

PURPOSEFUL LEARNING SPACES FOR NEUROATYPICAL STUDENTS IN K- 12 +HIGHER EDUCATION

AN INVESTIGATION OF DESIGN PRINCIPLES IN SMALL, MEDIUM, AND LARGE CLASSROOMS

Tuesday, November 7th, 2023

2:30 -3:30 p.m.

INTRODUCTION

FACULTY RESEARCHERS

- David Kniola , Ph.D., School of Education (Education Research and Evaluation)
- Elif Tural , Ph.D., School of Design (Interior Design)

INDUSTRY PARTNER

- Andrew Kim, MDes ., Director, Workspace Futures, Steelcase

STUDENT RESEARCHERS

- Jennifer Bertollo , Clinical Psychology Doctoral Candidate
- Haleigh Daughtrey , Interior Design
- Lauren Shelton, Interior Design



Human Centered
Evidence Based
Future Focused

Design with, *not just for*

Inclusive design uses participatory methods to create new ways for traditionally excluded users to participate in activities of their choice.

When successful, inclusive design leverages diverse lived experiences and perspectives to enhance experience and empower participation.

Shifts within Design Practice

Equal Experience
“One size fits all”

Equitable Experience
“Many choices fits one”

Equality



Equity



OPENING ACTIVITY

1. Move to a space in the room that you think best supports learning for neurodiverse students.
2. Talk about why you selected this space. What need does the space meet?

PROJECT OVERVIEW

The purpose of this project was to investigate design principles that enhance learning spaces for neuroatypical students in higher education.

We view this important group of learners as critical to learning spaces because they offer unique contributions that enhance learning for all students.



DEFINING NEURODIVERSITY

NEURO ATYPICAL

- Conditions where cognitive abilities and associated learning, mood, attention, sociability, and other mental functions do not present as typical of the larger population
- Autism community

NEURODIVERSE

- Coined to **promote equality and inclusion** of "neurological minorities"
- Inclusive of range of brain differences including autism, ADHD, anxiety, learning disabilities



OUR APPROACH

- Moving away from historical use of disability, illness, mental disorders, behavioral and emotional disorders, “abnormal”, deficiencies
- This project centered **diversity, strengths, and interdependence**
- Emerging research points to range of unique traits including working with systems, identifying details in complex patterns, systemizing tasks (databases, computer codes), visual - spatial abilities, nurturing behaviors, processing low - definition or blurred visual scenes, peripheral perceptions in visual information, three - dimensional thinking, greater array of novelty - seeking, and creativity

ACTIVITIES

THREE MAIN PHASES OF THE PROJECT:

- Literature review (K12 and higher education)
- Engaging student learners (interviews and partners in design work)
- Visual designs and conceptual models

RESEARCH DESIGN

1. Developed initial designs based on existing literature.
2. Interviewed students about experiences and initial designs.
3. Concurrent review of K12 and Higher Ed literature.
4. Modified designs based on student feedback.
5. Surveyed students about modified designs.

LITERATURE REVIEW K- 12

- **Space and Organization:** importance of physical organization and layout; clear boundaries; selecting open/flowing spaces vs. confined/organized spaces based on activity and individual needs; respite sensory - friendly space (Colbert, 1997; Gaines & Curry, 2011; Martin, 2016; Schopler, 1994).
- **Visual Strategies:** clear labeling, visual schedules (to assist with predictability/difficulty with transition), visual simplicity (avoid harsh lights/patterns and distractions, color choices that are functional rather than aesthetic and less likely to have discrimination difficulty (e.g., blue - yellow color blindness) (Gaines & Curry, 2011; Martin, 2016; Schopler, 1994).
- **Lighting:** dimming option, avoid LED, avoid loud or strobing light fixtures (Gaines et al., 2016; Martin, 2016).
- **Noise Control:** acoustically friendly environments, limit open concept for echo, acoustic tiles/drapery/carpet, soundproof walls, quiet HVAC systems such as in - floor heat (Kanakri, et al., 2017; Martin, 2016).
- **Furniture and Equipment:** flexible, comfortable furniture options (e.g., Steelcase Node Chair), furniture with manipulative configurations (Attai, et al., 2021; Gaines et al., 2016; Schopler, 1994).

LITERATURE REVIEW HIGHER ED

- **Visuals:** avoid florescent lights, avoid distracting visual stimuli, sunglasses or similar filter to lessen harshness of light (Mostafa, 2018; Robertson & Ne'eman, 2008).
- **Noise/Acoustics:** limit echo, lessen background noise, allow for individual adjusting acoustics/volume, headphones available/allowed to dampen noise (Dwyer et. al, 2023; Mostafa, 2018; Robertson & Ne'eman, 2008).
- **Space:** spatial sequencing in layout of classroom materials/activities, compartmentalizing spaces by activity and sensory level (sensory zoning); quiet, sensory - friendly escape/respice space (Dwyer et. al, 2023; Kuder & Accardo, 2018; Mostafa, 2018).
- **Technology:** option to type, option to participate through technology (polling system/audience response system/clicker), importance of having these technologies built into the classroom (to avoid loss/forgetting, software updates and compatibility issues across devices); creative technologies for interaction such as 3 - D worlds (Eiland & Todd, 2019; Robertson & Ne'eman, 2008).
- Importance of making supports widely available/built in, but also maintaining methods of individualizing supports based on unique needs.

STUDENT INTERVIEWS

- 9 students (7 undergraduate, 2 graduate)
- 7 women, 2 men
- ADHD, autism, Asperger's, anxiety (and combinations)
- Semi-structured interviews.
 - Experiences in college and high school classrooms
 - Aspects of classroom space and design that challenge learning, capitalize on strengths
 - Reactions to preliminary classroom designs

INSIGHTS AND THEMES FROM INTERVIEWS

- Flexible and adaptable design
- Interdependent and interconnected learning spaces
- Vibrant and inspiring
- Distractions and interruptions
- Strengths and contributions to learning
- Learners are distinctive

STUDENT INTERVIEWS BASED ON DESIGNS

“I **need to see faces** and be connected because it is essential to my learning. Interacting with other students to collaborate and provide my unique perspective fosters a connection. I like having **proximity (but not “too close”)**. And I like the ability to **swivel in a chair** to see and talk to others.”

“Well..ADHD people like to **fidget and stim**. I know autistic people stim too. If we have the ability to do it quietly in class **without drawing unwanted attention**, it helps. I wiggle my toes but some people need certain stims or something bigger hence the moving chairs that are quiet but stable so it’s not an obsessive motion out of aggravation and fixation.”

“A strength of neurodiverse students is that we have thought about how the brain works and are more intentional with learning. **Windows serve a dual purpose**. They mitigate harsh manmade overhead lighting and provides opportunity to connect to the outside world, **a reminder of why I am in college and connecting what I am learning to society.**”

DESIGN CONSIDERATIONS

SENSORY ZONING

- grouping high stimulus to low stimulus
- activity based

COMPARTMENTALIZATION AND COORDINATION

- change of floor covering
- furniture arrangements and color
- wayfinding
- visibility

