A4LE SOUTHERN REGION CONFERENCE

Embracing the **“Nature”** of Learning

SEM-105

April 6, 2023

DENTON INDEPENDENT SCHOOL DISTRICT

CORGAN

Introductions

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Learning Objectives

1

THE SCIENCE OF LEARNING THROUGH PLAY

Explore research from the behavioral and brain sciences and education to understand the science of how children learn through play.

2

STRUCTURED VS. UNSTRUCTURED LEARNING

Recognize the differences between structured and unstructured learning, and the benefits of unstructured learning experiences for learning, behavior, and wellbeing.

3

THE BENEFITS OF LEARNING IN NATURE

Understand the benefits of engaging with and learning in natural environments through the lens of research in environmental psychology.

4

DESIGNING FOR UNSTRUCTURED LEARNING

Apply research-based insights to meaningfully integrate unstructured learning into the design of spaces for learning, including design strategies for both indoor and outdoor learning spaces.

Patterns All Around Us

STATISTICAL FRACTALS

EXACT FRACTALS

EUCLIDEAN AND PLATONIC GEOMETRIES

Nature’s Patterns

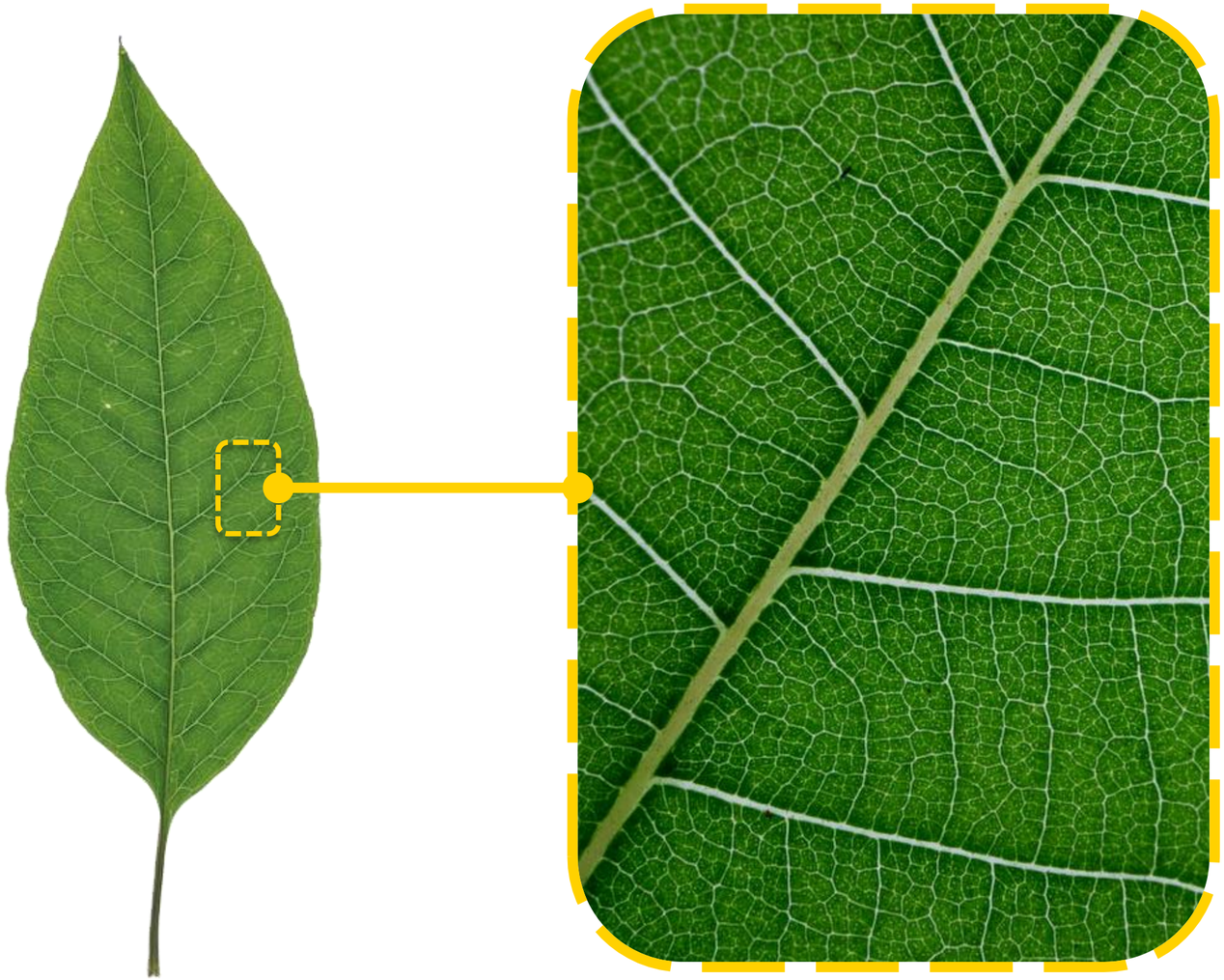
Humans show a **visual preference** for nature’s most common patterns- ***statistical fractals***

Physiological benefits have been observed when we view these patterns

[Hägerhäll et al, 2008; Robles et al, 2020; Barlow, 2020; Taylor et al, 2018; Taylor, 2006]

Human Nature and the Natural World

Patterns found in the science of learning and the science of the natural world have something interesting in common: an ***“unstructured structure” that is iterative and organic***

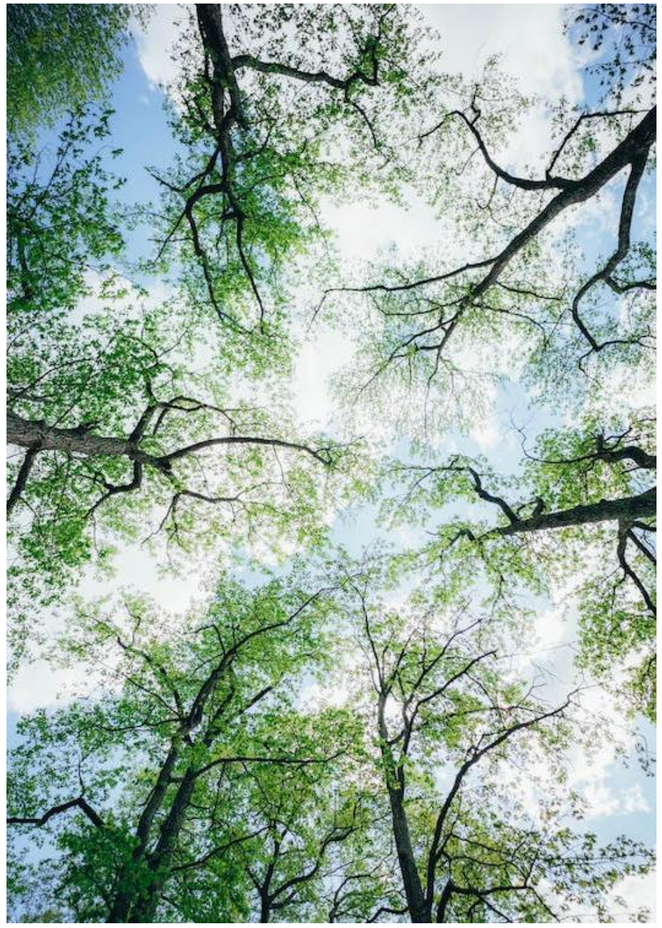


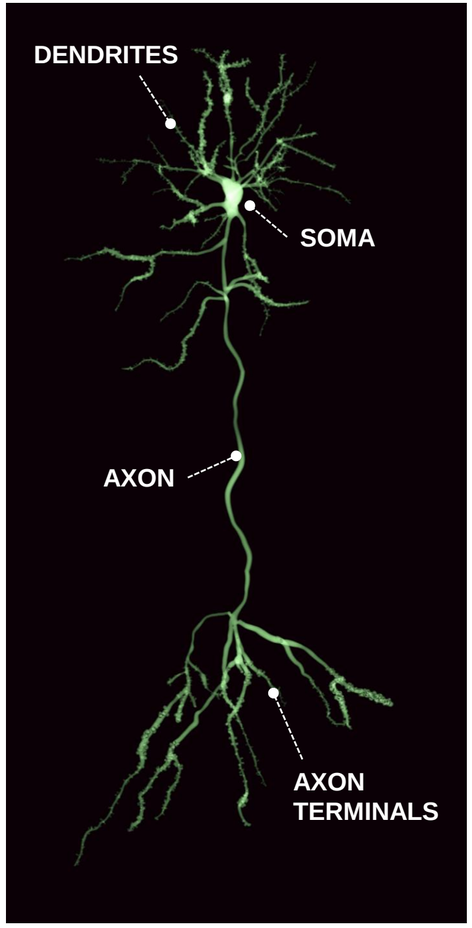
A Fractal Perspective on Learning

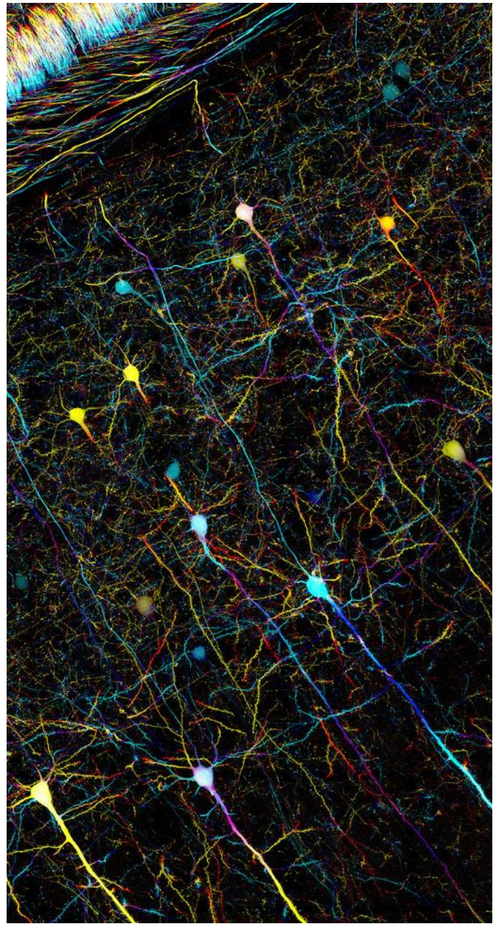
- New knowledge branches off from core understanding
- Everything connects and those connections strengthen the structure
- Recursive patterns of interaction build deeper, more specific insight
- Infinite repetition with organic variety
- Resulting forms are shaped by surrounding conditions and forces

