

An aerial photograph of a modern playground. The playground features a large, light-colored, curved slide structure, a tall wooden tower with a spiral staircase, and a complex climbing structure with orange and blue elements. The playground is surrounded by green trees and a paved area. A semi-transparent white rectangular box is overlaid on the center of the image, containing the title text.

Engineering Physical Activity and Well Being into the Playground

TODAY'S PRESENTERS



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LEONA KETTERL, AIA,

ALEP, LEED BD+C

SENIOR ARCHITECT

RAINFORTH GRAU ARCHITECTS

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National Physical Activity Trends



- **1/5** of US schools meet P.E. requirements (200min every 10 days)
- **<50%** of elementary school students that live within 1/4 mile from school walk or bike
- During school hours, boys and girls have **fewer breaks** in sedentary time than during any other weekday or weekend period
- Media consumes significant time at home
 - **2.3-3.5 hours/day** (≤ 8 years)
 - **>7.5 hours/day** (8-18 years)

LA COUNTY CHILDHOOD STATISTICS



- **Physical Activity habits (6-17yrs)**
 - **23%** watch more than 3 hours TV / day
 - **28.7%** meet physical activity recommendations each week
 - **10.9%** are completely sedentary
- **Health Outcomes**
 - **>25%** LA County students are obese
 - Obesity negatively correlated with neurocognitive functioning
 - Obese children **7 – 10x** more likely to become obese adults

GREEN SPACE

Access in Los Angeles

- Median **3.3** acres of park space/1000 people
 - **>94%** of public park infrastructure is in poor or fair condition
 - **30%** of LA residents live within walking distance of a public park
- **20%** LAUSD playgrounds are paved surfaces with **0%** tree coverage
 - **4.1%** average tree canopy coverage on play areas



Potential Solution

Add green space to public schoolyards where children spend most sunlit hours

MVPA on school playgrounds has been linked to the playground design (Bohn-Gettler & Pellegrini, 2014; Institute of Medicine, 2013)

Students spend more time sedentary on solid surfaces (Anderson et al., 2015; Barton et al., 2015; Foster, 2012)

Natural spaces are associated with greater perception of safety, playground cohesiveness, less boredom, and fewer bullying incidences (Bates et al., 2018; Hyndman, 2015)



A photograph of three children playing in a park. They are standing on large, cut tree stumps. A girl in a pink shirt and purple skirt is in the center, smiling. A boy in a black shirt is to her right, and another boy is to her left. They are all wearing sneakers. The background shows a wooden fence and trees.

POTENTIAL IMPACT

In California alone,
over 10,000 public
schools serve 6.2
million students on
**130,000 acres of
public land.**

Schoolyard Greening Study



- **Subjects**
 - Control (n=393) and Experimental (n=538) Title I schools
 - 1st-6th grade students
- **Intervention (Los Angeles Beautification Team)**
 - Large-scale greening project at experimental location
 - Grass field + trees, outdoor classroom

Schoolyard Greening Study



- **Methods**

- Data collection at recess
 - Pre, Post, 4-mo. follow-up, 16-mo. follow-up
- Direct observation
- Accelerometer Wear

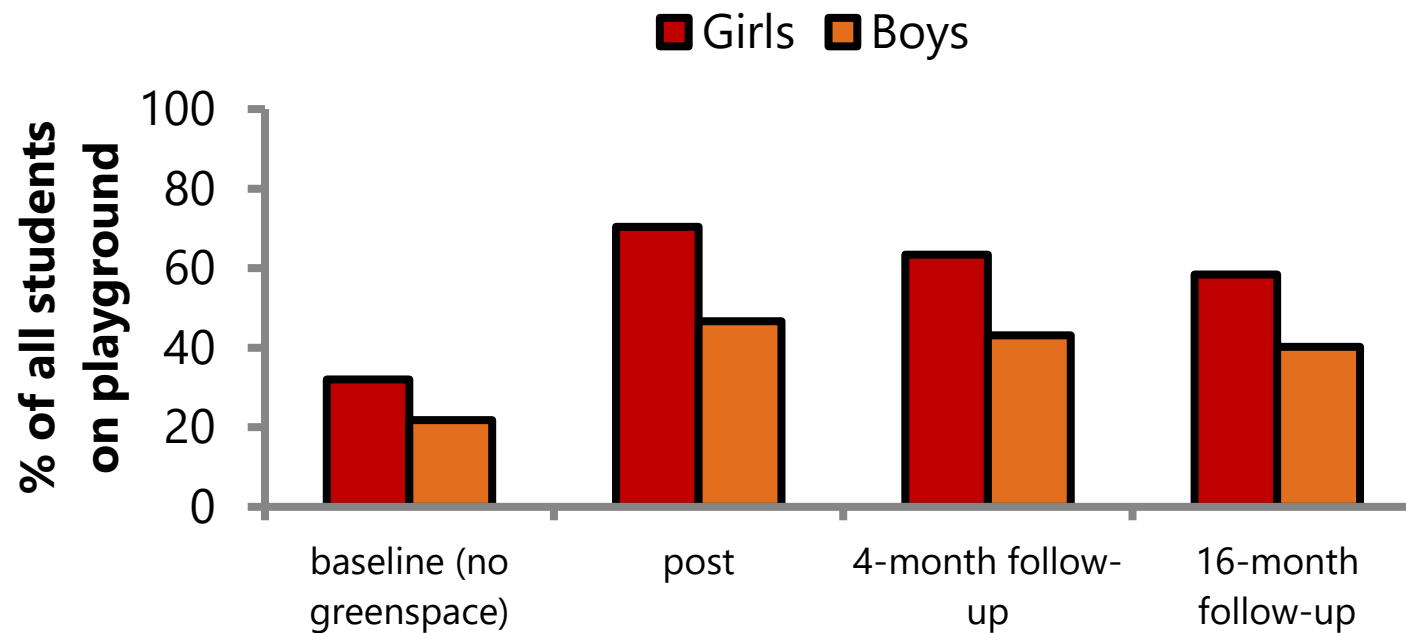
ZONE PREFERENCE

- **Most Popular**
 - **Baseline:** handball (18.8%), 4-square/dodgeball (16.5%), asphalt fields (16.9%)
 - **Post, 4 and 16-month follow-up:** grass field (15.5 – 27.2%), non-designated green space (mulch, trees, boulders) (17.5 – 25.0%), outdoor classroom (11.8 – 15.2%)
- **Least popular baseline, post, 4 and 16-month follow-up**
 - **Girls:** kickball, basketball (1.3 – 6.0%)
 - **Boys:** play structure, tetherball, volleyball (2.0 – 5.1%)