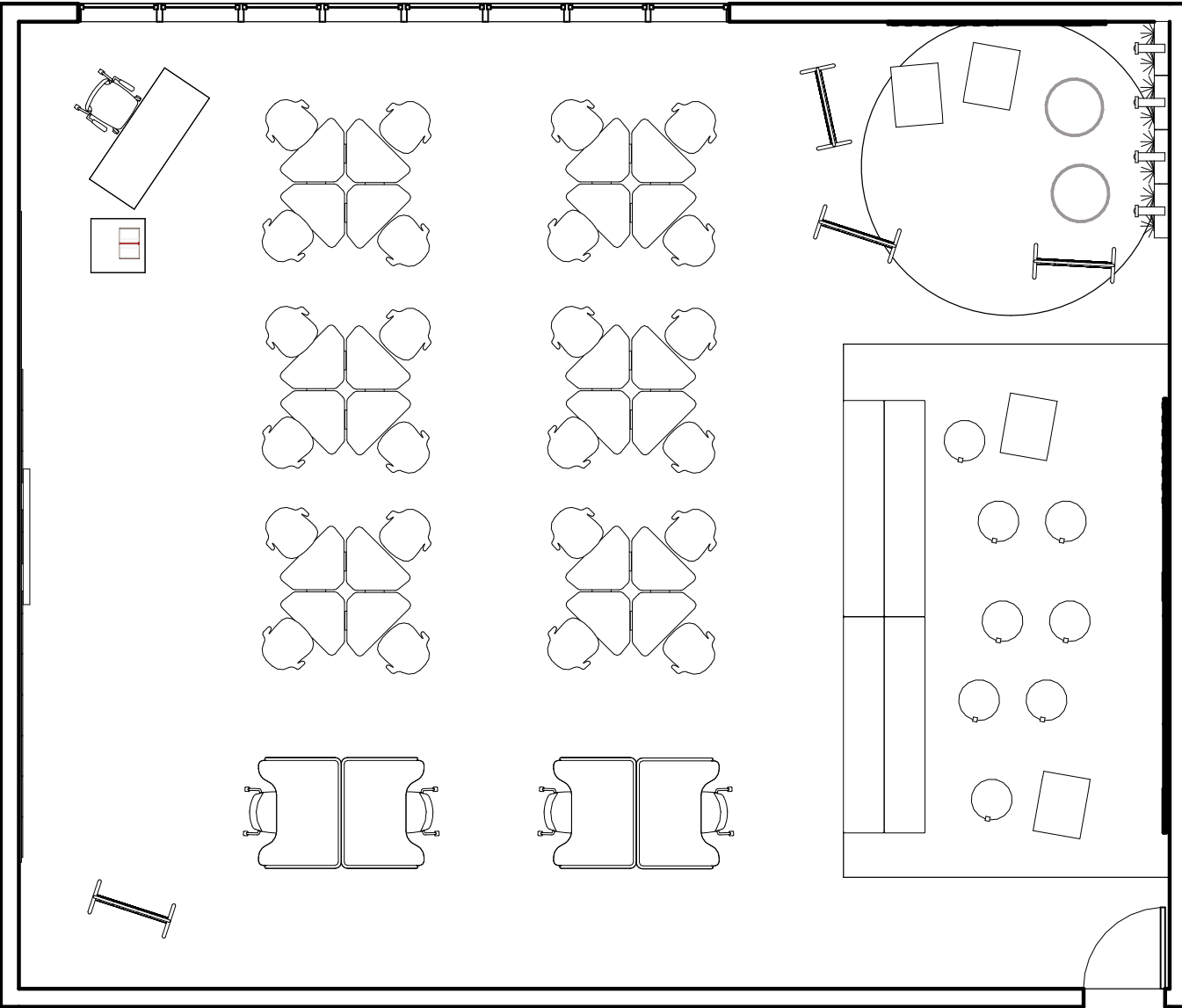
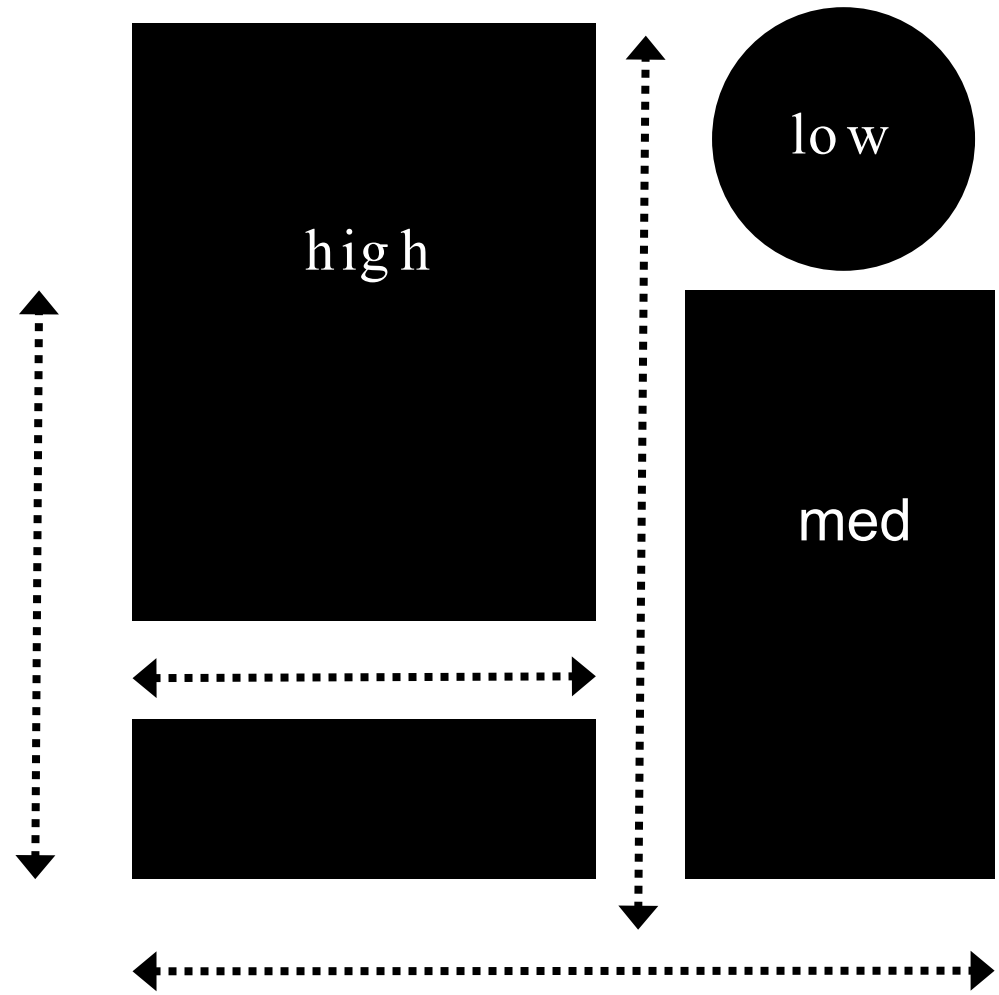
OFFER CHOICE

- flexibility
- adaptability

SAFETY

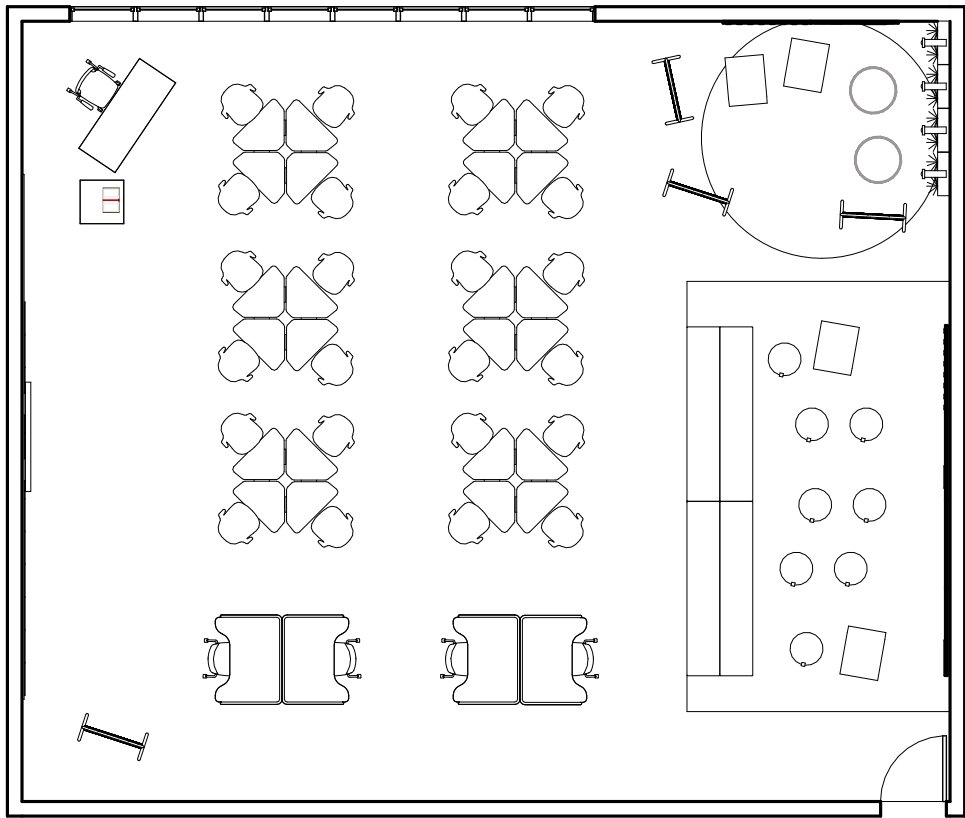
- avoid hard edges and corners
- offer greater personal space and circulation paths

