in a positive and meaningful way. These spaces helped bring together a process of designing as well as learning that combined three categories of partakers in the process of learning as suggested by Vartiainen (2014): "*the subjects, objects, and tools*." The article argues and demonstrates that the tripartite division of elements in the learning environment facilitated the inclusion of neurologically diverse activities that catered to this group of learners. The tetra compartmentalization of the classroom described in this paper furthered the inclusion of subjects, objects, and tools in the classroom, and spatially supported diversity. The participatory design thinking methods, or what is known as a design-oriented pedagogy (Vartiainen, 2014), are a potent tool for re-thinking apace empathetically to encourage inclusion and neurodiversity, as this research affirms and reminds. The article will cover a brief description of the case study and purpose, a literature review and the participatory methodology used for this case study, the proposed prototype generated through this method, and the implication of this process and project.

The Case Study: Context and Goals

This article focuses on the research, and design of a specialized program classroom in an alternative school in a Midwest town in North America through a participatory research methodology. The Alternative Elementary Program is based on a concept of student-centered learning, and this philosophy translates into all aspects of a student's experience at the school. The project was initiated by one of the intervention specialists from the school, who is committed to inclusive learning practices and giving agency to her students in the design of curriculum and learning environment. An intervention specialist is a licensed special education teacher with at least one additional year in the field. It is a designation that identifies a teacher as equipped to write and implement Individualized Education Plans (IEP), develop curriculum, and establish behavior management systems for students with exceptionalities in their classrooms [1]. She contacted the researchers for assistance in developing a prototype for the third and fourth-grade specialized program classroom focusing on the methodology and procedures to actively involve the students and the school community. The researchers delved into an understanding of the alternative school through interviews with the teachers and the community members. A survey of the current classroom and school was conducted to know the various space types and uses. One of the common goals identified by all the educators, community, and researchers was to have the students involved in the creation of their own learning space as an opportunity to foster planning and management skills as well as to reinforce their cognitive strengths while teaching the various elements from the school curriculum.

Literature Review: Neurodiversity and Inclusiveness

Neurodiversity states that some developmental disorders are common variances in the brain and that persons who have these characteristics also have specific advantages (Disabled World, 2022). This term reflects both the difficulties that neurodivergent people face (including the lack of toleration by so-called "normal" or "neurotypical" individuals) as well as the unique sensory needs of these individuals (Armstrong, 2012). The concept of neurodiversity encourages brain diversity in the same way that we talk about biodiversity and cultural diversity (Singer, 2017). Its

implication in the educational setting is enormous. It encourages both regular and special needs educators or intervention specialists to have an opportunity to step out of the box and embrace an entirely new way of thinking about human diversity. Besides making changes just to the curriculum, the learning environment must meet the sensory needs of students to provide them with the opportunity to feel physically comfortable, encourage self-regulation, and focus on the tasks (Rose, 2001).

Drawing on new research in neuroscience, and principles from universal design, Universal Design for Learning (UDL) embraces the concept of improved access for everyone and applies it to the curriculum materials and teaching methods (Katz, 2013). A teacher's goal is for every student to learn skills and understand the subject, but not every child learns the same way. Traditional curriculum materials offer only limited flexibility for meeting that goal. The work of Howard Gardner, a Harvard professor, in his development of the theory of Multiple Intelligences supports the notion that all learners can be successful when they have access to multiple forms of educational content (Barrington, 2004). Learning is fluid and complex, and it's important to avoid labeling students as one type of learner. In the classroom, this theory is used with the understanding that each student has a different combination of their strongest and weakest intelligence. Similar to the ideas presented in the universal design in education, the theory of multiple intelligences encourages providing students with a range of learning opportunities. To address these different intelligence educators should provide a variety of visual, auditory, interactive, etc. activities to engage every student (Barrington, 2004). The researchers delved more into the literature that goes beyond the ideas presented in the universal design in education and the theory of multiple intelligences that encourages a range of learning opportunities in the classroom, by co-creating classrooms with students to support their learning. This approach is consistent with the Alternate School's fundamental principle of student-centered learning, which is reflected in all elements of a student's school experience.