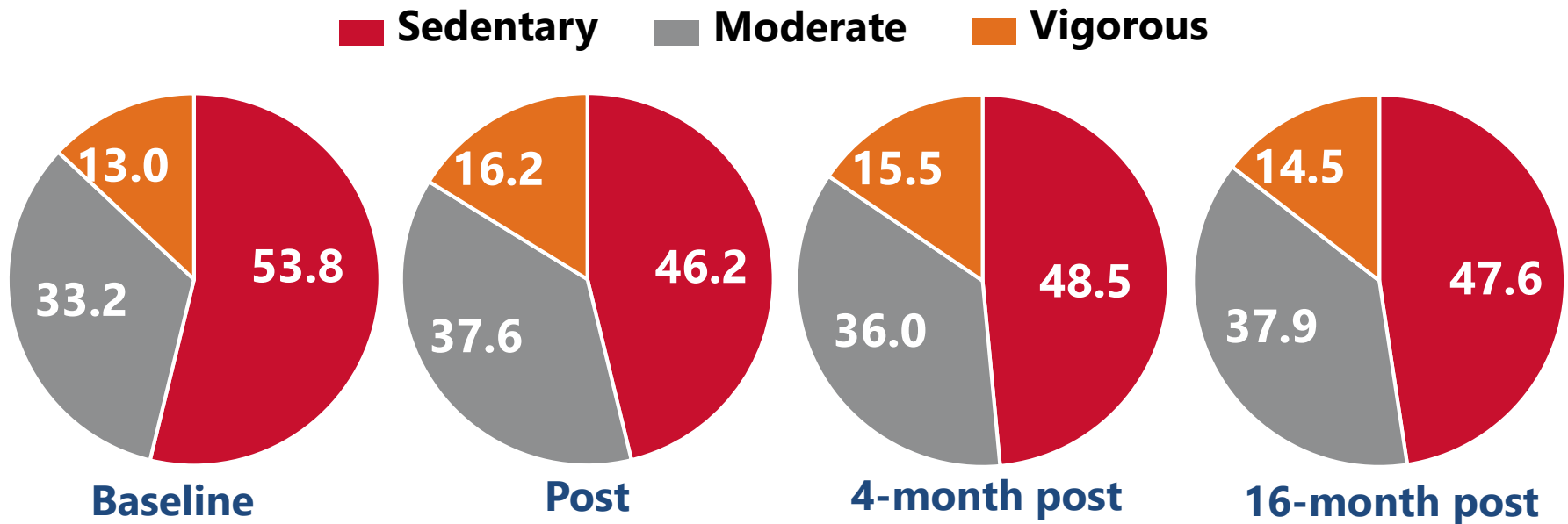
STUDENTS OBSERVED

In Zones Replaced with Green Space



ACTIVITY LEVELS

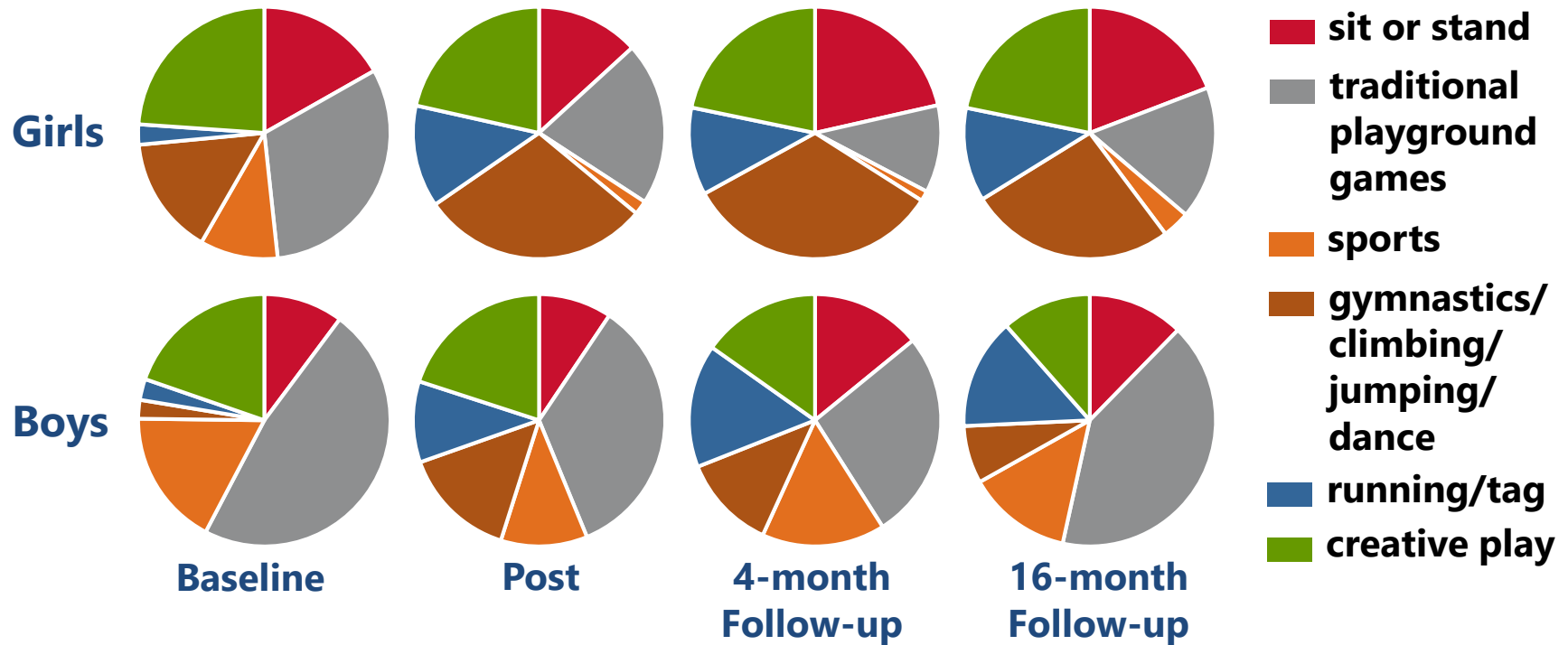
% Students Active on the Playground



- Population activity levels were similar between control & experimental at baseline & did not change for control throughout study
- **33 – 40** experimental students previously sedentary during single recess period are now active

ACTIVITY PREFERENCE

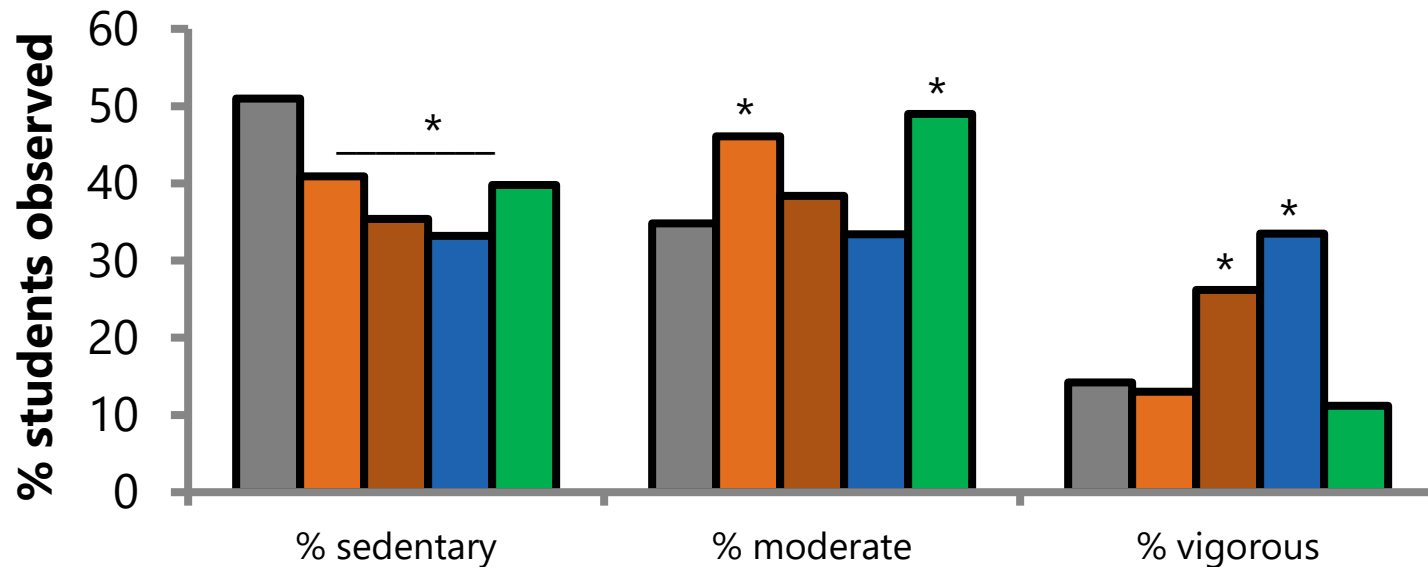
% Students Active on the Playground



Activity preference was similar between control & experimental at baseline & remained stable throughout the study at control location