APPLIED RESEARCH

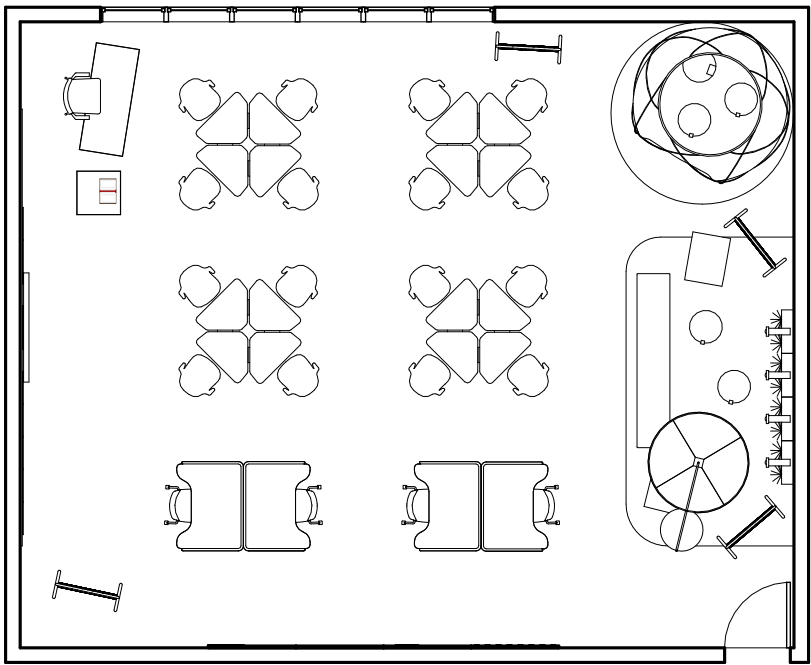


K- 12 FLOOR PLANS

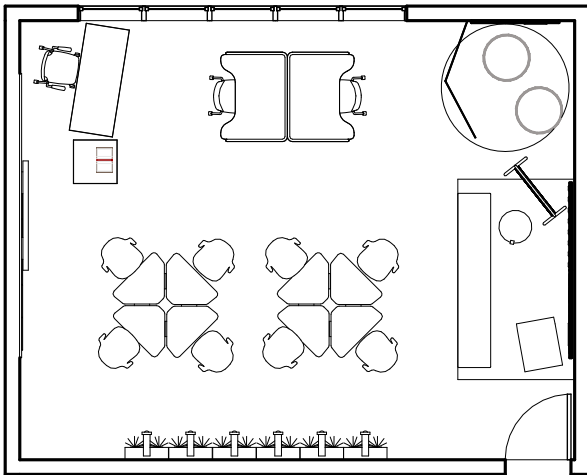
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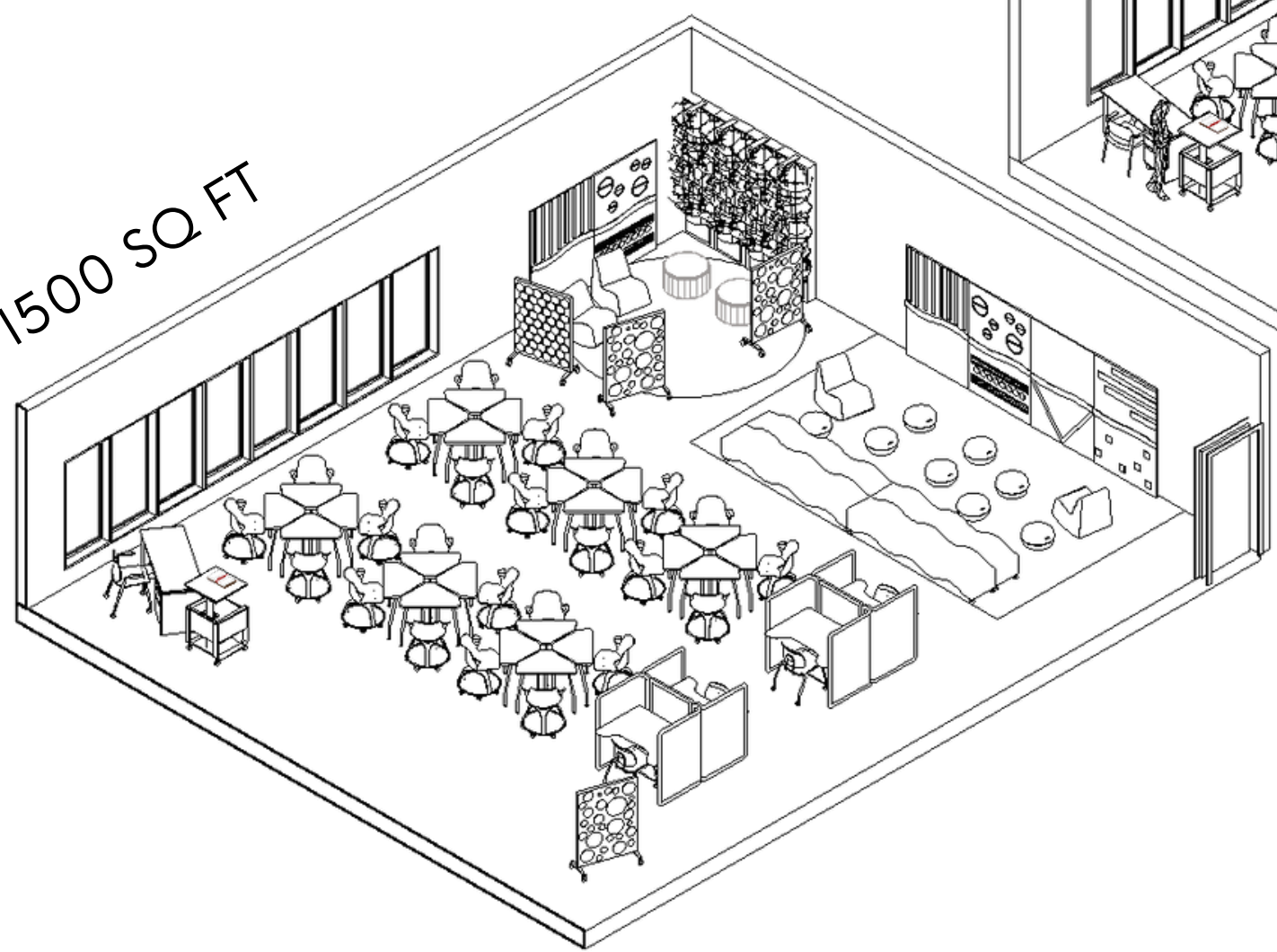