Dendritic Arborization

Learning is Like Building a Forest of Neurons







- **Dendritic Arborization:** neurons “branch out” to form a dense network of connections with other neurons
- **Synaptic connections** facilitate the flow of information in the brain
- Extensive arborization can be considered a sign of **complexity**
- ***Learning is the process of building, strengthening, and pruning synaptic connections***

[Purves et al, 2018]

All behavior is motivated by an innate desire to meet five basic human needs

Glasser’s Choice Theory

1. Survival
2. Love and Belonging
3. Power and Self-Worth
4. **Fun and Enjoyment**
5. Freedom

[Glasser, 1999]

Play: An Unstructured Approach to Learning

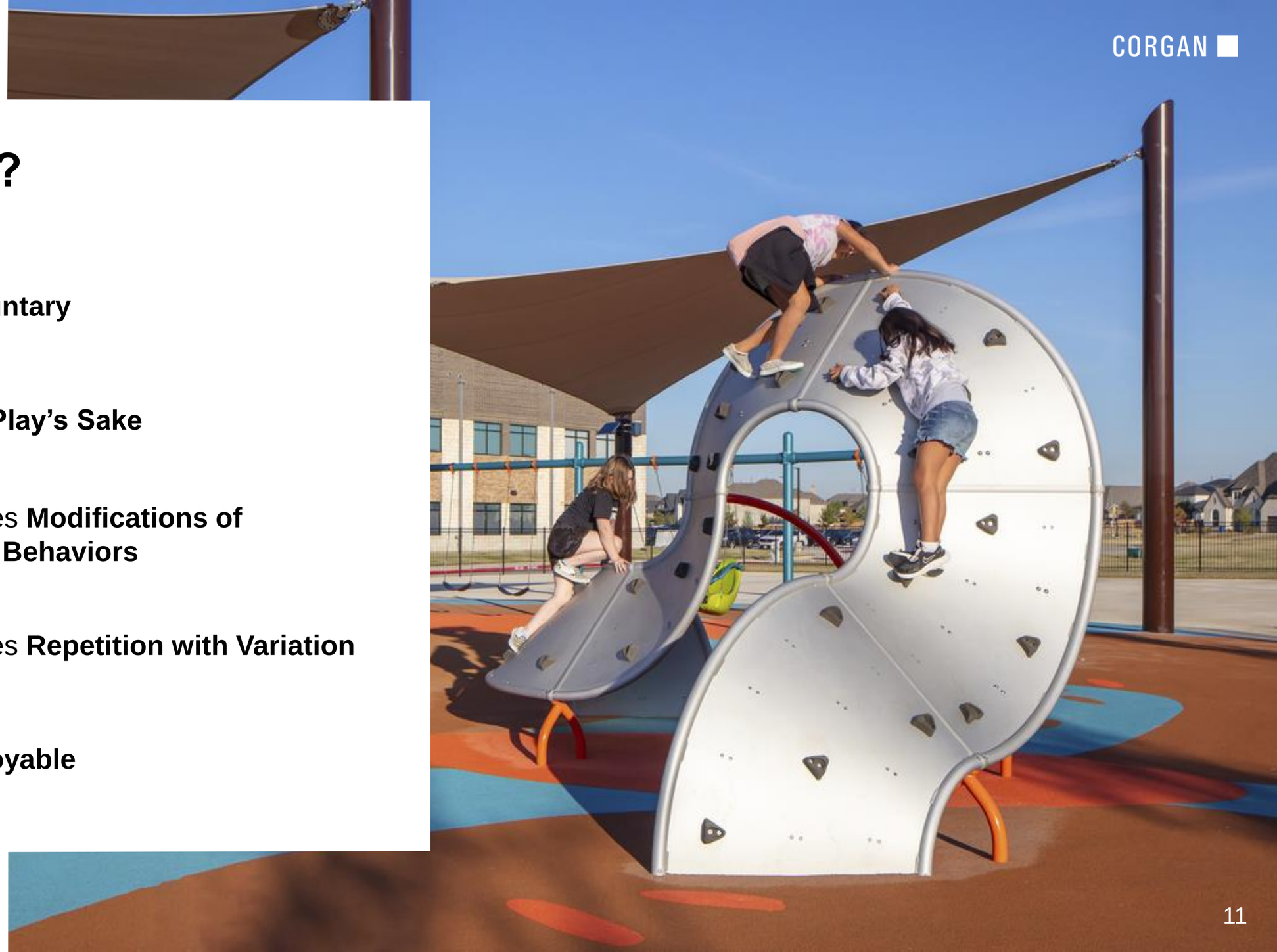
Unstructured play has been shown to “***promote the social-emotional, cognitive, language, and self-regulation skills that build executive function and a prosocial brain***”

-Dr. Michael Yogman

What is “Play”?

Burghardt’s Criteria

1. Play is **Voluntary**
2. Play is **for Play’s Sake**
3. Play Involves **Modifications of Functional Behaviors**
4. Play Involves **Repetition with Variation**
5. Play is **Enjoyable**



[Burghardt, 2011; Dr. Suzanne Quinn]

Playful Learning Principles

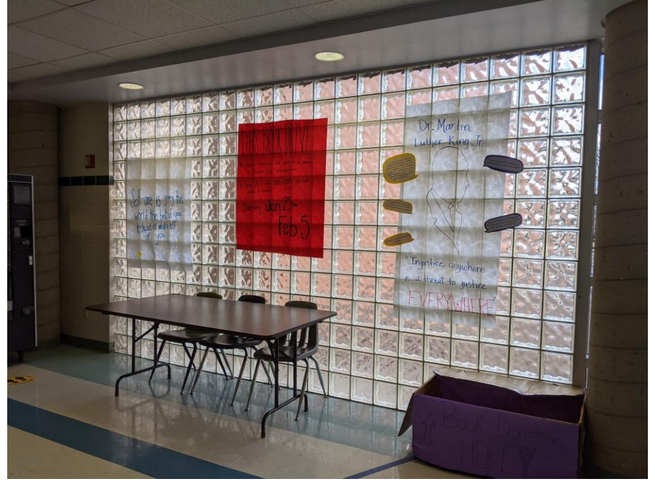
- *Active*
- *Engaging*
- *Meaningful*
- *Socially Interactive*
- *Iterative*
- *Joyful*
- Well-articulated ***learning goal***

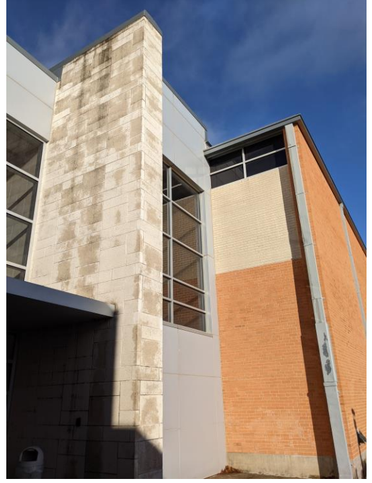
> Playful learning aims to stimulate the construction of new knowledge and skills by letting students **wonder, experiment, fail, take risk, construct, and reflect critically on the content and their learning experience**
>
> ***Norgard et al, 2017***

[Hirsh-Pasek et al, 2022; Roth et al, 2017; Golinkoff et al, 2016]

Denton ISD

Newton Rayzor Elementary School & Calhoun Middle School





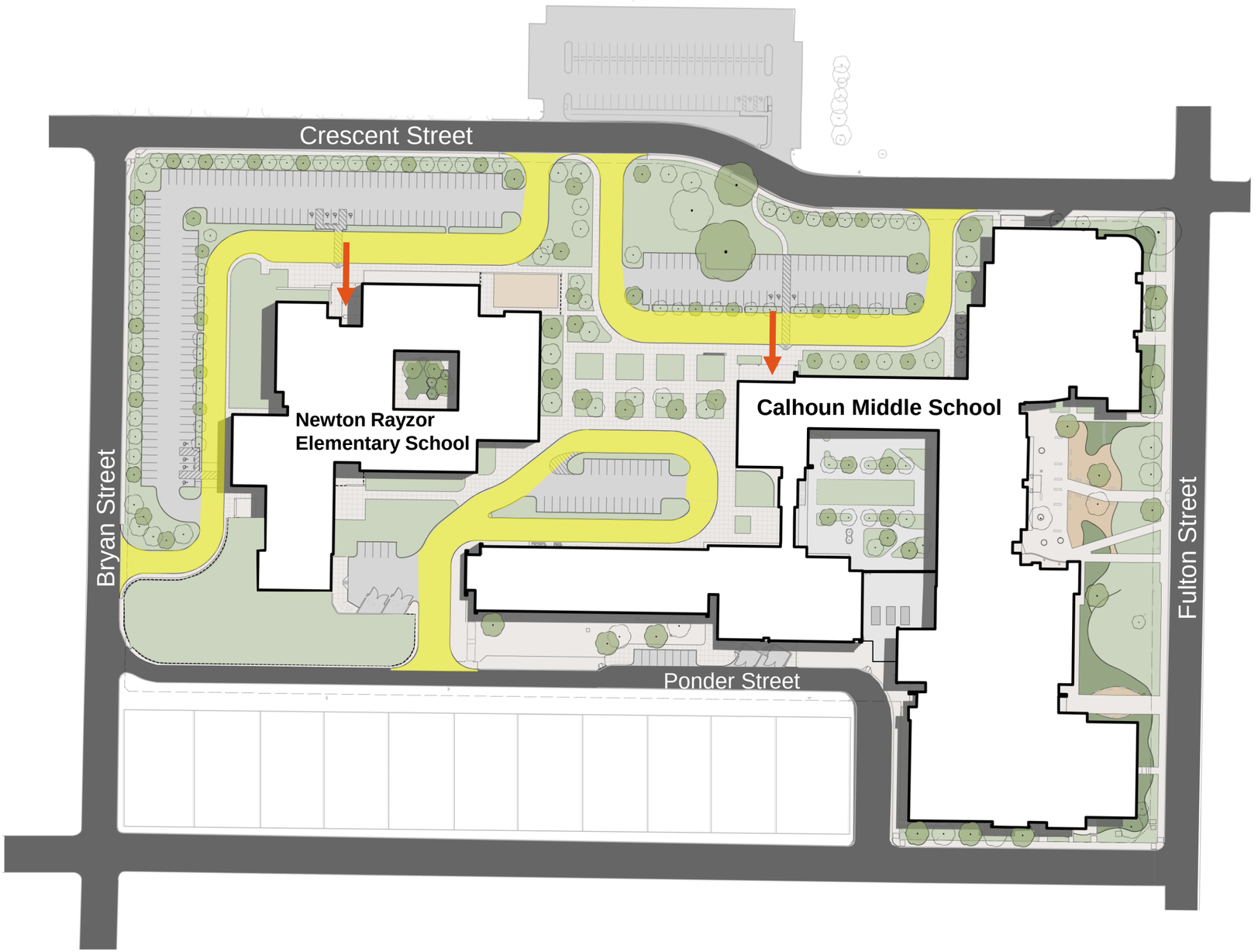
Aerial Photography
Denton HS, 1956

NEWTON RAYZOR ELEMENTARY SCHOOL

CALHOUN MIDDLE SCHOOL

Two Schools on One Connected Campus

- Transformation of the original Denton High School campus
- IB World Schools
- Inspire a connection between Rayzor and Calhoun
- Integrate connections to the outdoors