The authors, Hare and Dillon (2016) emphasize in their book, The Space: A Guide for Educators, an empathetic and reflective design process of co-creation of classroom spaces that would actively bring students, teachers, and community into the conversation. Based on their experiences, conversations, and research they outlined four spaces within the classroom that would promote not only a variety of learning styles but also provide an agency to the students in the design of the classroom. These four spaces include "*spaces to collaborate, create, showcase learning, and for quiet activities*." Spaces to collaborate should have flexibility in furniture for formal, and informal conversations and collaboration, while the spaces to create should be equipped with a variety of writable surfaces, digital makers area, and space to do creative work (Hare & Dillon, 2016). Spaces to showcase should exhibit both the process and final work for feedback and reflection. Hare and Dillon (2016) differentiate here between "display" and "showcase," the former a passive display of finished work and the latter an interactive display of the "progress of work." They propose three kinds of quiet spaces: "seeing quiet" which is the absence of clutter, "hearing quiet" which is promoting silence and introduces white noise, and "feeling quiet" which is providing moments to reflect (Hare and Dillon, 2016).

This tetra compartmentalization of the classroom encourages a range of learning opportunities to meet the sensory needs of diverse learners. This spatial configuration and the co-creation approach described in the next section are consistent with the Alternative School's fundamental principle of student-centered learning.

Methodology for the Case Study

The methodology for the case study is broken down into three subheadings covering the objectives, the participatory method, and, the process used for this case study.

Objectives of the Case Study

After the literature review, interaction with the user group, community members, and the intervention specialist, the researchers posed these questions: Can we offer children the ability to select which of their skills they wish to nurture while also teaching them how to steer forth with their limitations? Can we go beyond the prescriptive step-oriented nature of the interior design process to fully immerse and actively co-create with the users? Can we design a prototype for the classroom that creates effective learning spaces for diverse learners and can be implemented in other learning settings in the future? This research aimed to create a scalable, flexible classroom prototype for neurodiverse learners through a collaborative design process.

Participatory Research: The Method for the Case Study

Design is a social process and emerges through the co-creation of objects, narratives, identities, and shared social understanding (Balsamo, 2010, Jenkins et al. 2008). Participatory design is a human-centered approach to research and design that advocates active user and community engagement at all stages of the design process (Martin & Hanington, 2012). In the participatory research methodology, the emphasis on the process eliminates subconscious biases and premeditated results. This methodology helps develop deep empathy for the users giving them authority both in the process and the end product. This enables designers to understand other people's realities and perspectives and develop solutions informed and inspired by an empathetic response, empowering them (Kouprie & Visser, 2009). Hence, this research aimed to co-create the design of the classroom with the school community and their students to improve and enrich physical, emotional, and social interactions, adding value to the design responses (Tellez Bohorquez, 2017). Borrowing from Vartiainen's (2014) design-oriented pedagogy this research project takes into consideration three contributing categories subjects, objects, and tools, as reflected in Figure 1 - URL http://rapidintellect.com/AEQweb/6068lip1.pdf This tripartite division includes the expert school community or *subjects*, working with real-life *objects* and artifacts, facilitated by the third category including diverse physical and cognitive *tools* for thinking. This process is more end-user inclusive providing an authority to them to take charge of the research agenda, methodology, and product and delineates from the linear, step-oriented, unidirectional approach of probing, priming, understanding, and generating (Sanders, 2002).

Participatory Research: The Process

The intervention specialist and the researchers mutually initiated a list of subjects, objects, and tools to be developed as the design process evolved. *Subjects* provide different kinds of perspectives and paths with which to engage in inquiry with the extended learning community (Liljeström et al., 2012). The subjects identified for this project were the intervention specialists

from the school, cultural anthropologists, parent volunteers, design researchers, marketing specialists, and furniture vendors who helped understand various *objects* such as curriculum, neurodiversity, modes, and modalities of teaching and learning, both spatial and curricular. These knowledgeable subjects strongly supported the four-space model presented by Hare and Dillon (2016) as it gives students options inside the classroom so they may explore, learn, and develop critical thinking skills. Thus, this four-space model became an *object* to ask questions, develop the design of the classroom through the shared expertise of researchers, teachers, and students, and manifest the priorities of all subjects.

As per Vartiainen (2014) *tools* equip participants with physical, digital, and representational devices to think, make and document the project process collaboratively. With the assistance of the subjects, the researchers generated tools to help students develop an understanding of space to co-create the classroom with them. An exploratory walk and talk were given on the project site by the researchers and teachers to acquaint the students with spatial vocabulary while also assisting them in gaining spatial experience. The goal was to discuss spatial attributes, and strategies like color, lighting, materials, volumes, furniture, and fixtures that affect the perception of our spaces and contribute to learning, accessibility, mobility, and collaboration in the space. This activity highlighted and discussed the “objects” in the tripartite division of the design process.