ACTIVITY MODE

And Population Activity Levels



■ traditional playground games

■ sports

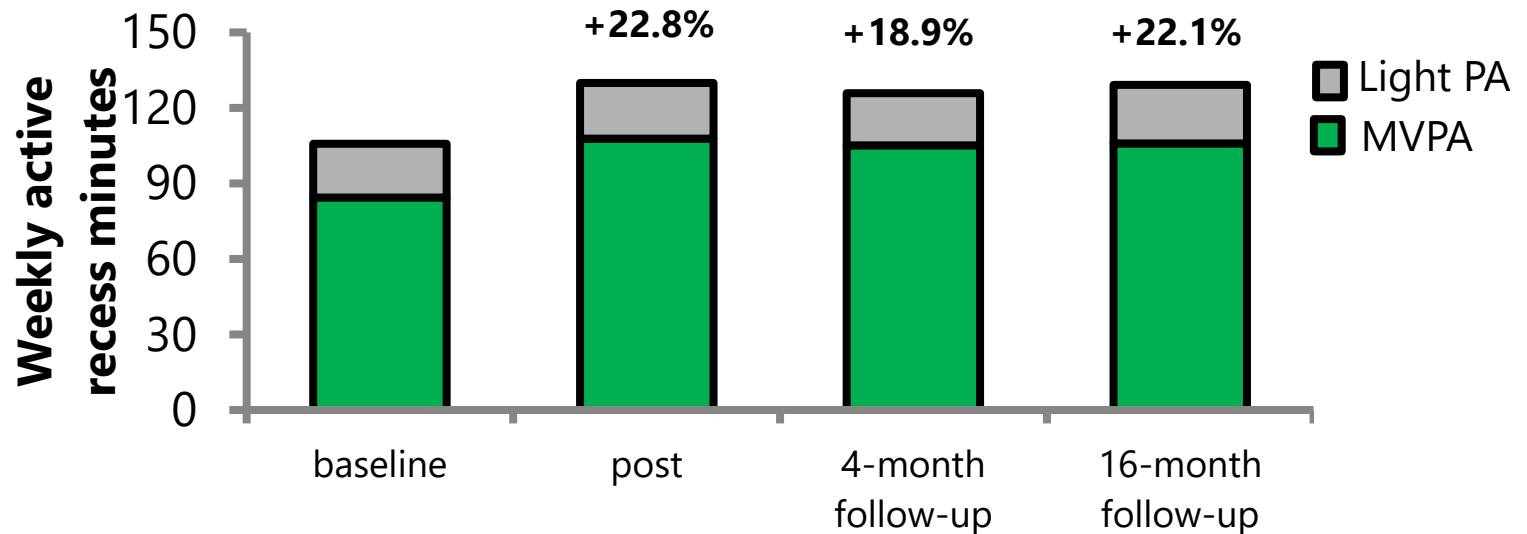
■ running/tag

■ gymnastics/ climbing/ jumping/ dance

■ creative play

ACTIVITY CHANGES

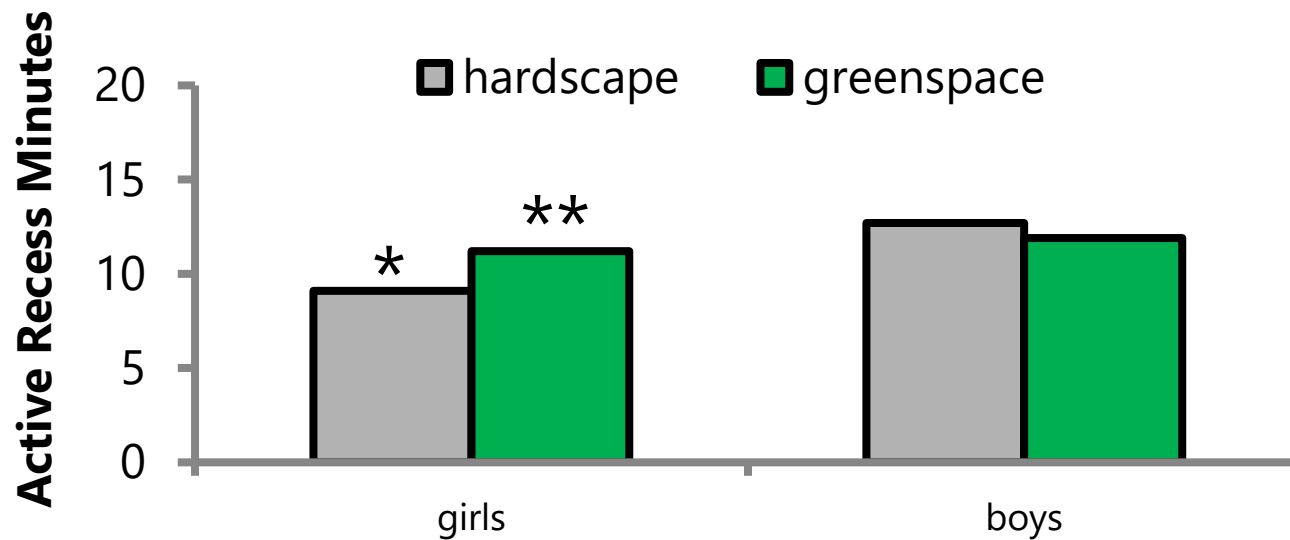
Individual Activity Level Changes



- Activity levels significantly greater than baseline at all post-greening time periods; greatest difference for 5th graders
- Renovations have allowed students to accumulate **20 – 30 additional** weekly minutes in moderate-to-vigorous physical activity at recess