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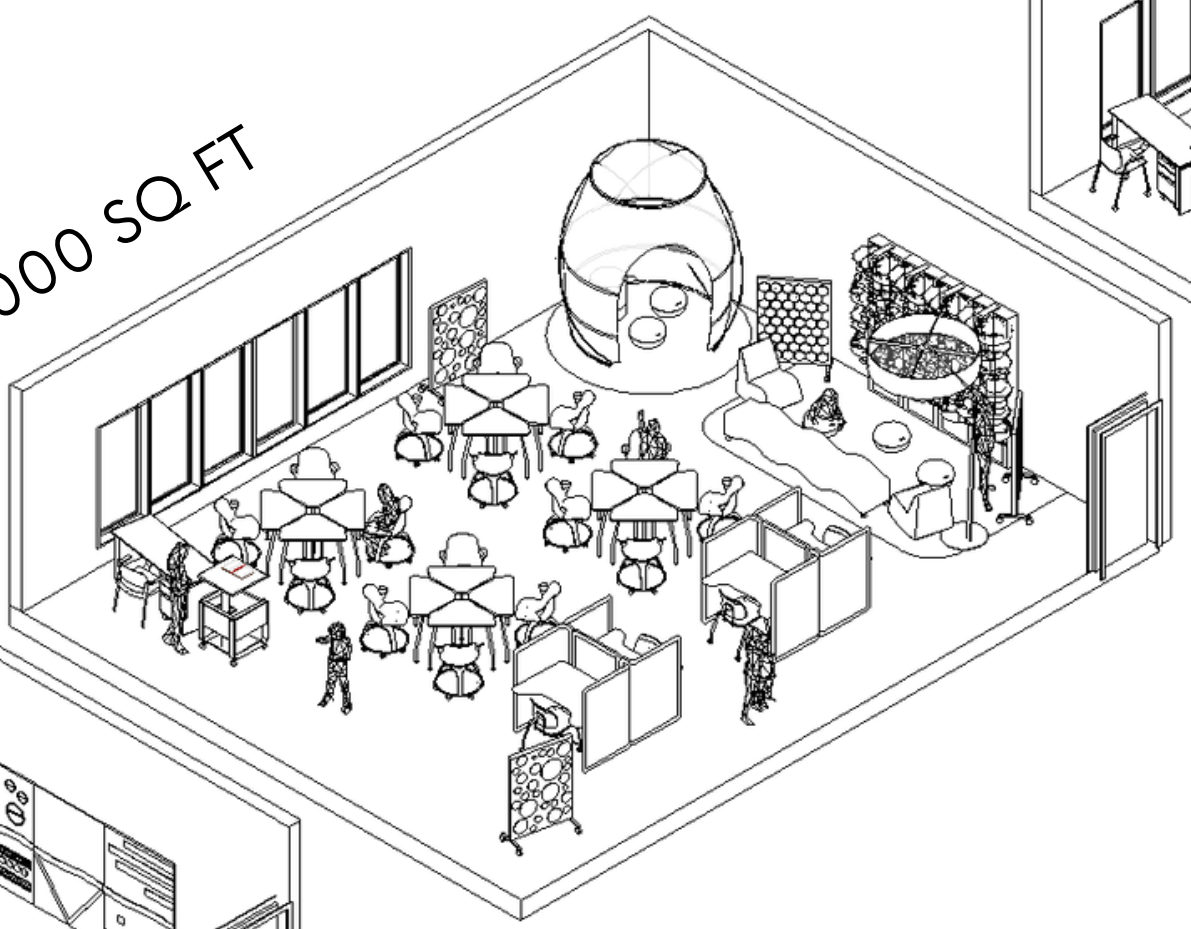


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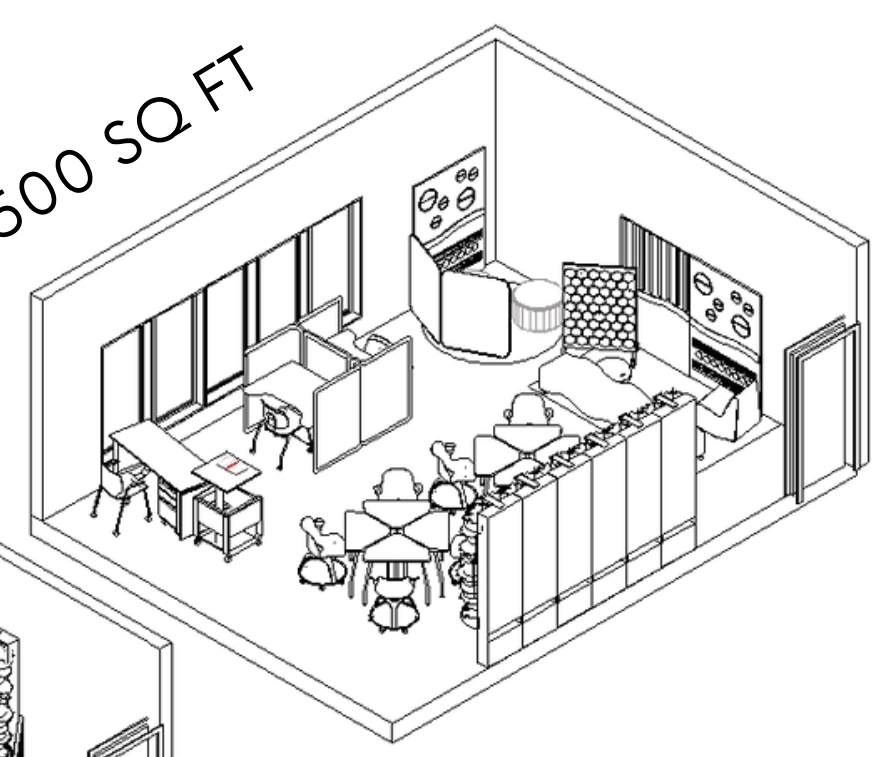
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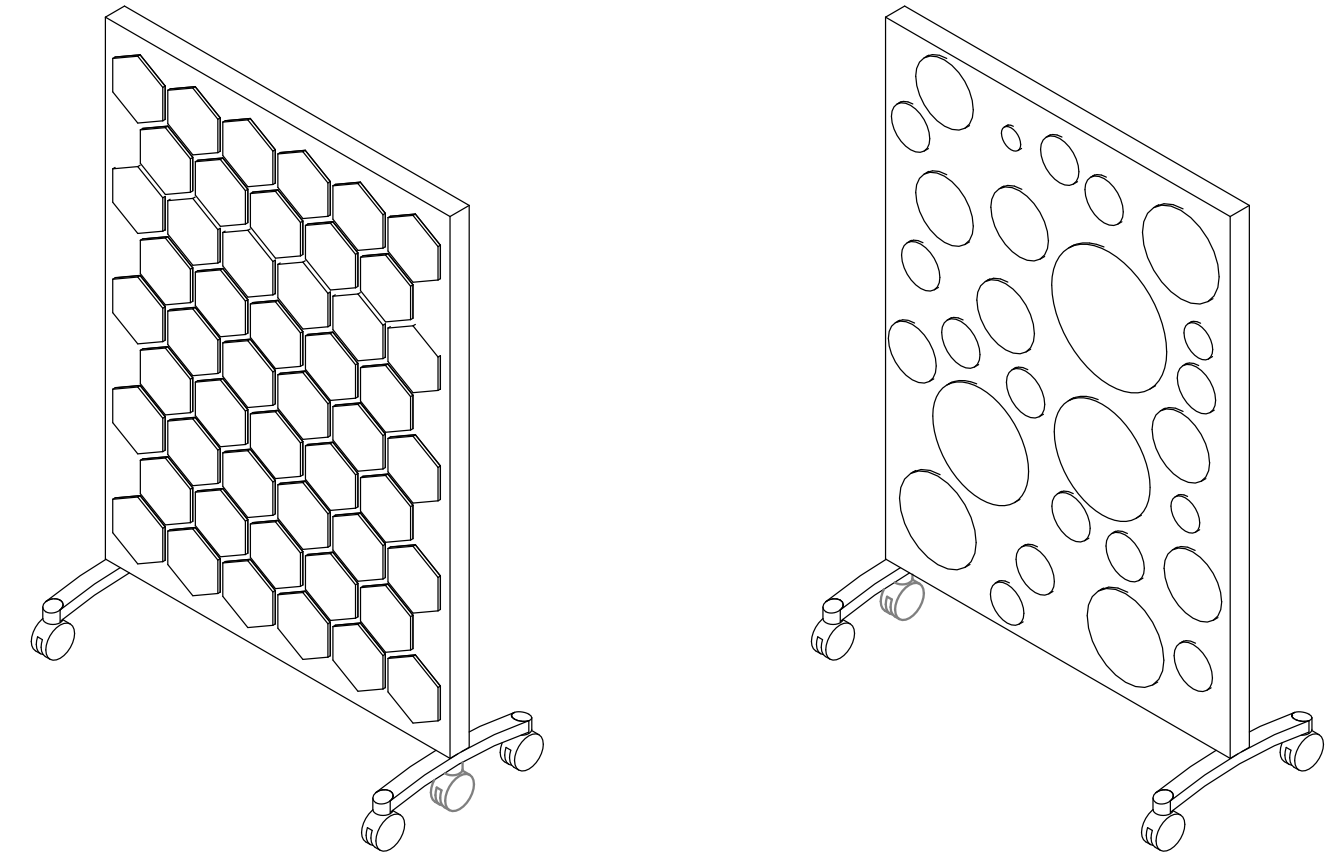
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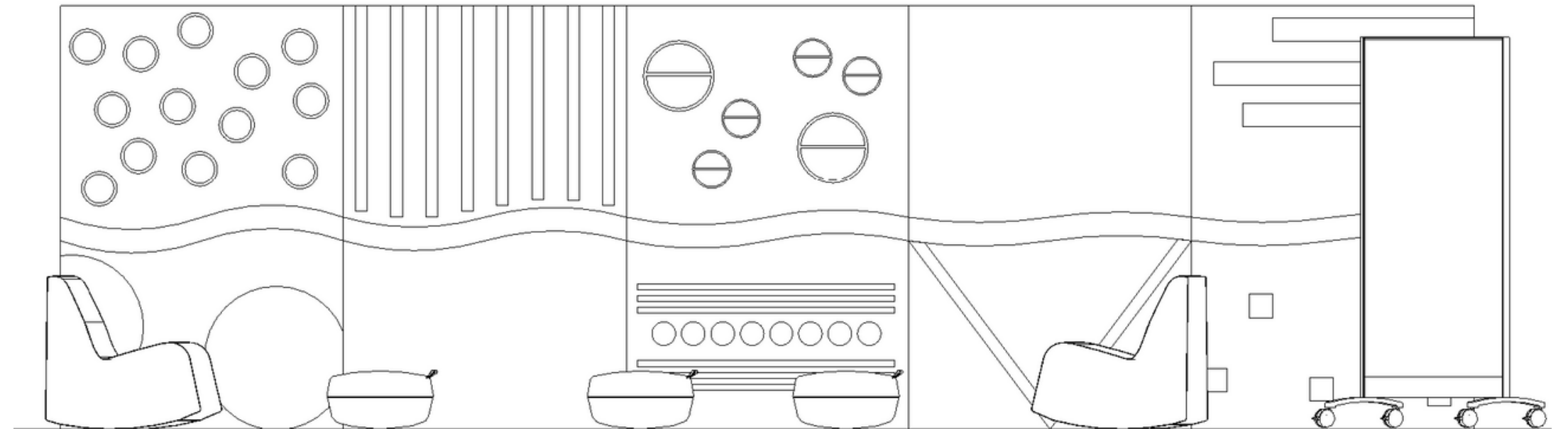