Newton Rayzor Elementary Campus Visioning –

Insights from Students and Teachers

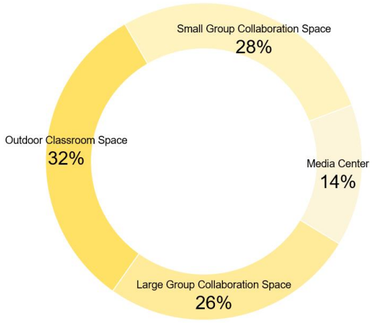
Newton Rayzor Elementary School — Survey Responses

What are the factors that apply in a learning space that help your students to learn best? Put in order from 1-5 with 1 being the most important in helping students learn best.

1. OUTDOOR VIEWS/ACCESS TO NATURAL LIGHT
2. EASE OF COLLABORATION WITH OTHERS
3. CAPABILITY TO CHOOSE WHERE TO WORK
4. APPROPRIATE TECHNOLOGY
5. A VARIETY OF FURNITURE SELECTIONS

Newton Rayzor Elementary School — Survey Responses

Other than a classroom, in what type of space would you like to use for teaching? Choose all that apply



Newton Rayzor Elementary School — Survey Responses

What aspects of Newton Rayzor would you like to see implemented in this new school?

COMMUNITY
Collaboration, Family, Connection between grade levels, Multiple learning environments, Displays of student work, Flexibility, Connectedness

CONNECTION TO NATURE
Garden, Views to the Outdoors, Sustainable-environmentally conscious, Natural light, Exploration spaces

DIVERSITY
International mindedness, Systems of Equity, Blend of Cultures and Communities, Inclusive

KINDNESS
Welcome environment, Warmth, Inclusiveness, Comfortable learning spaces

Design Strategies for Primary Education

1

CREATE WARMTH

Develop a vibrant, welcoming space with playful energy to comfort and engage students as they learn and grow

2

FOCUS ON COMPATIBILITY

Align design features with students’ developmental needs as they grow for a fulfilling and appropriate learning space

3

INSPIRE CURIOSITY

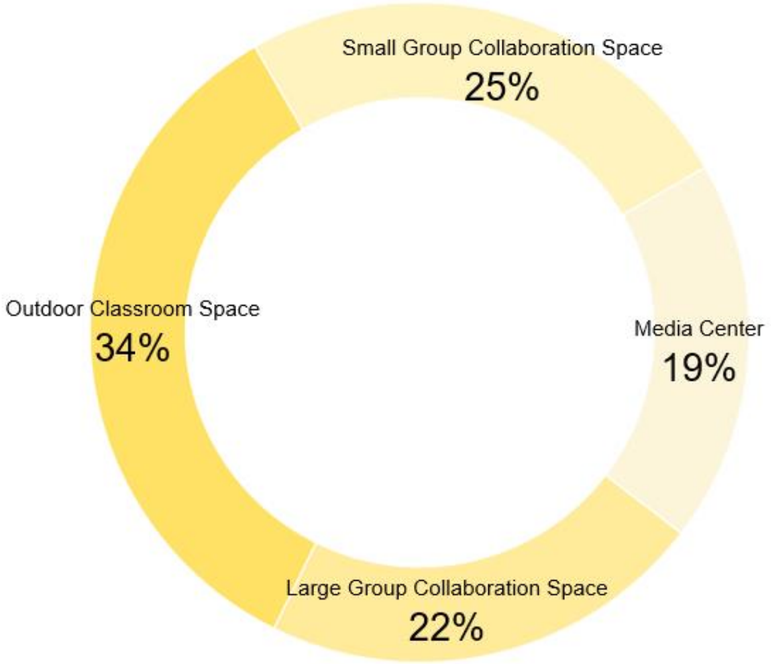
Support exploration and student-led learning with opportunities to observe, experiment, and discover

Calhoun Middle School Campus Visioning –

Insights from Students and Teachers

Calhoun Middle School — Survey Responses

Other than a classroom, in what type of space would you like to use for teaching? Choose all that apply



Calhoun Middle School — Survey Responses

Describe your ideal collaboration space including how teachers and students would use it.

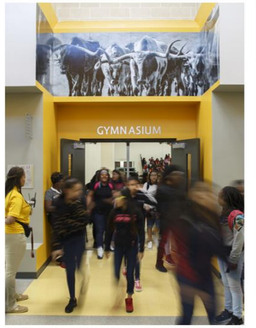
FLEXIBILITY
Movable seating
Writable surfaces
Varied seating options
Kid friendly furniture
Ease of access to teachers and peers
Multidisciplinary

VARIETY
Private and public areas
Open
Focus areas
Places for teachers to work with students
Storage for personal items

COMFORTABILITY
Soft seating
Warmth and safety
Low acoustics
Natural light
Organic furniture shapes

Calhoun Middle School — Survey Responses

What aspects of Calhoun would you like to see implemented in this new school?



PHYSICAL CONNECTION
Classes in close proximity, Enclosed school, Large collaboration spaces, Accessibility to all students, Natural light, Ability to access nature

COMMUNITY
Team, Comradery of staff, Grade level family, Involvement, Respect, Fun environment

HISTORY
Heart of Denton, Heritage, School history, Same branding

PRIDE
Pride of school history and future of the students, Reinforcing Values/Beliefs, Traditions, Resilience as a campus, Perseverance, Pride in achievement

DIVERSITY
Multicultural art and tributes, Student creativity, Expression, Artistry carried over from current school

Design Strategies for Secondary Education

1

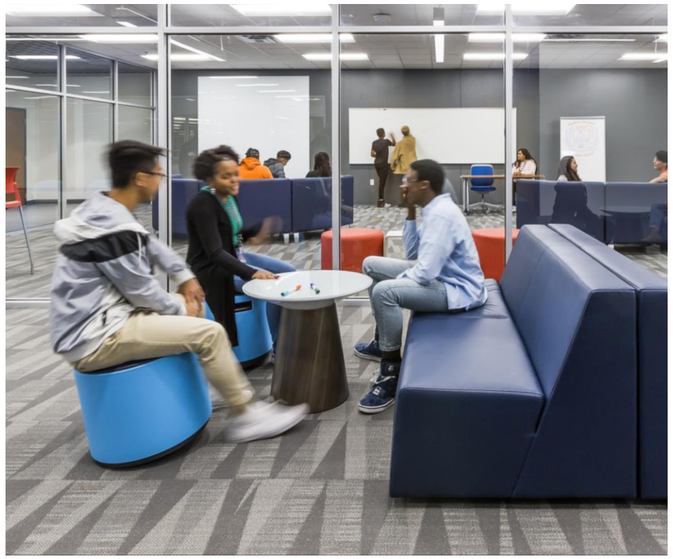
CONTEXTUALIZE LEARNING

Understand that *how* and *where* something is learned is a part of *what* is learned. Integrate hands-on, real-world learning to build 21st century skills

2

ALIGN WITH DEVELOPMENT

Create spaces that support young adolescents’ needs for autonomy, peer interaction, competence, and relatedness