SURFACE TYPE

And Individual Activity Level

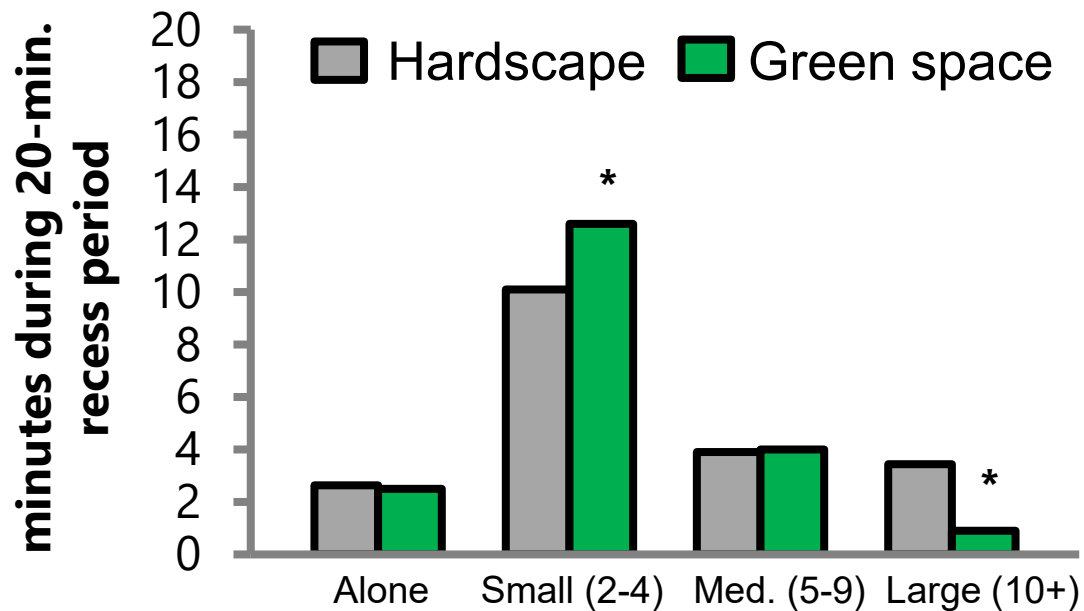


*Significantly different than opposite sex for same surface, $p < 0.05$

**Significantly different than hardscape for same sex, $p < 0.05$

SURFACE TYPE

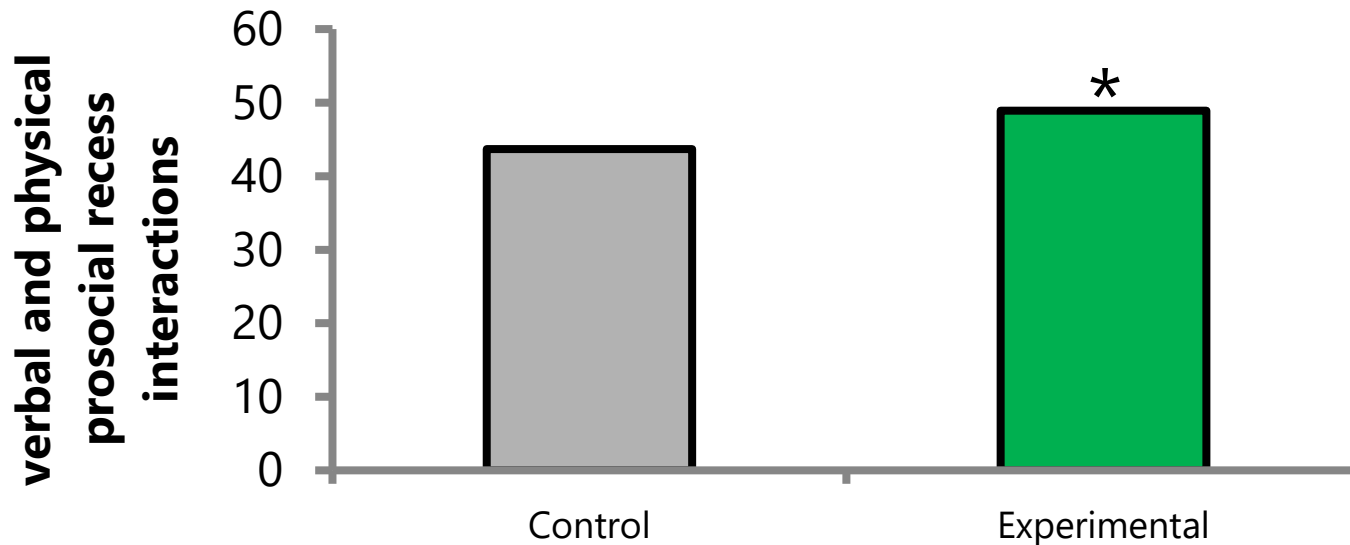
And Group Size



Negative correlation between time spent in **large groups** (10+ people) and individual **vigorous** intensity activity, $p < 0.05$

*Significantly different than hardscape, $p < 0.05$

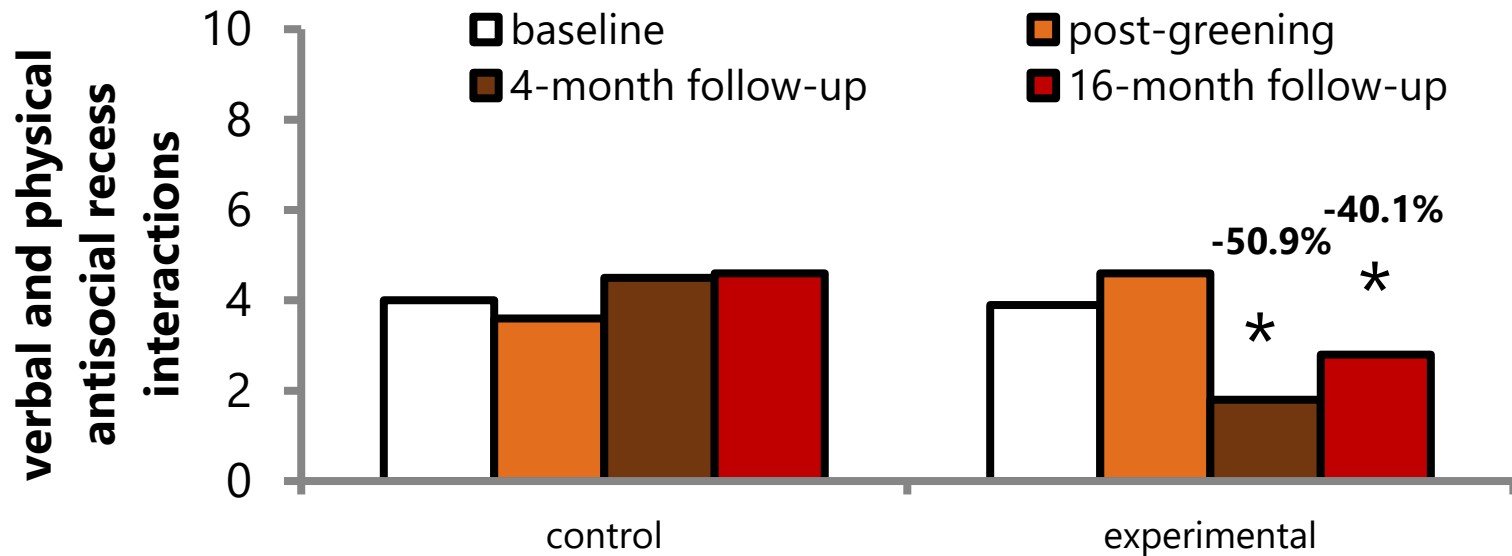
PROSOCIAL INTERACTIONS



*Significantly different than control, $p < 0.05$

Positive correlation between prosocial behavior and amount of time spent in **small groups** (2 – 4 people)

ANTISOCIAL INTERACTIONS



*Significantly different than control location and different than baseline, $p < 0.05$