APPLIED RESEARCH



Proposed Sensory Panel Design

- 6'x4'
- Acoustic properties
- Attachable/ detachable textured parts for sensory stimulation
- Mobile





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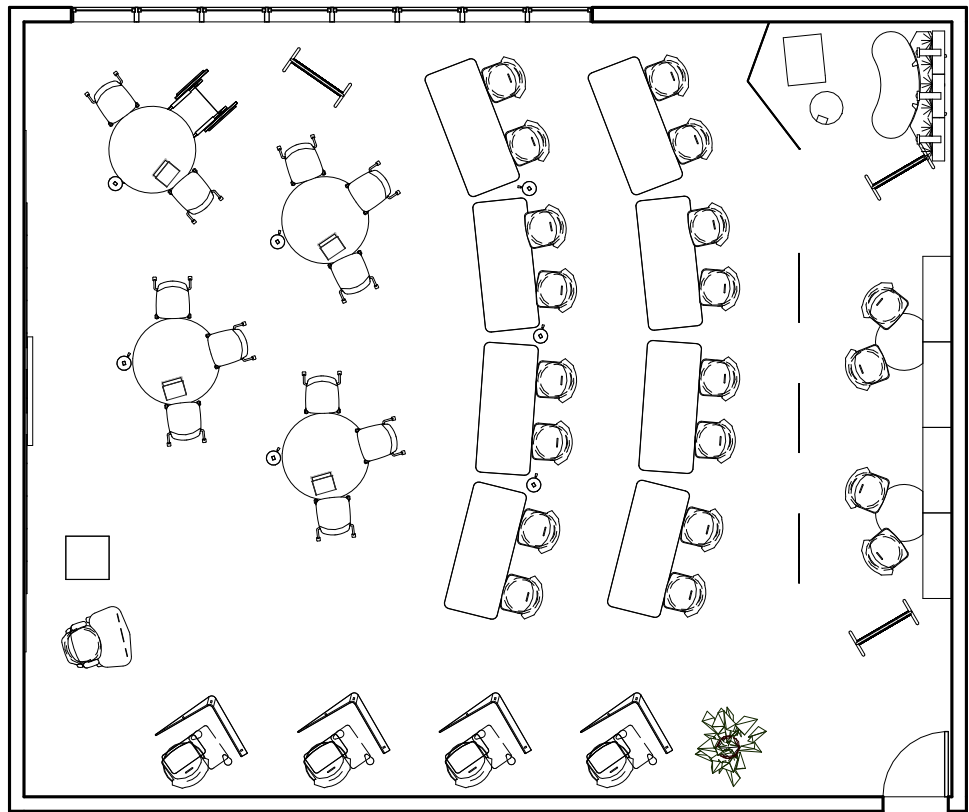
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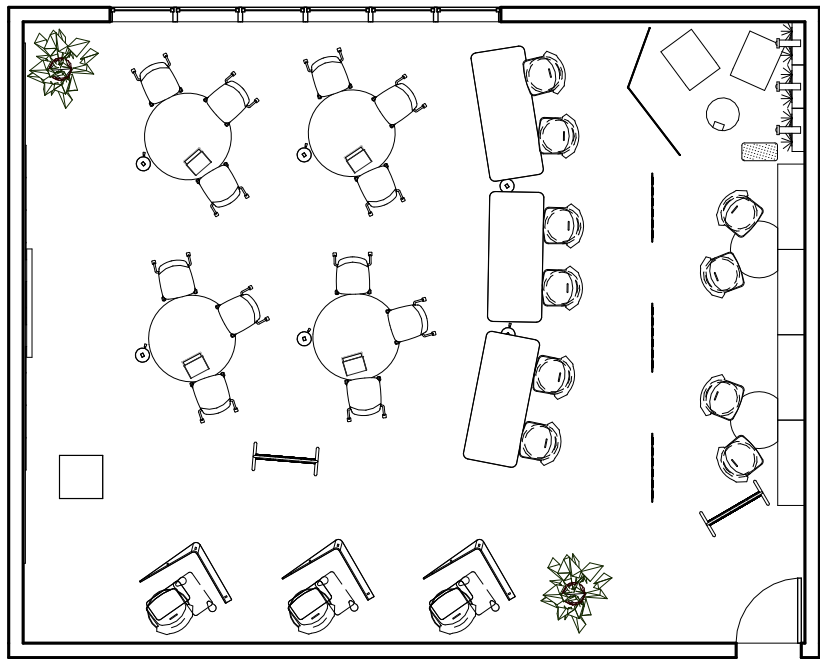
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HIGHER ED FLOOR PLANS