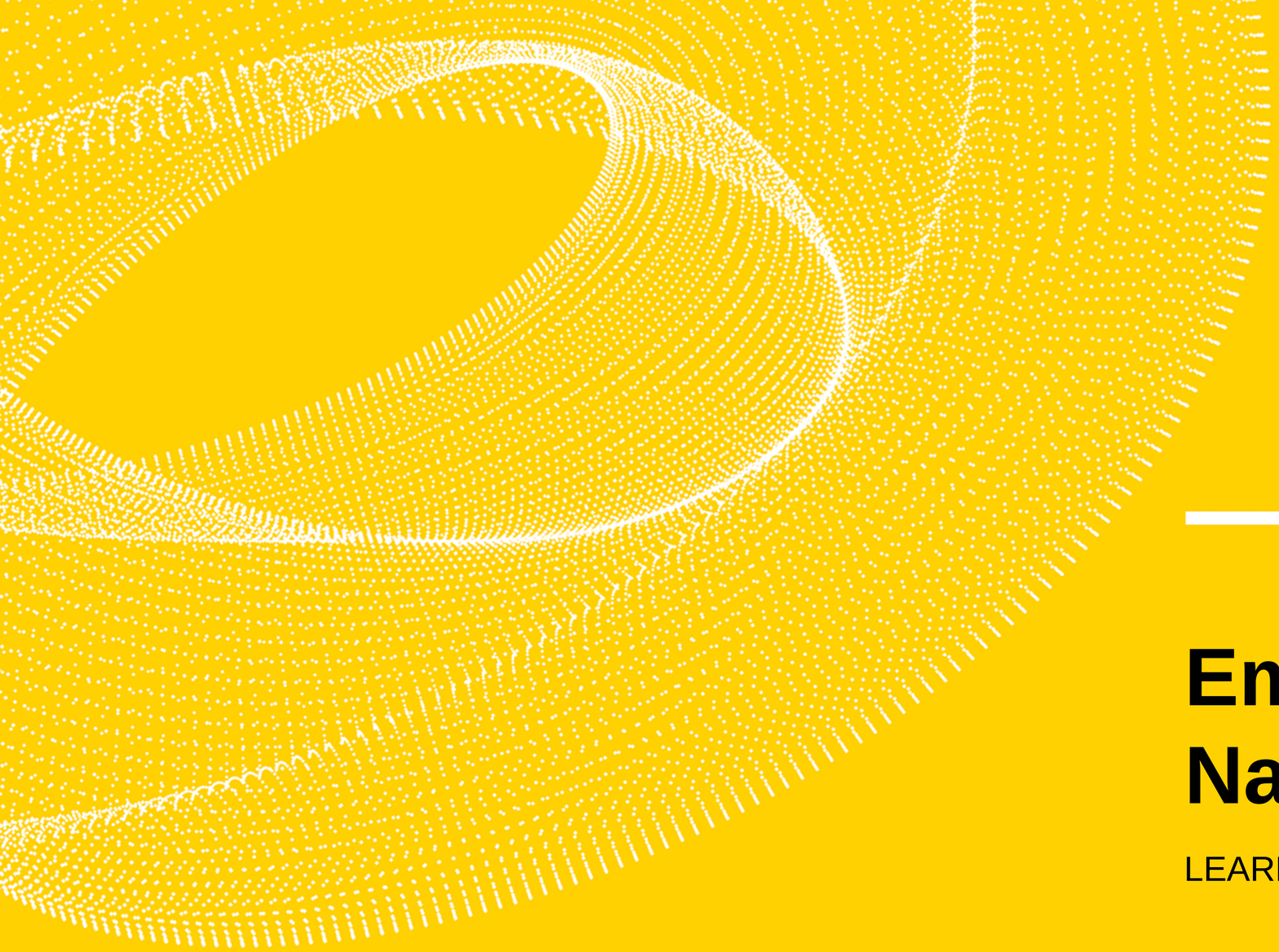
3

PROMOTE CONNECTIVITY

Encourage cross-disciplinary thinking, peer interaction, and mentorship. Support the convergence of people and ideas

Denton ISD’s Approach to Integrating Playful, Unstructured Learning

- **Students are taught to drive their own learning**
- Encourage exploration, curiosity, and inquiry
- **Flexible learning environment**
  - Extra space outside of the classroom
  - Huddle spaces
  - Makerspaces
  - Opportunities to create, problem-solve, collaborate in the space



Embracing the Nature of Learning

LEARNING EMERGES FROM PLAY

Researchers have found that **Children Learn Best Under These Conditions:**

- When they are **having fun** and **enjoying the activity**
- When the **activity is meaningful** or **has significance in their lives**
- When they are **actively engaged** and **involved** in the material to be learned
- When they are **social or working with someone else or on a team**
- When the activity **changes with the child's abilities**

[Brookings Institute, 2021]

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BODY

- Movement is encouraged through hands-on activities
- Increased sensory engagement takes advantage of the body's natural perceptual capabilities

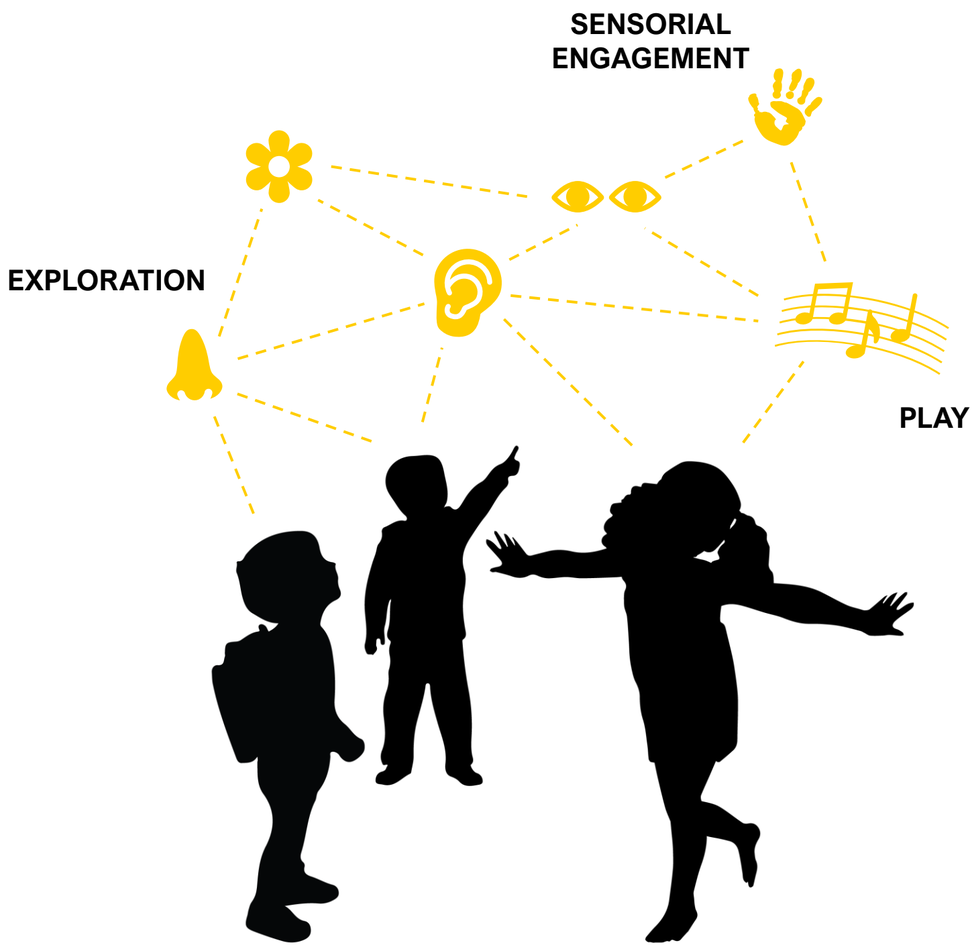
MIND

- Learning is student-led and inquiry-based
- Creativity and problem-solving are encouraged through divergent and critical thinking
- The formation of generalized knowledge is the goal
- Social and Emotional Learning is also emphasized

ENVIRONMENT

- Engage the social, cultural, technological, natural, and material environment
- Holistic learning environments connect students to the real world
- Integrate real-life experiences into the classroom

[Allal, 2001; Hoogendoorn, 2015; Herold, 2019]



YOUNG LEARNERS

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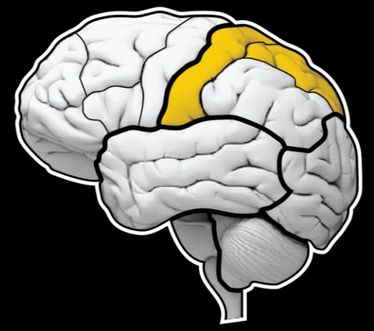
Relating to “Place”:
Young Learners

Younger children show a “heightened attentiveness” to place during childhood due to their **developmental drive for sensory integration** and to gather information about their environment.



Children focus on what the environment can provide and what they can do in the environment:

- Engage with the environment through their senses
- Emotional regulation and stress reduction
- Exploration and place-play
- Self-directed learning activities
- Prefer natural over man-made environments

[Morgan, 2010]

Play is an “Emergent Process”

1

PHYSICAL

Motor skills

Muscle strength

Bone density

2

SOCIAL / EMOTIONAL

Dramatic play

Elaborate role play

Interacting with peers

3

COGNITIVE

Language mastery skills through role play

4

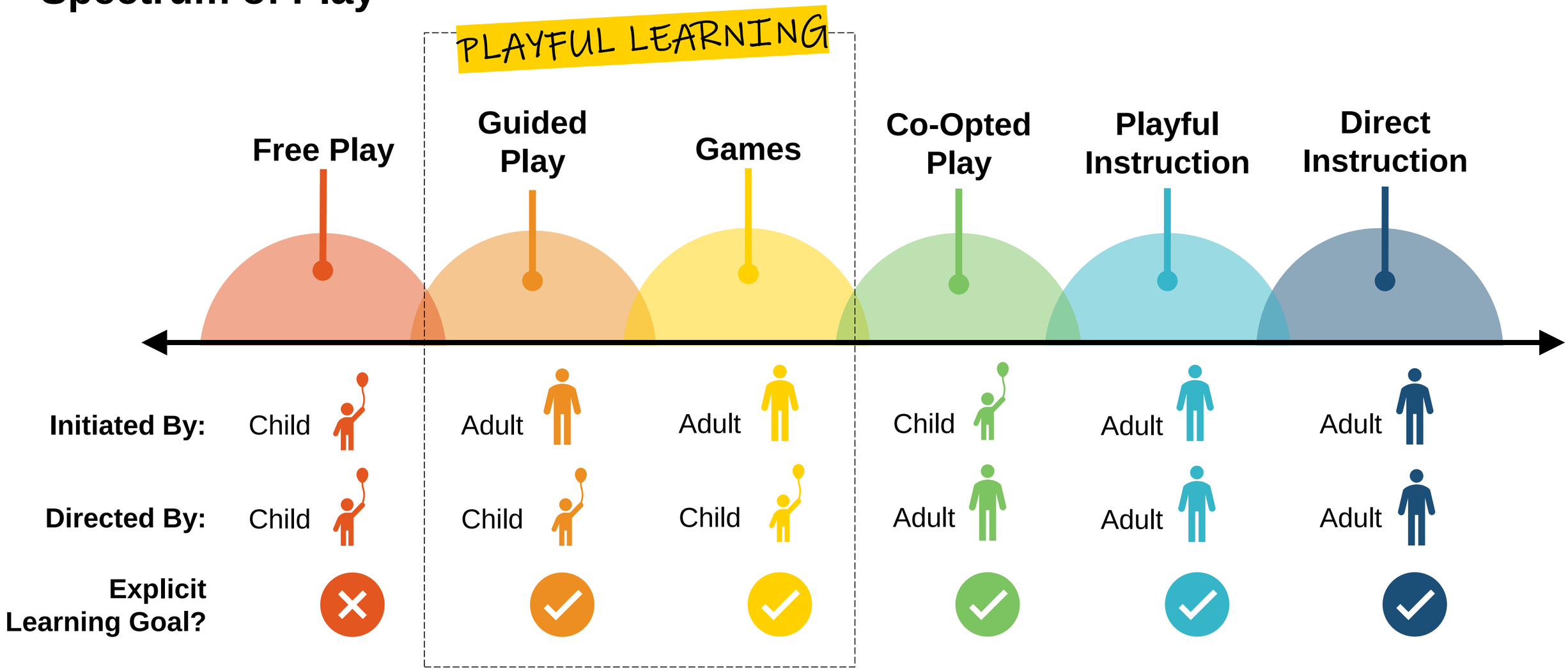
CREATIVE

Elaborations and creations

Emerging ability to play games with rules

Reference: Dr. Suzanne Quinn

Spectrum of Play



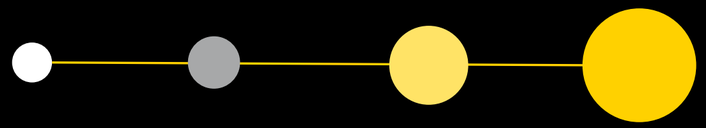
[Brookings Institute, 2021; Zosh et al, 2018]

Structured Learning

Learning path within a formal, hierarchical structure with clearly defined objectives

Traditional classroom setting with **guided lessons and rigid procedures** directed by the facilitator.