Green Space Impacts between Playgrounds



87,834 sq. ft
328 students
green space: 28%



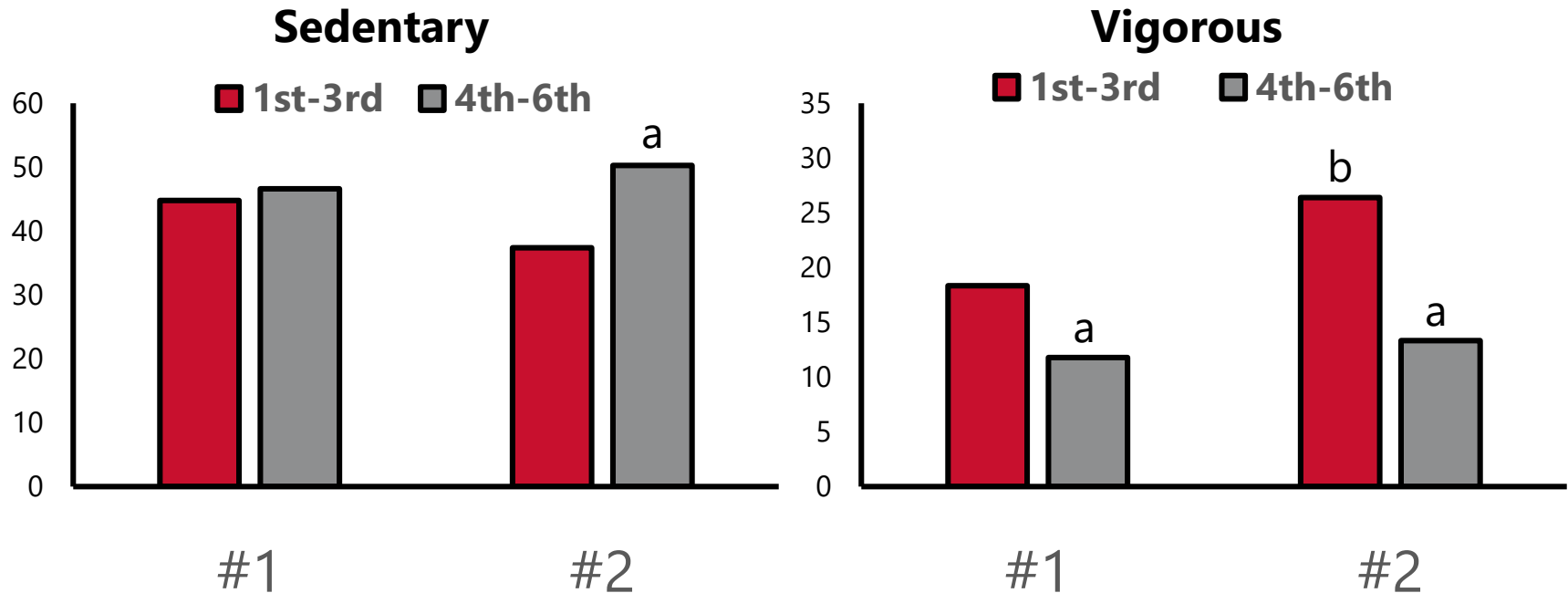
88,027 sq. ft
106 students
green space: 50.1%

Green Space Impacts between Playgrounds

	#1	#2
Open Grassy Field	X	X
Open Asphalt Field		X
Woodchip Area	X	X
Trees within schoolyard	X	X
Kickball	X	X
Handball	X	
4 Square/ Dodgeball	X	X
Basketball	X	X
Tetherball	X	
Volleyball		
Track Lanes	X	X
Play Structure	X	X
Outdoor Classroom	X	
Painted Hardscape	X	