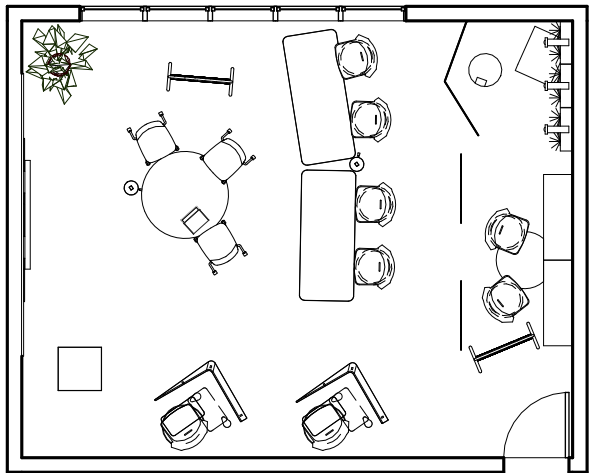
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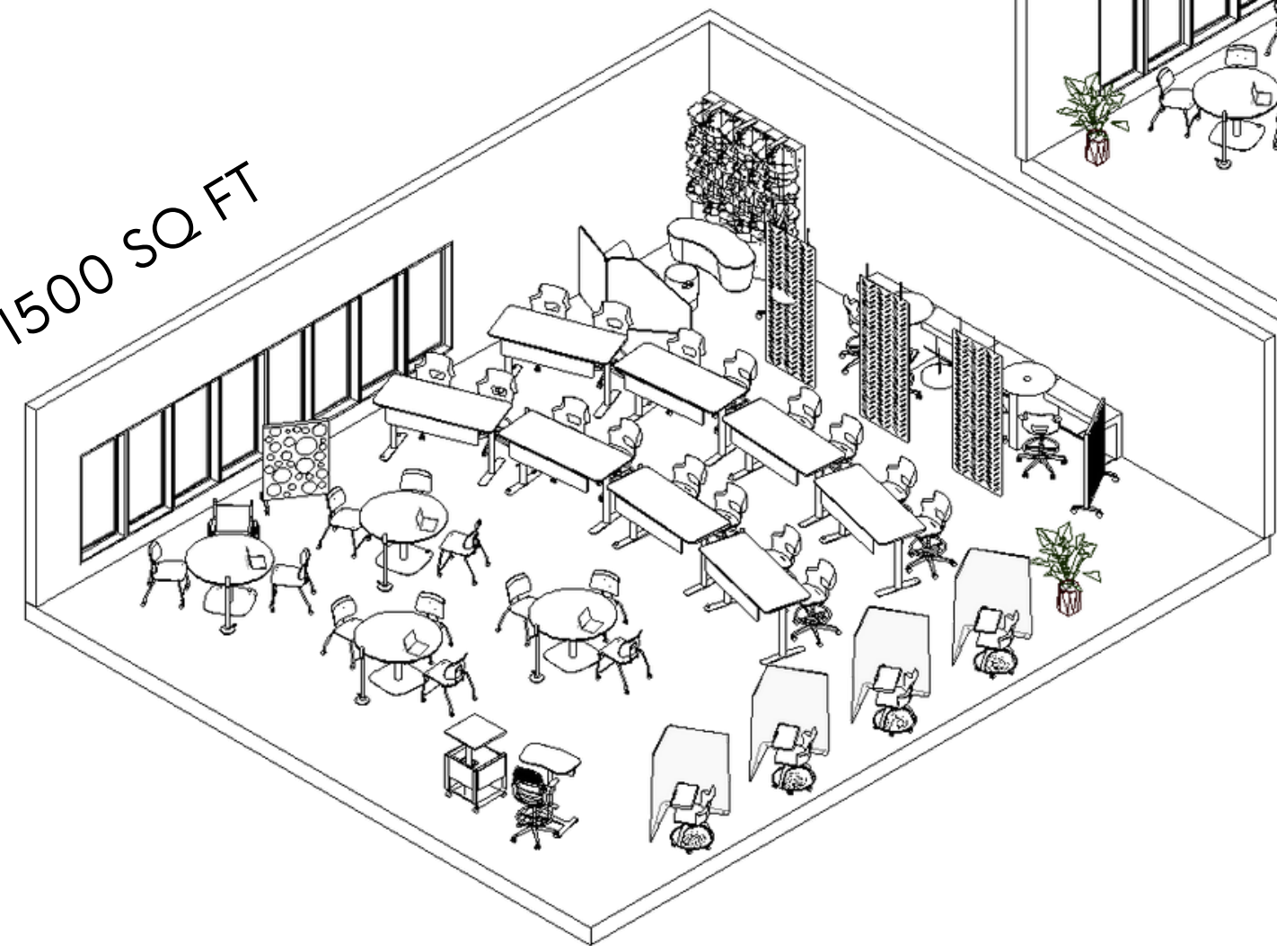


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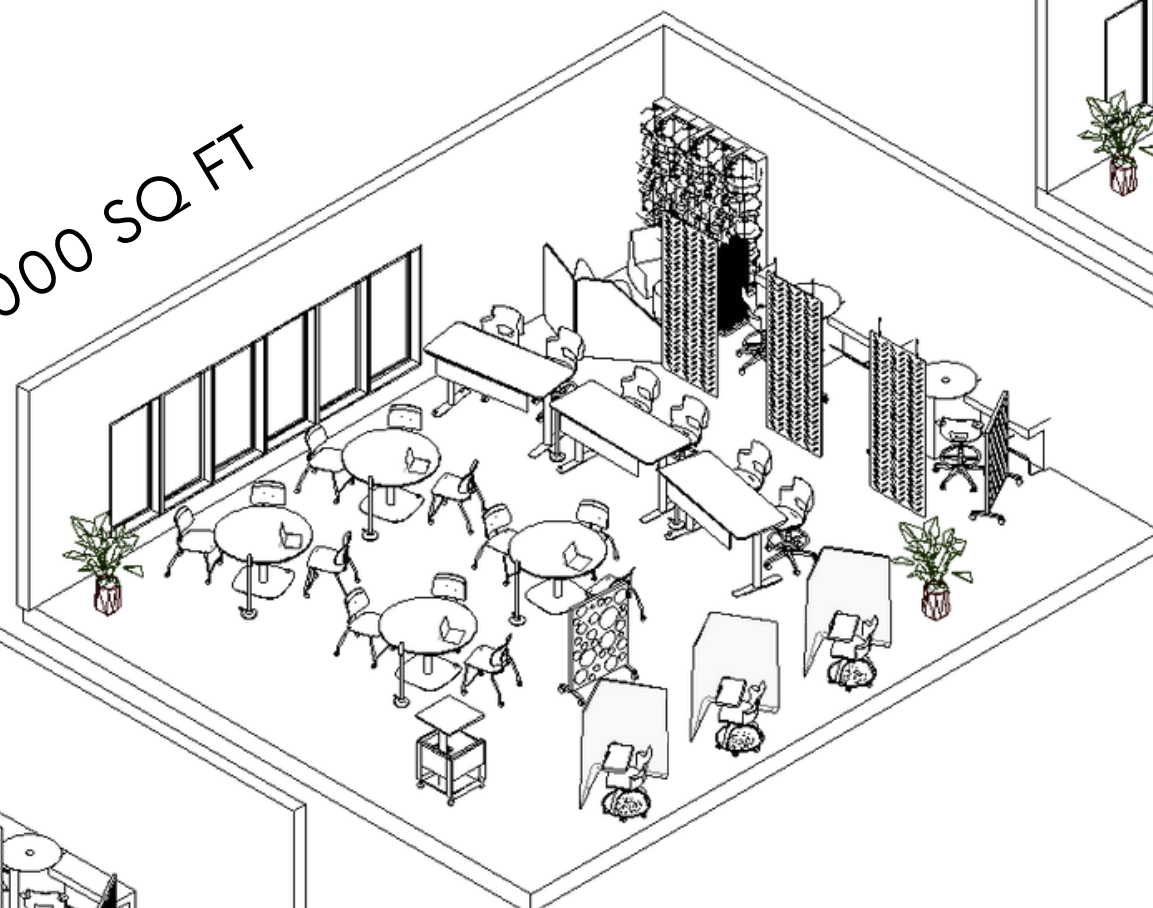