The students were shown the digital tool called SketchUp since it is a more user-friendly program. As the researchers expressed and illustrate the design ideas for the classroom in the software the students participated and provided input about the layout making the design process participatory. A parent volunteer who was an architect by trade also spent a session with the students to make a physical model of the classroom in foam core and paper representing the space and human figures to help understand the scale. To experience the difference between a scaled model and a 1:1 space, the students went out to the schoolyard where they translated the plan of the classroom on the basketball courts using chalk to draw. Following these activities, they were asked the questions based on Hare and Dillon's (2016), space types- how would they like to collaborate, showcase, learn, and spent their quiet time in their classrooms? To assist in helping them visualize these space types, the researchers created image boards for each space type. This participation assisted in understanding the preferences of the user group and served as provocative initiators for discussions to determine spatial strategies and the character of each space type within the classroom design. This interaction and results are indicated in Figure 2 - URL http://rapidintellect.com/AEQweb/6068lip2.pdf The activities were not just limited to the creation of design guidelines, but the students were engaged in creating inventory and budget for the furniture and equipment using excel sheets.

Based on all these activities the design guidelines were established which were used to generate multiple digital prototypes. After several workshops and input, the students unanimously decided on the solution that would fit their sensory needs. Hence, the goals associated with each step were to ensure resource accessibility, encourage mobility, ignite inspiration, and foster respect in the classroom. This conglomeration of subjects, objects, and tools empowered the students and enlightened all the partakers.

The Development of the Prototype

Merriam-Webster (n.d.), defines a prototype as a first, typical, or preliminary model of something from which subsequent forms are formed or replicated. This prototype will act as a model for receiving feedback from intervention specialists, parents, students, educators, and designers before being developed and implemented into a design-build project. The classroom is not only an evolving end-product but represents the participatory process followed including students as co-creators. The students brought in their singular experiences and expertise, collaborated and learned from each other, and sought feedback by sharing and showcasing ideas. The classroom space is divided into four quadrants. The first quadrant acts as a space to collaborate with circular mobile seating, giving agency to the students to organize it as per the size of the group and nature of work. This transitions into the second quadrant which is the space to create. This contains a long table facilitating hands-on exploration and storage space for learning objects and supplies. The sensory and restorative zone is once again located in the quietest part of the classroom, giving students control through enclosed furniture, calming green space, and outdoor views while also providing teachers with visual access for safety reasons. The last quadrant represents a space to showcase their work enhancing their sense of pride and fostering peer learning. A flexible, mobile peg wall systems divide these spaces into four quadrants while offering flexibility for one zone to open into the next. This prototype is represented in Figures 3 - URL http://rapidintellect.com/AEQweb/6068lip3.pdf
Figures 4 - URL http://rapidintellect.com/AEQweb/6068lip4.pdf

Implications

The classroom design itself came to be a representation of the steps of the participatory process. It transformed the design process to not be an ocular-centric stylistic process deriving from precedent studies that did not take into consideration studies in neurodiversity. It remained not just a product of the participatory process but a mechanism that nurtured it. The four spaces to be designed metonymically indicated the process of participation. It questioned the basic premise of learning space and presented an alternative to allow students to be involved in the setting up of the space that they would use rather than try and design it for them. It did not limit activities possible in a pre-defined space but allowed for extending the possibilities of a space where significant parts of their growing lives are spent. It gave the flexibility to the students to choose which of their abilities they wanted to nurture while equipping them with ways to handle their sensory limitations. It also helped the teacher to recognize the strengths of the students by diversifying the learning process. The process inculcated ownership of the space that encouraged a constant tweaking of the space with time. The solution was not fixed or complete but changed with changing requirements and realizations in a perpetual process of discovery and adaptations. The setup did not only allow for flexibility in ways of thinking but also the flexibility of posture and space type ranging from public to semi-private areas within the classroom, supporting the requirements for different students with different physical and cognitive abilities. The authors want to emphasize the uniqueness of the process that created the classroom design, which represents the design process as much as is the product of the design process.

Endnotes

[1] Special Education and Teachers. (n.d.). https://education.ohio.gov/Topics/Special-Education

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