ACTIVITY LEVELS

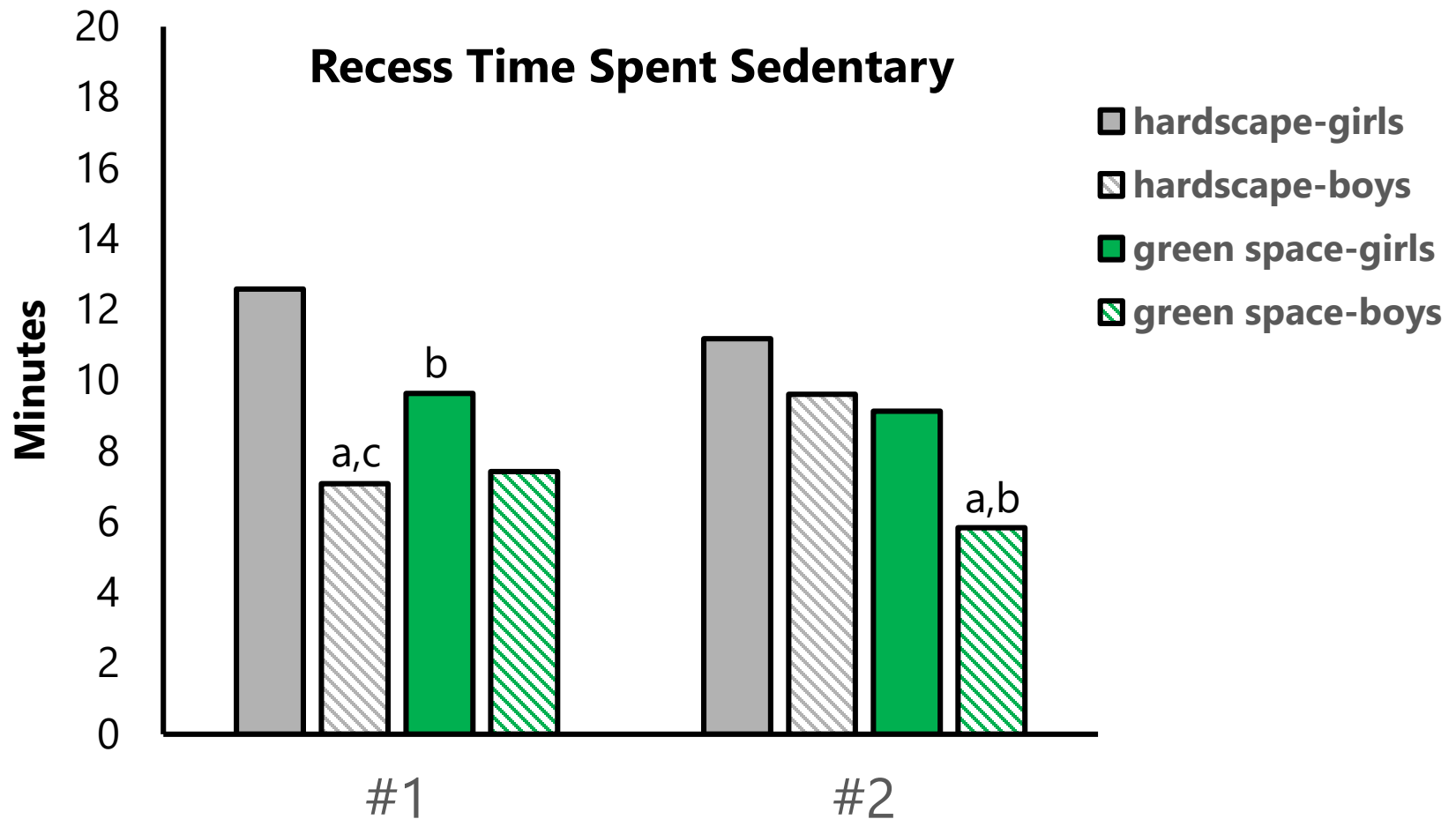
% Students Active on the Playground



Significant difference relative to 1st-3rd(a); #1 (b)

SURFACE TYPE

And Individual Activity Level



Significant difference relative to girls (a), hardscape (b), #2 (c)

CONCLUSIONS

- **Replacing large areas of asphalt with green space in urban schoolyards have the potential to:**
 - ↑ opportunities for children to interact with nature
 - Improve population and individual physical activity levels, particularly MVPA, in sex- and age-dependent ways
 - Improve social cohesiveness and decrease inter-student conflict
- **↑ green space alone may not be adequate to address physical activity and obesity concerns for low-income urban students**