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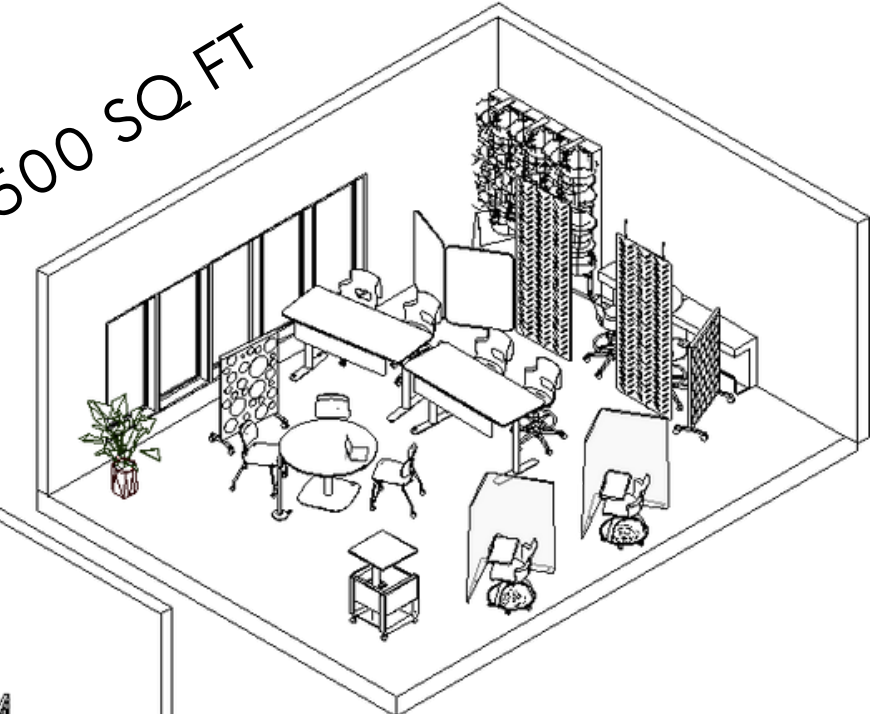
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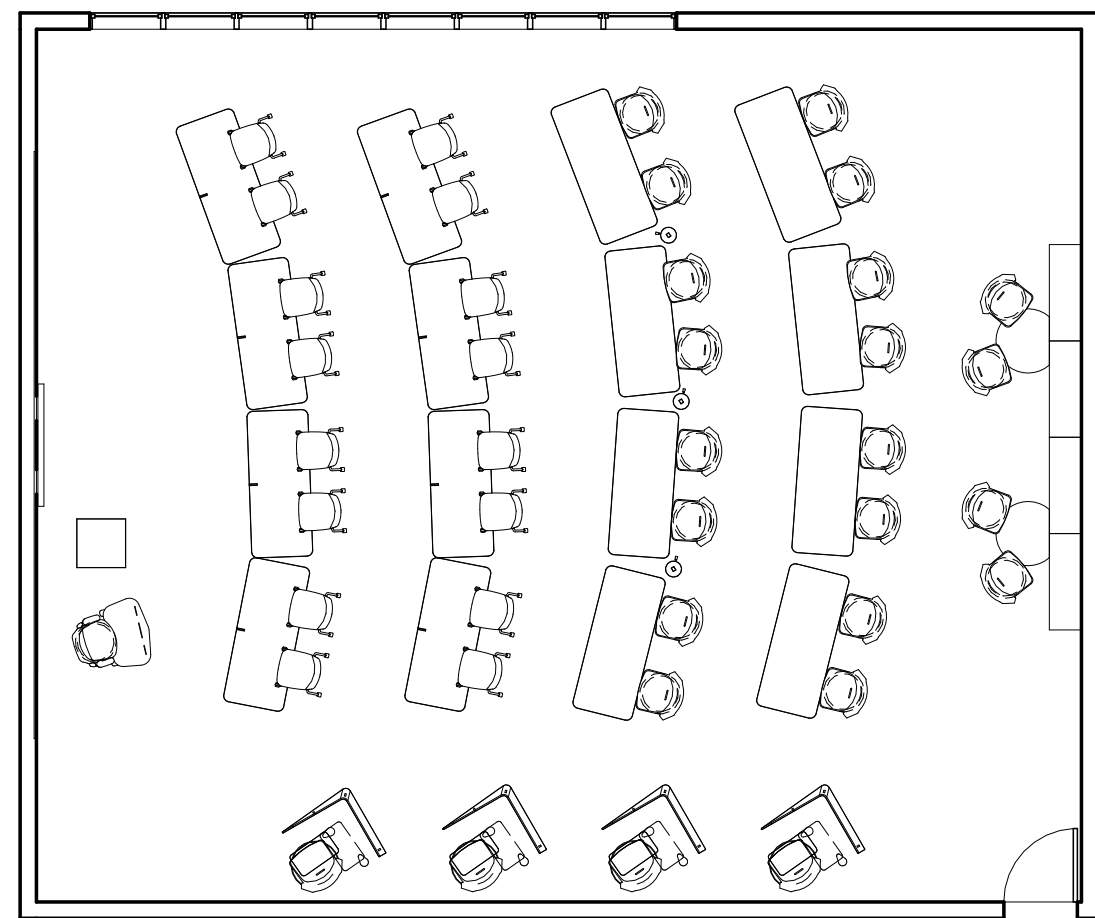


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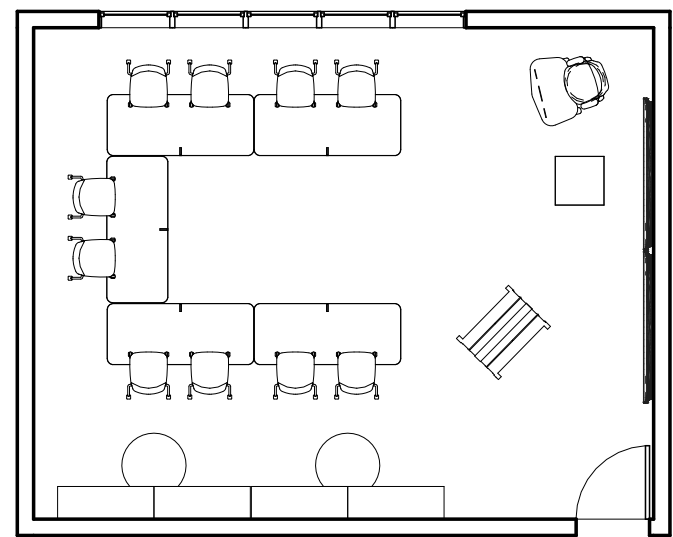


HIGHER ED ALTERNATE LAYOUTS

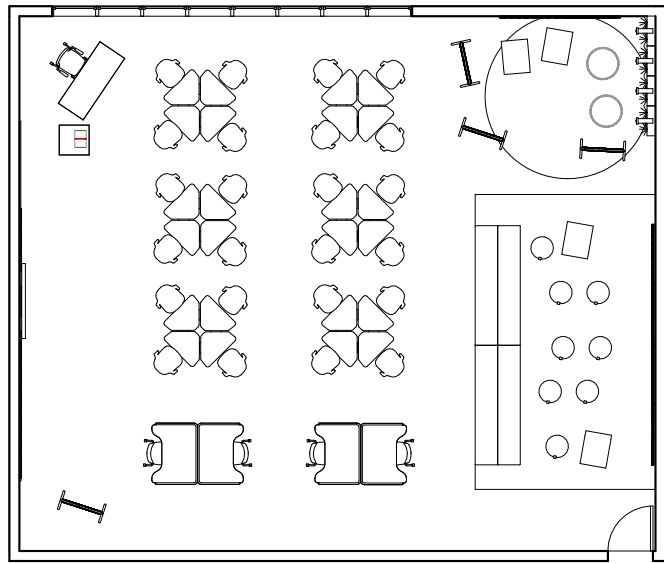
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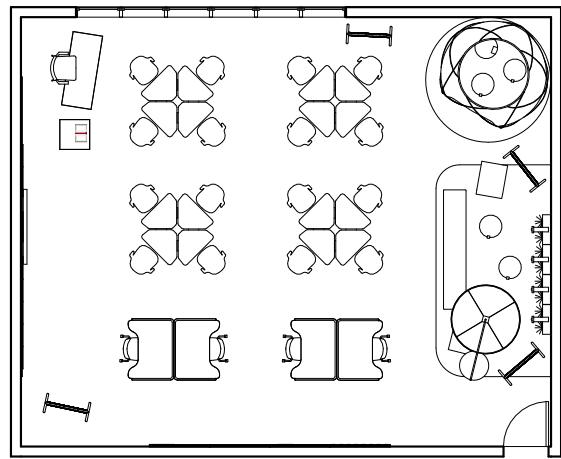
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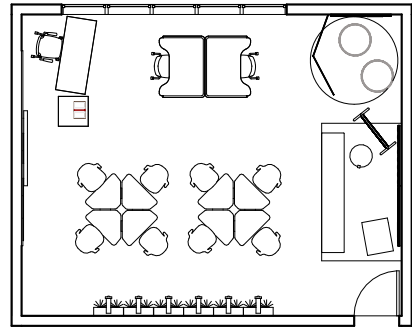
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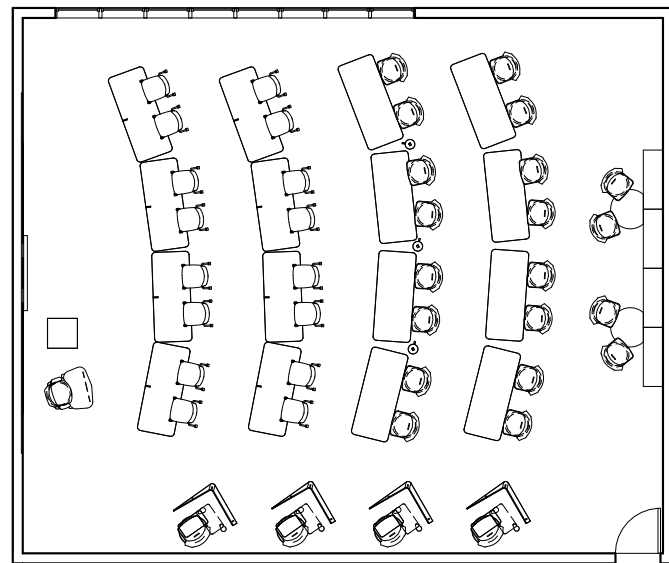
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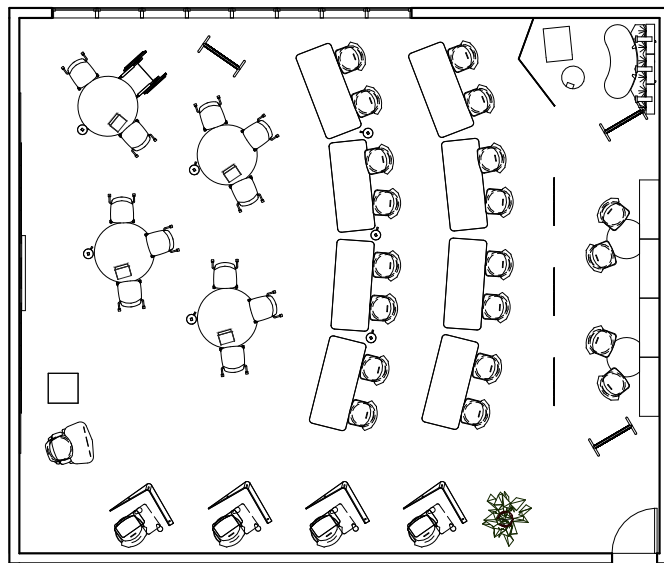
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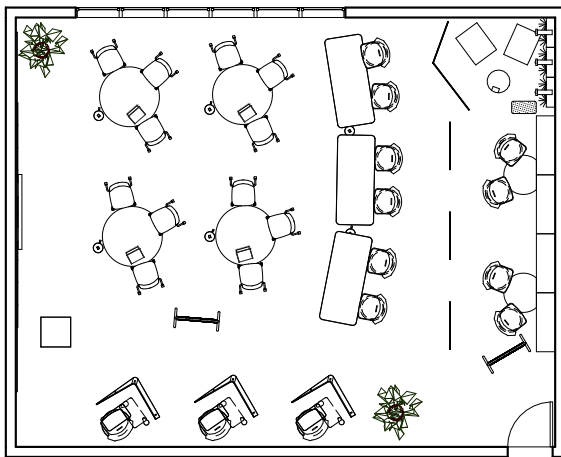
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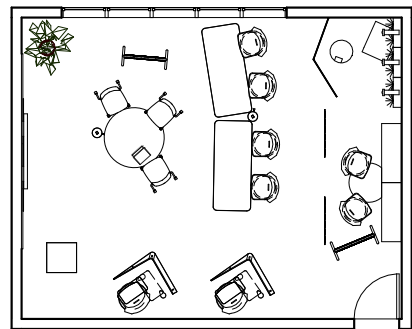
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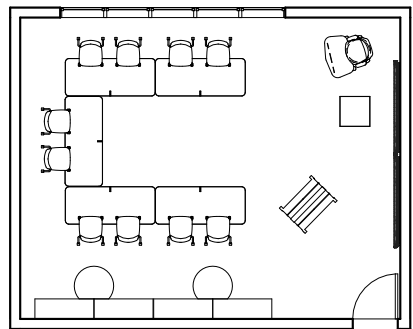
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HIGHER ED 1500 SQ. FT.