Provides support and direction while building proficiency



[Lynch, 2020]

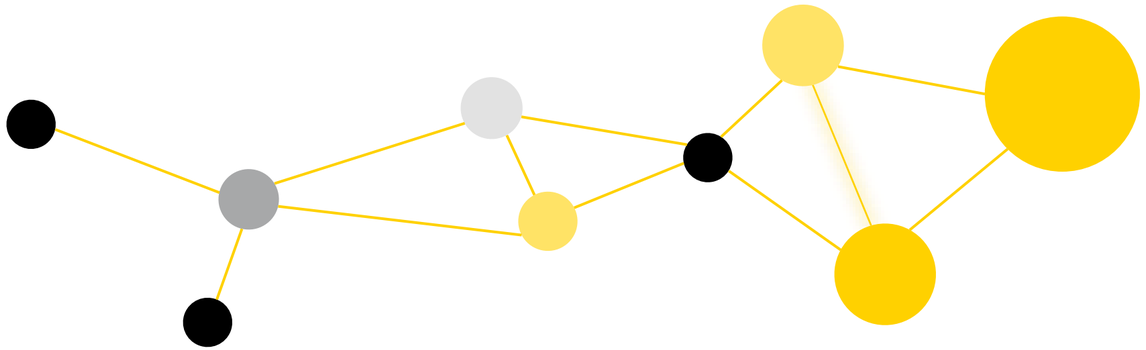
Unstructured Learning

Dynamic and **completely student-led learning** in which the learner is a self-directed knowledge-seeker

Benefits for the development of social-emotional, cognitive, and executive function skills

Mirrors the real world to prepare students to **navigate unpredictability with resilience**

Can be **implemented at any scale** and is **applicable at any grade level**



Unstructured Learning Across Development

Connecting Playful Learning Experiences to Playful Learning Environments

ELEMENTARY SCHOOL

Dynamic and open-ended, hands-on, creative, and discovery-driven experiences

MIDDLE SCHOOL

Collaborative, student-led, and inquiry-based experiential learning

HIGH SCHOOL

Exploratory, project-based learning in high-fidelity learning environments

[Lynch, 2020]

A Playful Learning Perspective on Modern Learning Models

- **Growing emphasis on:**
  - Inquiry-based learning
  - Student-led learning
  - Project-based learning

- **Why?**
  - Build a lifelong learning mindset
  - Increased engagement
  - Utility value

- **Modern Learning Models**
  - **International Baccalaureate (IB)**
  - STREAM
  - Universal Design for Learning (UDL)
  - Montessori

Embracing the “Nature” of Learning

IB Program Overlay:
Inquiry, Action, and Reflection

- **Student-led, hands-on learning** experiences connected to the real world (both globally and locally)
- Students learn to **think critically and solve complex problems**
- Focus on grounded, meaningful, collaborative, and socially engaged learning
- The learning environment is viewed as the “*context* in which learning happens”

> *Through the interplay of **asking, doing, and thinking, this constructivist approach leads towards open, democratic classrooms**… Learning communities in IB World Schools engage in cycles of **inquiry, action, and refection** that lead to deeper understanding and a lifetime of learning.*
>
> *-IB Learner Profile*

Integrating Opportunities for Unstructured Learning

LIBRARY

COLLABORATION

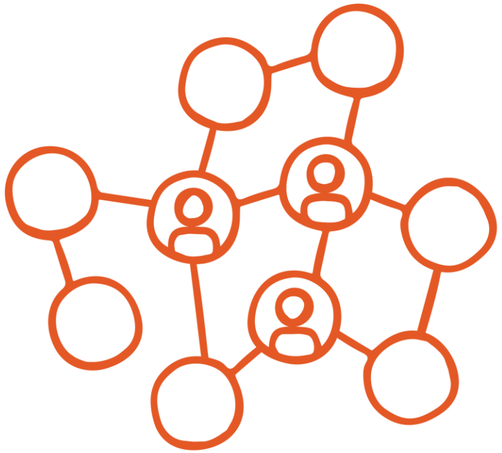
OUTDOOR LEARNING

Creating Spaces for Playful Learning

Reimagined Library Zones – Denton ISD Reimagined Libraries Report

REFLECTIVE

Relaxed, restorative spaces for reading, decompressing, and heads-down work. Quiet study tables and informal, comfortable seating with strong connections to nature.

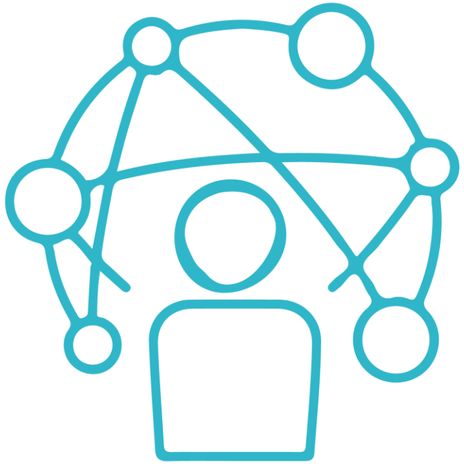


CONNECTIVE

Collaborative and adaptable spaces for small groups or classes to work together and share their growing knowledge. Flexible furniture allows the space to transform as needed.

INTERACTIVE

Hands-on learning spaces for exploration, discovery, and creativity. Functional worktables for individuals and groups of students to engage in project-based learning.



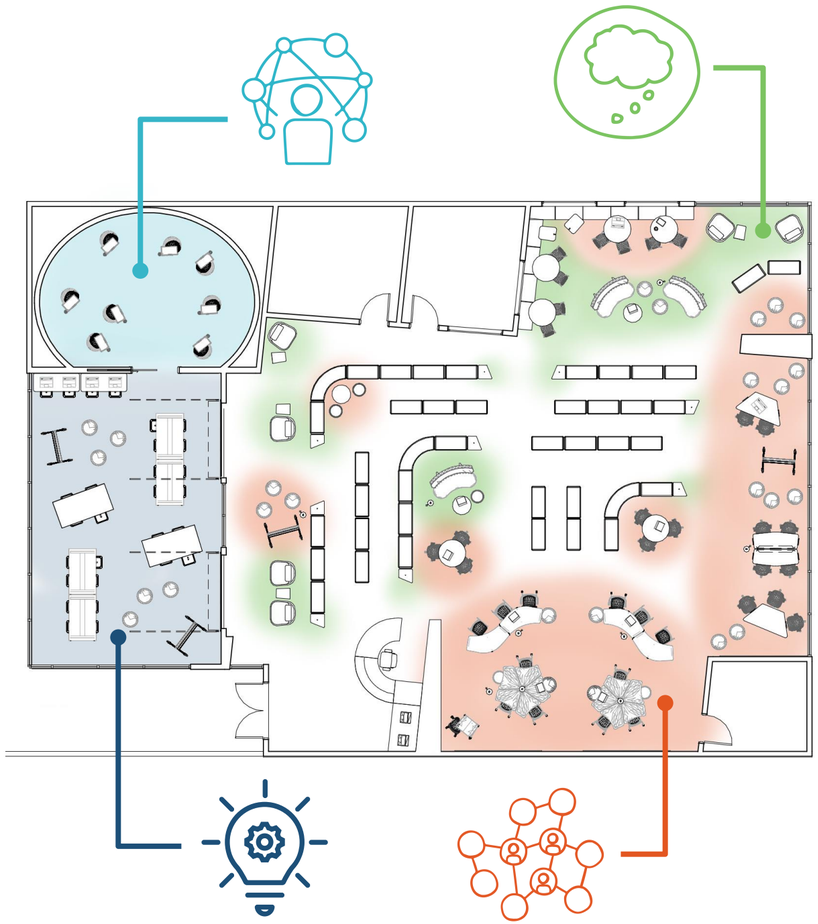
IMMERSIVE

Engaging and interactive learning spaces that facilitate technology-driven experiences with integrated Extended Reality technologies.