 - Play areas designed to challenge motor skills, but are not designed for sport, are critical to eliminating gender gap
 - As children age, relative importance of diverse play options on the playground ↑



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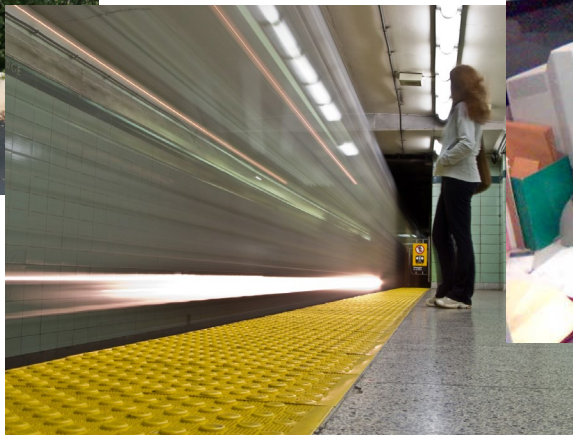
The Goal of Physical Education

The goal of physical education is to develop physically literate individuals who have the knowledge, skills and confidence to enjoy a lifetime of healthful physical activity.

--Society of Health and Physical Education (SHAPE America)



Engineering human movement out of our lives.



We start young...



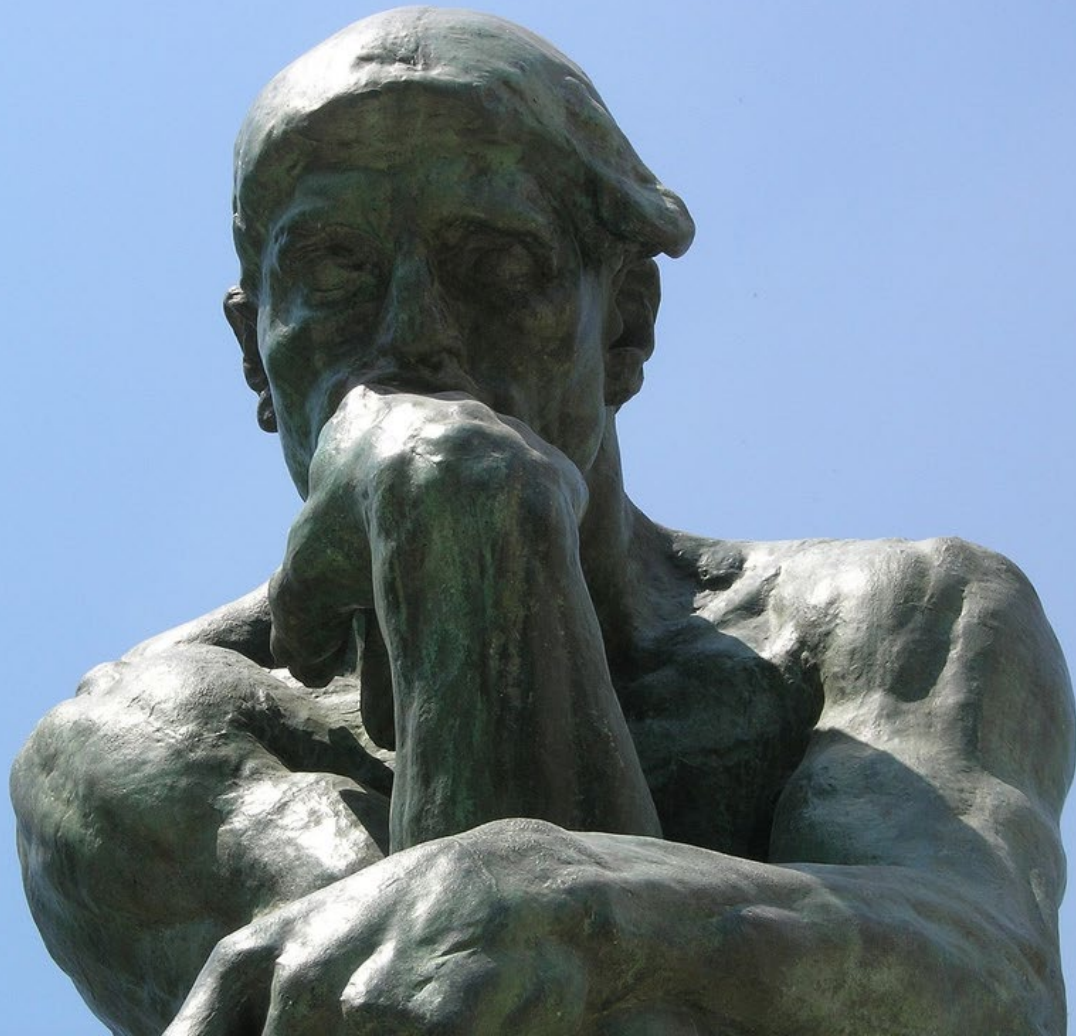
The cage isn't needed as we get older.