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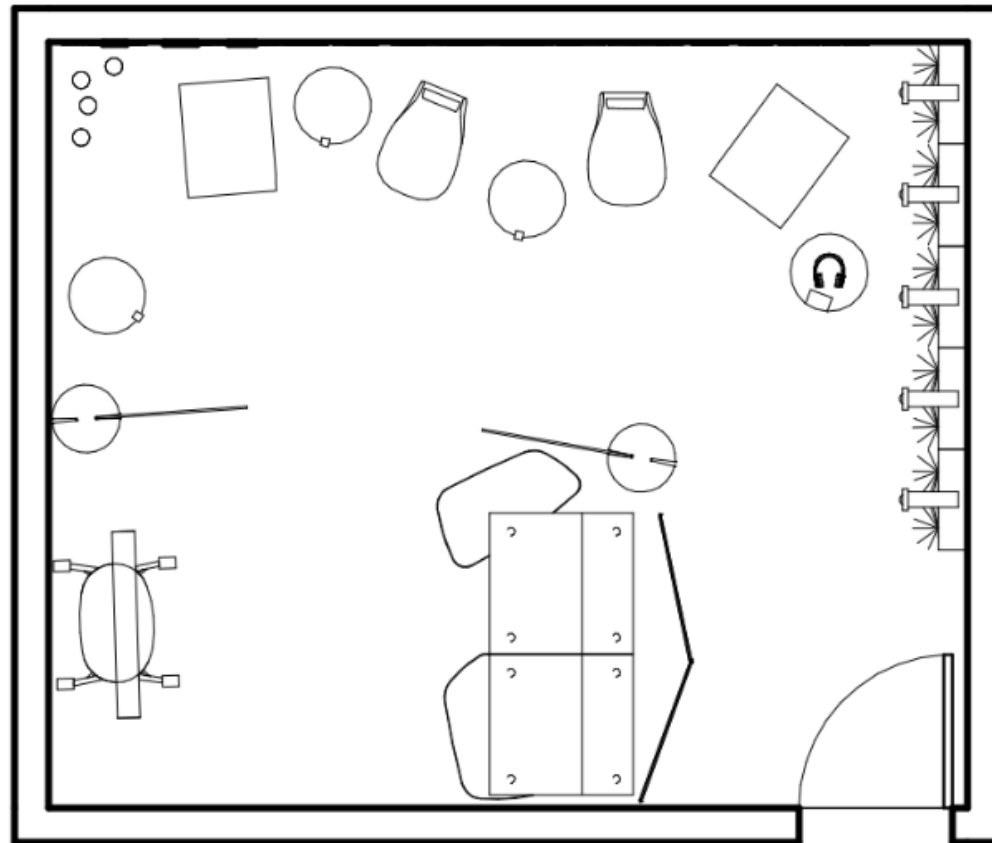




HIGHER ED 500 SQ. FT.



SENSORY ROOM LAYOUT





SENSORY ROOM



SENSORY ROOM



SENSORY ROOM

PANORAMIC VIEWS

500 SQFT

1000 SQFT

1500 SQFT

K-12



SENSORY ROOM

HIGHER-ED



SURVEY BASED ON DESIGNS

Statement	Very Negative Effect on My Learning	Negative	Slightly Negative	Slightly Positive	Positive	Very PositiveEffect on My Learning	This attribute does not affect my learning
Artificial Lighting (general overhead/electric lighting)	0.00%	20.00%	40.00%	20.00%	0.00%	20.00%	0.00%
Natural Lighting (windows, shades)	0.00%	0.00%	0.00%	20.00%	60.00%	20.00%	0.00%
Furniture (chairs, desks, soft seating)	0.00%	0.00%	0.00%	0.00%	75.00%	25.00%	0.00%
Furniture placement/arrangement (location, spacing, proximity to teacher, board)	0.00%	0.00%	0.00%	25.00%	50.00%	25.00%	0.00%
Private and semi-private areas	0.00%	0.00%	0.00%	20.00%	20.00%	60.00%	0.00%
Plant wall	0.00%	0.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Colors	0.00%	0.00%	40.00%	0.00%	60.00%	0.00%	0.00%
Textures	0.00%	0.00%	40.00%	20.00%	20.00%	20.00%	0.00%

BIG PICTURE FINDINGS

- Many students go undiagnosed until college years. Designed spaces may have important learning implications for students in K12 (and higher education).
- **Stimming and “sitting weirdly”.** Design choices support student movement and mask these distractions for other students in the room (tapping foot, sitting cross -legged)
- Students need a **variety** of spaces to meet unique and personal needs to align with classroom activity. Different activities require different space needs.
- Students want **private, semi -private, and collaborative spaces** to enhance their learning (focus) but not feel like outsiders in the classroom.

BIG PICTURE FINDINGS CONT.

- Students like designs that reduce or isolate **noise and chaos** (internal and external to room).
- Specific **design choices need additional research** (colors, patterns, textures, and lighting schemes).
- Students desire **control in their environment** . No “one size fits all” (hard vs. soft, straight vs. curved, windows vs. no windows). Having ability to manipulate seating, blinds to regulate lighting and visual “noise”, and dimmers on artificial lighting allows control of physical learning environment.



THANK YOU!

Please scan the QR code to
provide session feedback.



SCAN ME