Embracing the “Nature” of Learning

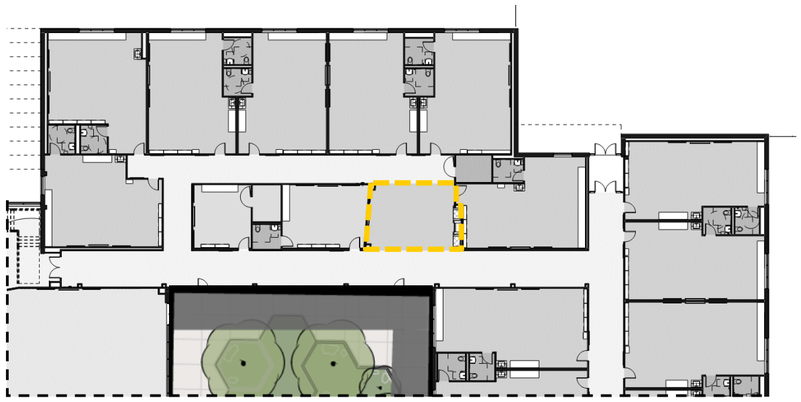
Newton Rayzor Elementary Library

Calhoun Middle School Library



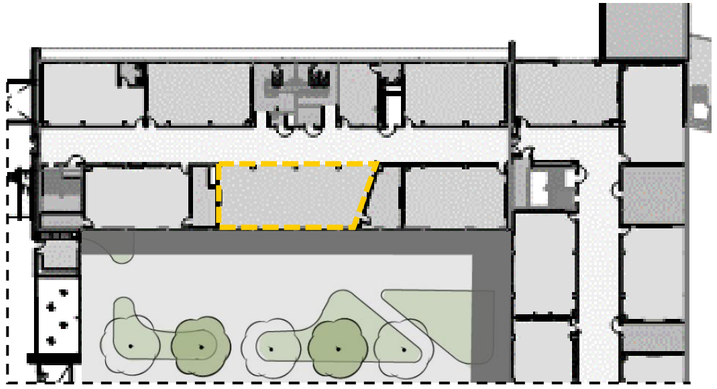
Newton Rayzor Elementary Collaboration Space

- Integrated in the grade-level classroom pod
- **Supports multidisciplinary and multimodal learning**
- Interactive surfaces
- Variety of **flexible furniture**
- **Vibrant, tactile, and playful design**
- Connections to outdoor learning

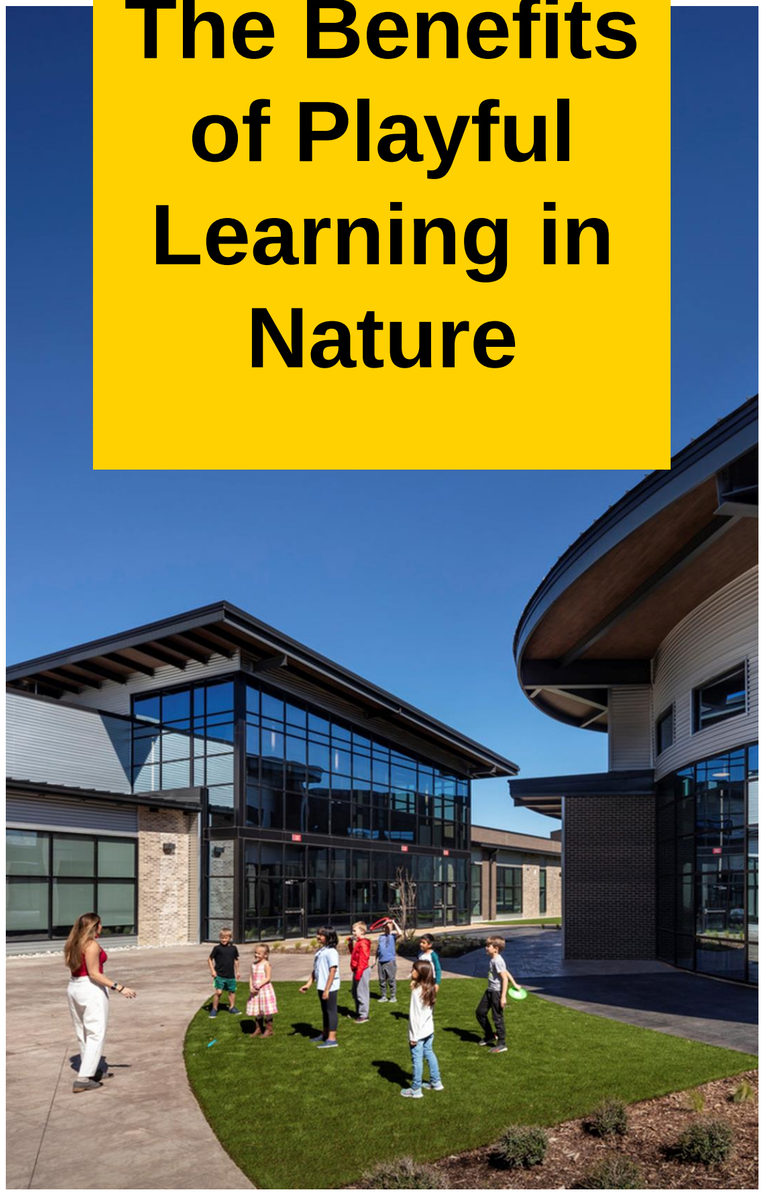


Calhoun Middle School Collaboration Space

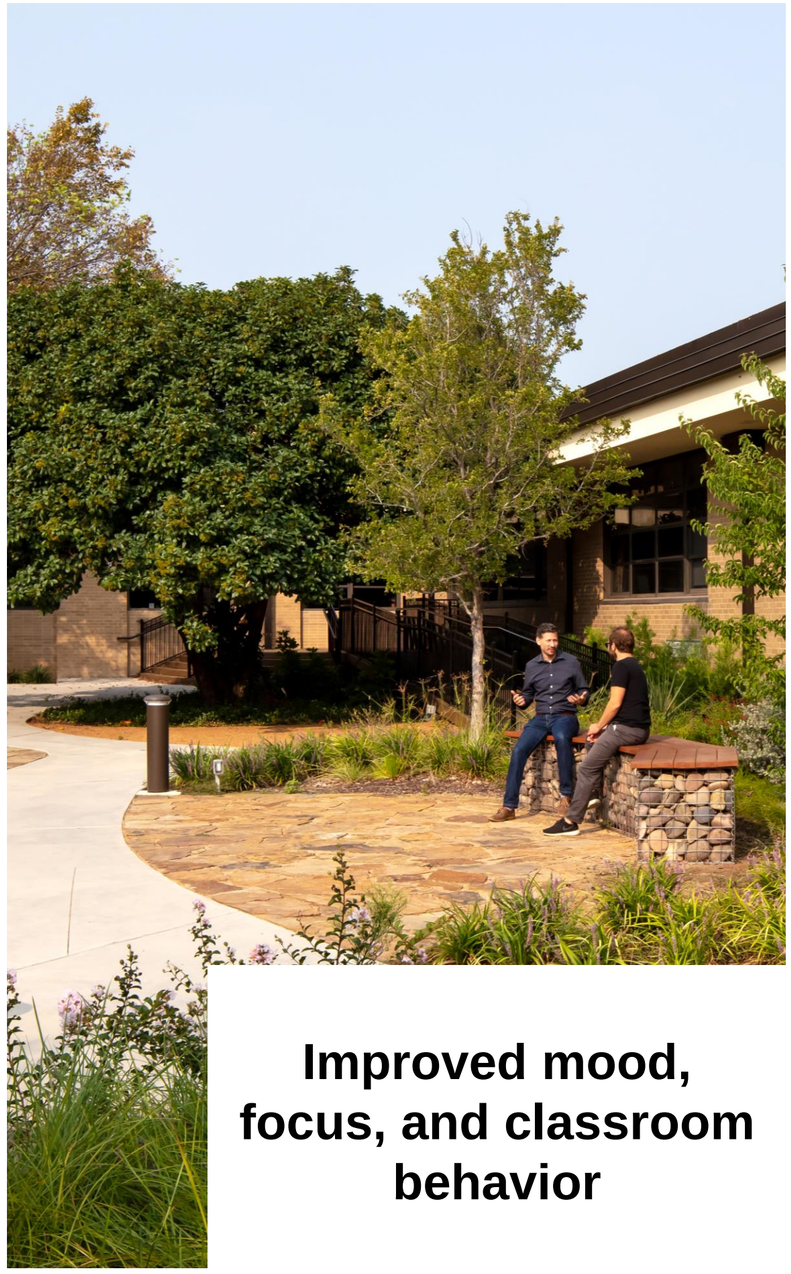
- Integrated in the grade-level classroom pod
- **Supports multidisciplinary and multimodal learning**
- Elevated design to encourage connection, self-efficacy, and growth
- Interactive surfaces and a variety of **flexible furniture**
- Connections to outdoor learning



The Benefits of Playful Learning in Nature



[Merrill, 2020; Dankiw et al, 2020; Gill et al, 2018; Nair et al, 2020]



Improved mood, focus, and classroom behavior

Increased originality and imagination

The Benefits of Engaging with Nature

Health, Wellbeing, and Cognitive Performance

Cognitive Restoration

Natural environments **restore limited cognitive resources,** mitigating symptoms of attention fatigue and ADHD

[Berman et al, 2008; Kaplan and Berman, 2010; Kuo et al, 2004]

Stress Reduction

Natural environments have a **stress reducing and physiologically restorative influence**

[Ulrich et al, 1991]

Physical Health

Exposure to wilderness and treescapes **promotes overall health** (fitness, heart and respiratory health, immune function, and more)

[Neuroscience News, 2020; Texas A&M Forest Service]

Wellbeing

Engaging with nature instills a **sense of wellbeing and calm contentment** due to the health benefits provided

[Neuroscience News, 2020; Landon et al, 2020]

Learning Opportunities

Outdoor learning can support **active, embodied learning experiences that excite students and connect them to the real world**

[Gill et al, 2018; Allal, 2001]

Nature Play & Creativity

Nature play is **less prescriptive and provides benefits that cross over into the classroom:** improved imagination, originality, attention levels, and behavior

[Merrill, 2020; Dankiw et al, 2020]

Emphasizing a Connection to the Outdoors

Rayzor Elementary and Calhoun Middle School Campus

EXISTING

NEW

Enhancing the Existing Campus Culture

- Students had to walk outside between classes and enjoyed the opportunity to be outside
- Students and teachers asked for **connections to the outdoors to be built into these campuses**

IB Program Overlay:
Outdoor Learning Opportunities

- **Open-ended learning environment** where students can develop their IB Learner Profile attributes organically
- Facilitates constructive social and academic interaction
- Culturally-connected experiences
  - **Performing arts:** music, theatre, tinikling poles (bamboo dance) for Philippine folk dancing
- Hands-on learning
  - **Gardens** to support farm-to-table market comparisons across various countries

> *Natural environments are inherently **less structured and less prescriptive- offering limitless opportunities for exploration and imagination***

Design Strategies for Outdoor Learning

1

INTEGRATE NATURE

Bring nature into the learning environment for engaging learning experience that connect students to the real-world.

2

INSPIRE FASCINATION

Provide cognitive and physiological restoration by passively engaging the mind (compatibility, escape, extent).

3

EMBRACE AMBIGUITY

Design should be open-ended rather than prescriptive. Create space for creativity, imagination, and a range of experiences.

4

PROMOTE CONNECTIVITY

Encourage cross-disciplinary thinking, peer interaction, and mentorship. Support the convergence of people and ideas.

5

NURTURE WELLBEING

Promote the health and well-being of the whole student with restorative space and opportunities for active learning.

6

FOSTER DISCOVERY

Support curiosity and student-led learning with opportunities to observe, explore, and experiment in the landscape.

Outdoor Learning Zones: Creating Experiential Spaces

ZONE 1

Gathering spaces for larger groups and outdoor activities. Sheltered but open to nature. More than just classroom outdoors

ZONE 2

Gathering spaces for smaller groups or individuals. Reflective, relaxed, informal, and nestled in the landscape

ZONE 3

Nature-focused, accessible learning spaces for independent and guided exploration. Geared for hands-on learning and observation

ZONE 4

More open space for recreation, can incorporate vegetation for sound/visual buffering and for ecosystem services

Learning Zones

Calhoun Middle School Courtyard

ZONE 1

Large open learning space with flexible furniture to support a variety of group sizes and functions

ZONE 2

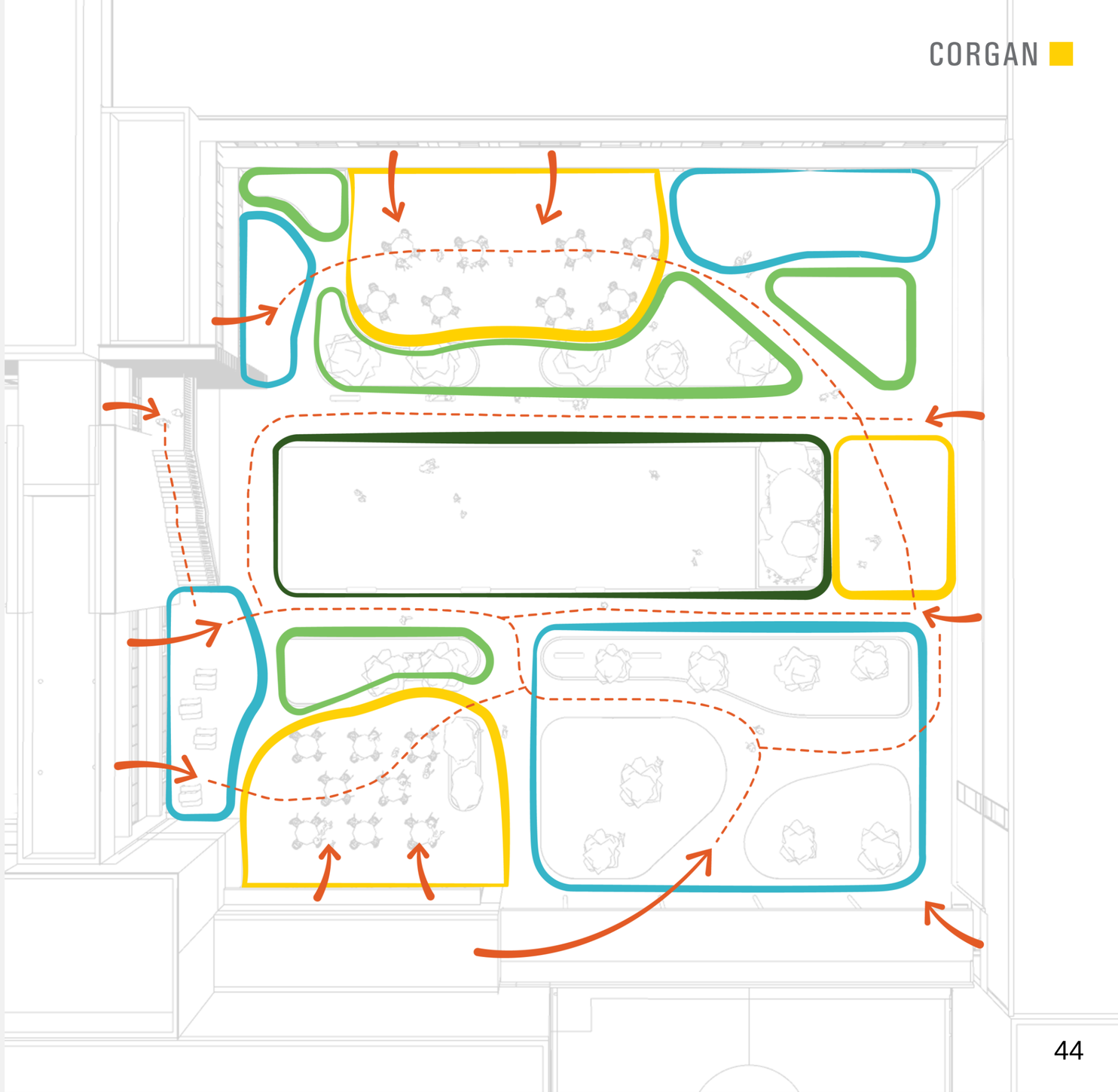
Reflective spaces for individuals and small groups. Informal seating, turf mounds, and benches located near vegetation

ZONE 3

Vegetated areas with trees and plants to provide shade and the restorative benefits of nature

ZONE 4

Large central lawn can be utilized for outdoor learning, socialization, and relaxation



Playful Learning Overlay

Calhoun Middle School Courtyard

Active and Engaging

With direct connections to variety of academic spaces, students and teachers can utilize the courtyard throughout the day for **grounded learning**

Open-Ended and Exploratory

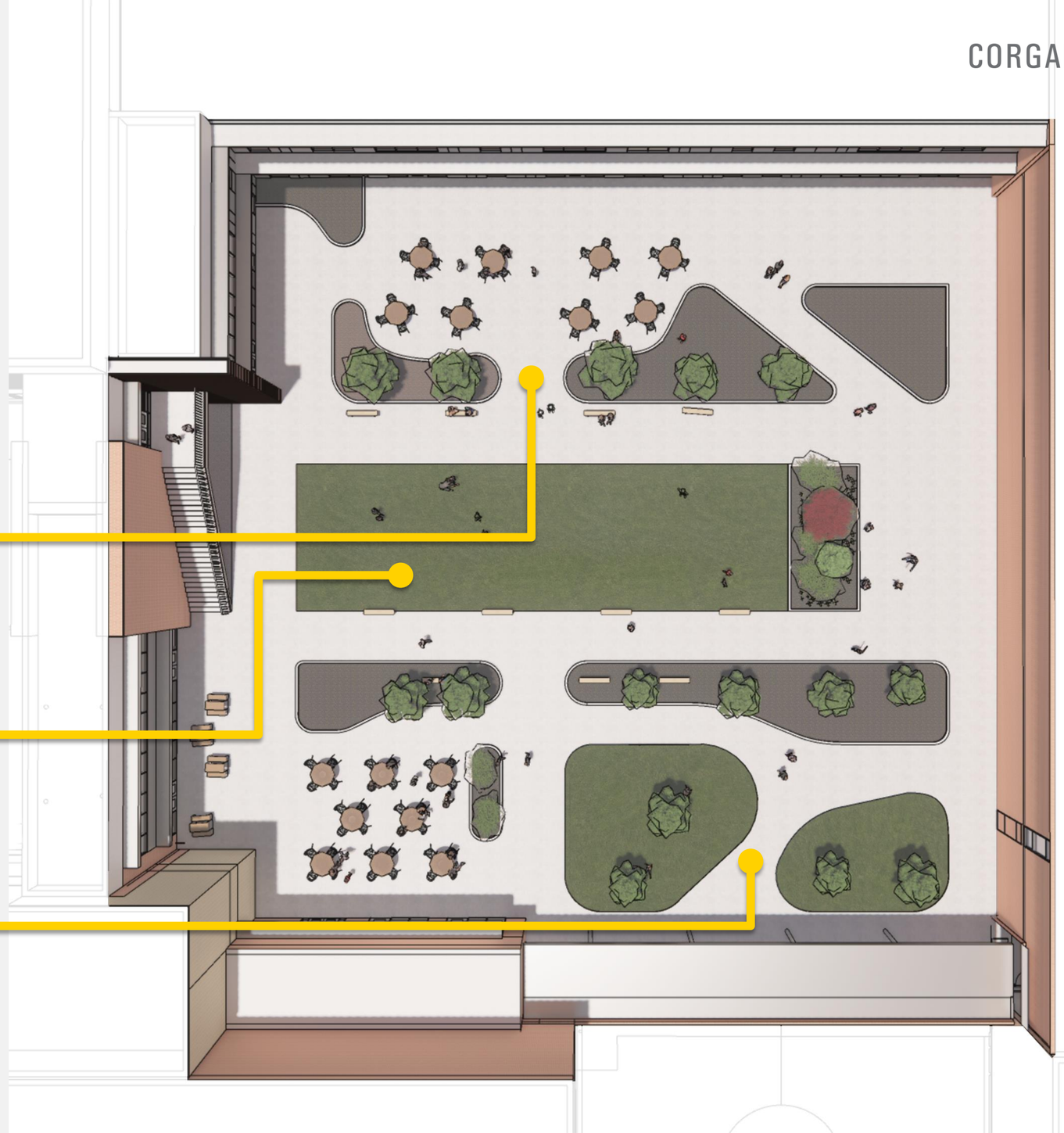
Flexible, multifunctional spaces that support **individual and group learning** and a **variety of learning modalities**

Meaningful Hands-On Learning

Hardscaped and turfed areas provide space for experiential learning activities that connect learning to the real world

Restorative Features

Curved pathways, vegetation, and relaxed seating elements provide a relaxing sense of escape and opportunities for **organic interaction**




Active Learning Opportunities
Hands-On Learning, Inside and Out
Restorative Features
Space for Reflection
Collaborative Exploration

Playful Learning Overlay

Rayzor Elementary School Courtyard

Meaningful Connections

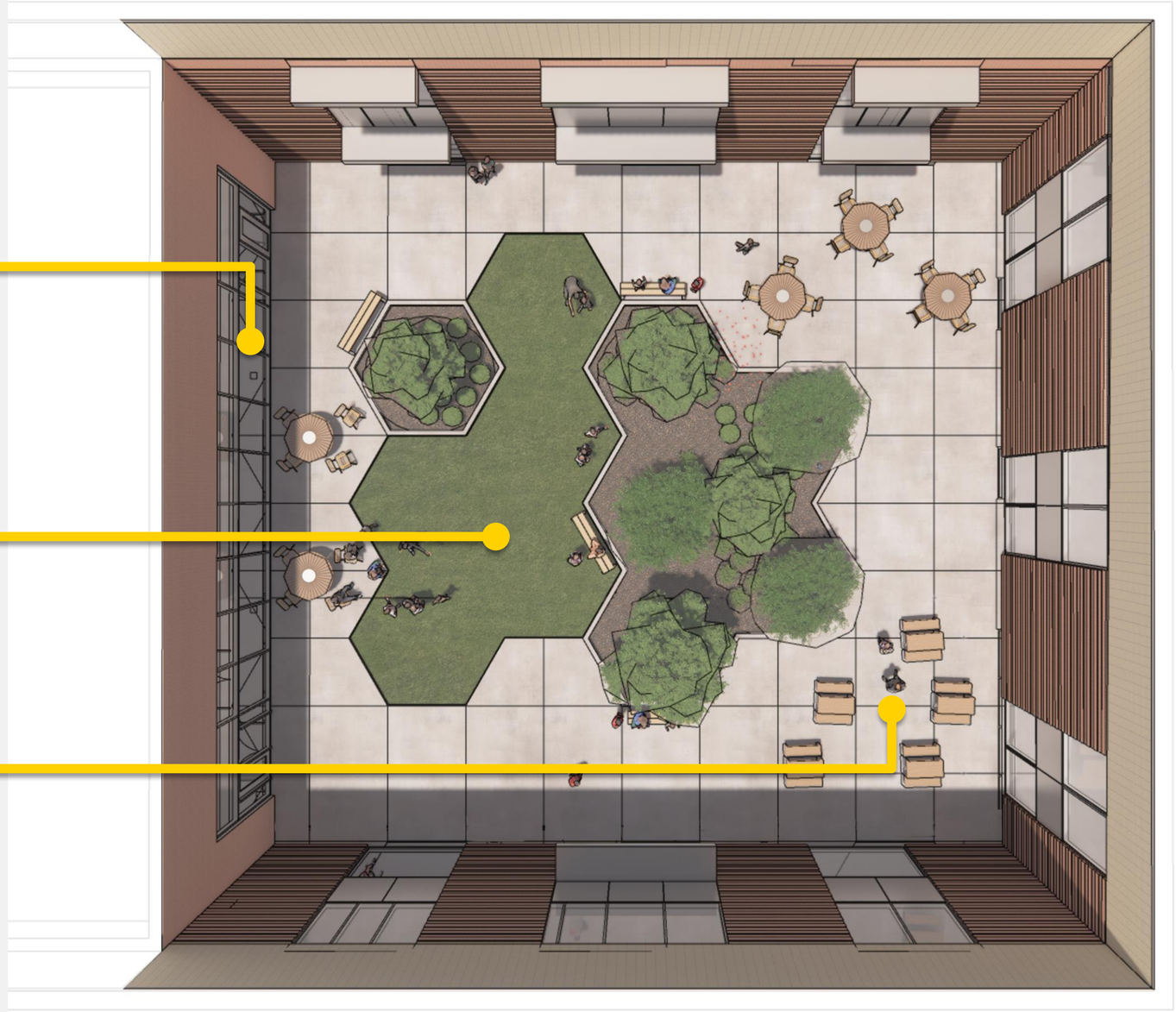
Direct access to the courtyard from grade-level classroom pods and the library to facilitate **active and connected learning experiences**

Dynamic Design

Playful shapes and forms connect to the school’s identity and create an **engaging** and inviting space

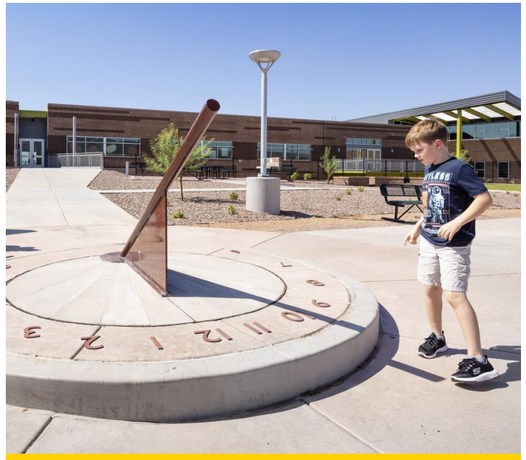
Opportunities for **Interaction**

Hardscaped and turfed areas of various shapes and sizes provides places for individuals, and small and large groups to align the scale and feel of their space to the type of activity and **interaction** they wish to engage in




Direct Academic Connections
Active Learning Opportunities
Collaboration & Interaction
Restorative Features

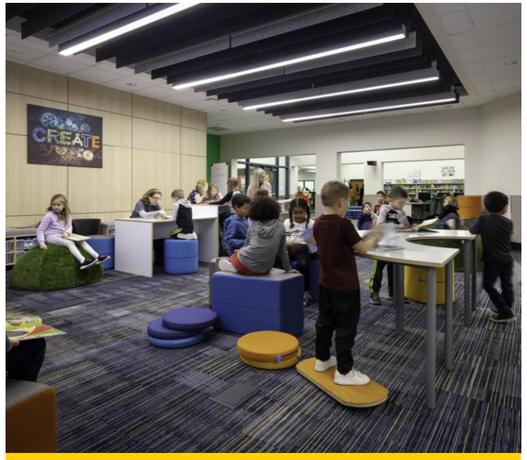
The Benefits of Playful Learning



Active, Embodied Learning

Where and ***how*** something is learned is a part of ***what*** is learned

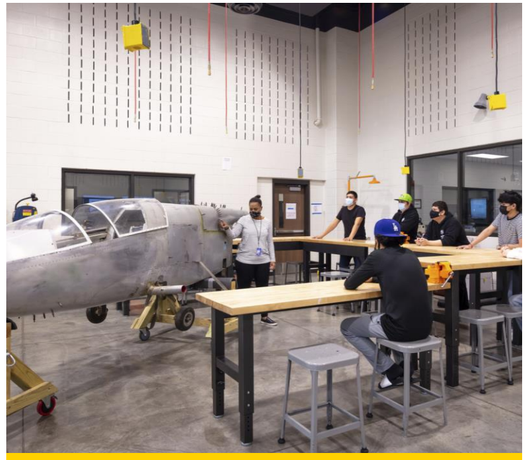
[Gill et al, 2018; Allal, 2001]



Open-Ended Opportunities

Learning in an informal context is inherently ***less prescriptive***

[Merrill, 2020; Nair et al, 2020; Gill et al, 2018]



Real-World Connections

Hands-on experiences build skills and connect to students’ interests

[Gill et al, 2018]

Nurture Curiosity

Immersive, tactile learning experiences engage students and encourage deeper thinking

[Gill et al, 2018; Lindgren et al, 2016]

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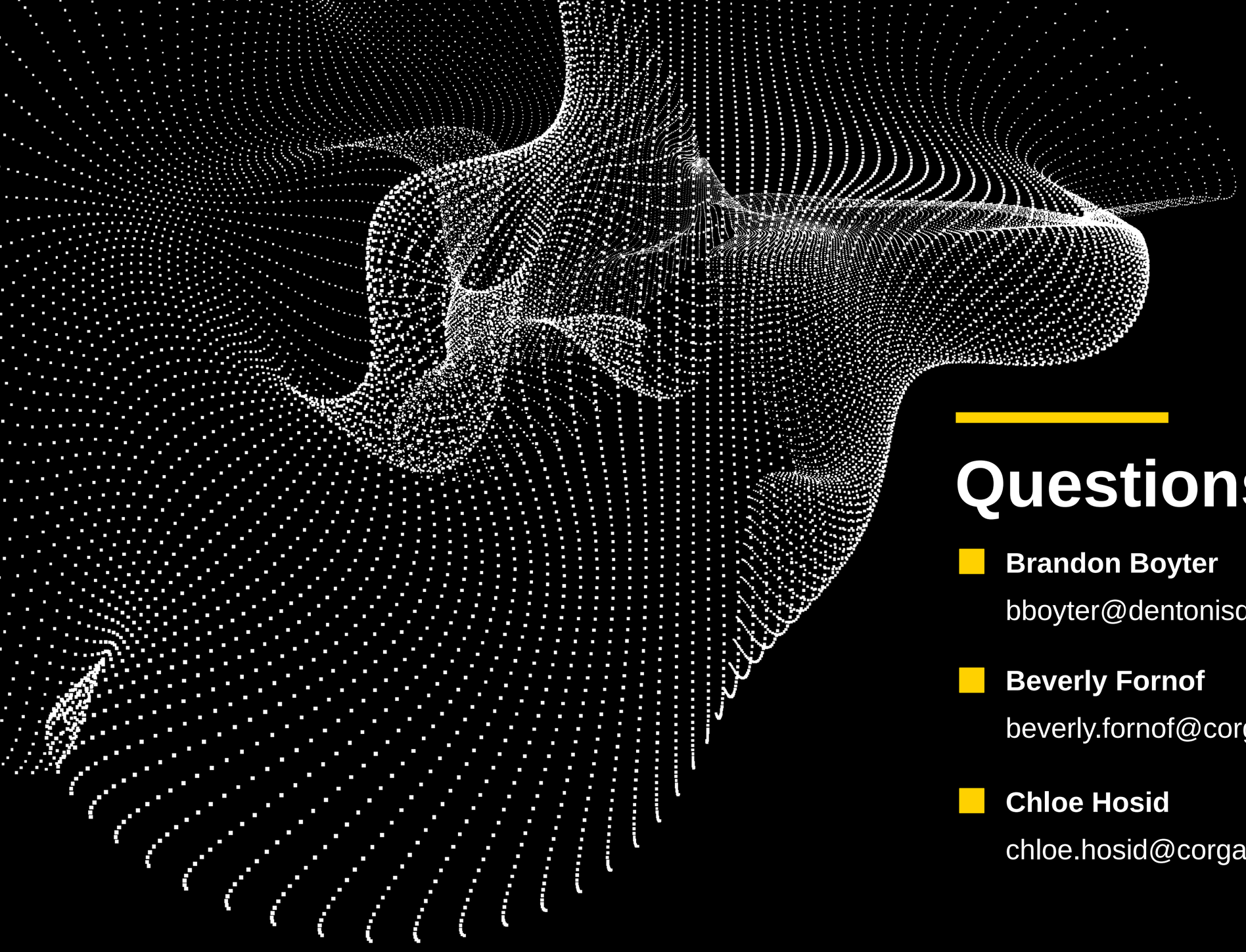

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