The cycle continues into adulthood.



How Can We Engineer Physical Activity Back In?



Quality Physical Education

Physical education is the sequential **educational program** that teaches students to:

- ☐ Understand & participate in regular physical activity that assists in developing and maintaining physical fitness throughout their lifetimes.
- ☐ Understand and improve their motor skills.
- ☐ Enjoy using their skills and knowledge to establish a healthy lifestyle.
- ☐ Understand how their bodies work.

Education Includes Four Components

Content

What

Assessment

How do we know?

Instruction

How

Environment

Surroundings
Conditions

Physical Activity vs. Quality Physical Education

Physical Activity (PA)

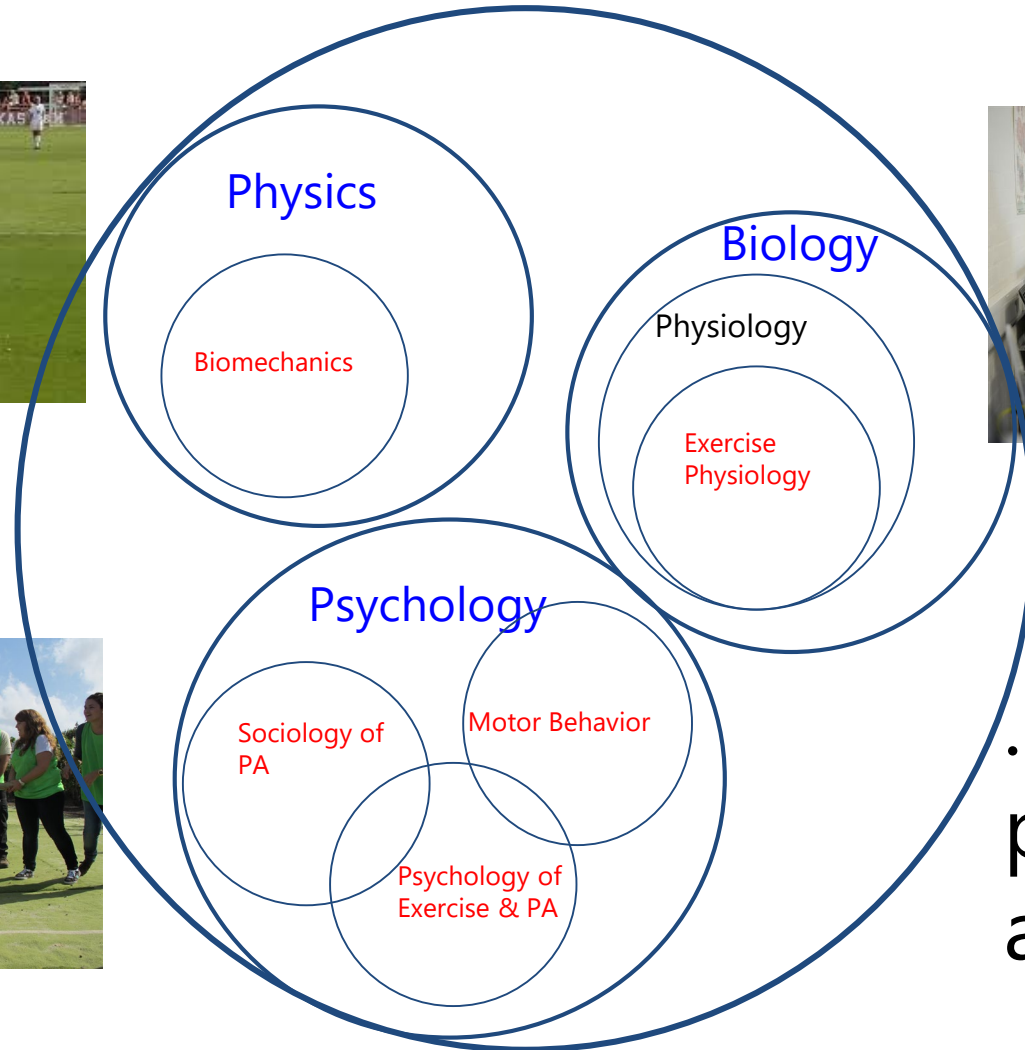
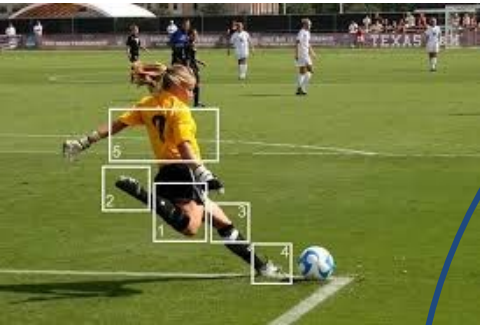
- ❑ Any bodily movement above rest.
- ❑ Guidelines refer to the subset of physical activity that enhances health.

Source: Centers for Disease Control & Prevention


Physical Education

- ❑ is the sequential educational program that teaches students to:
 - develop and maintain physical fitness throughout their lifetimes.
 - improving their motor skills.
- ❑ Enjoy using their skills and knowledge to establish a healthy lifestyle.
- ❑ Understand how their bodies work.

The Content of Physical Education is science-based...



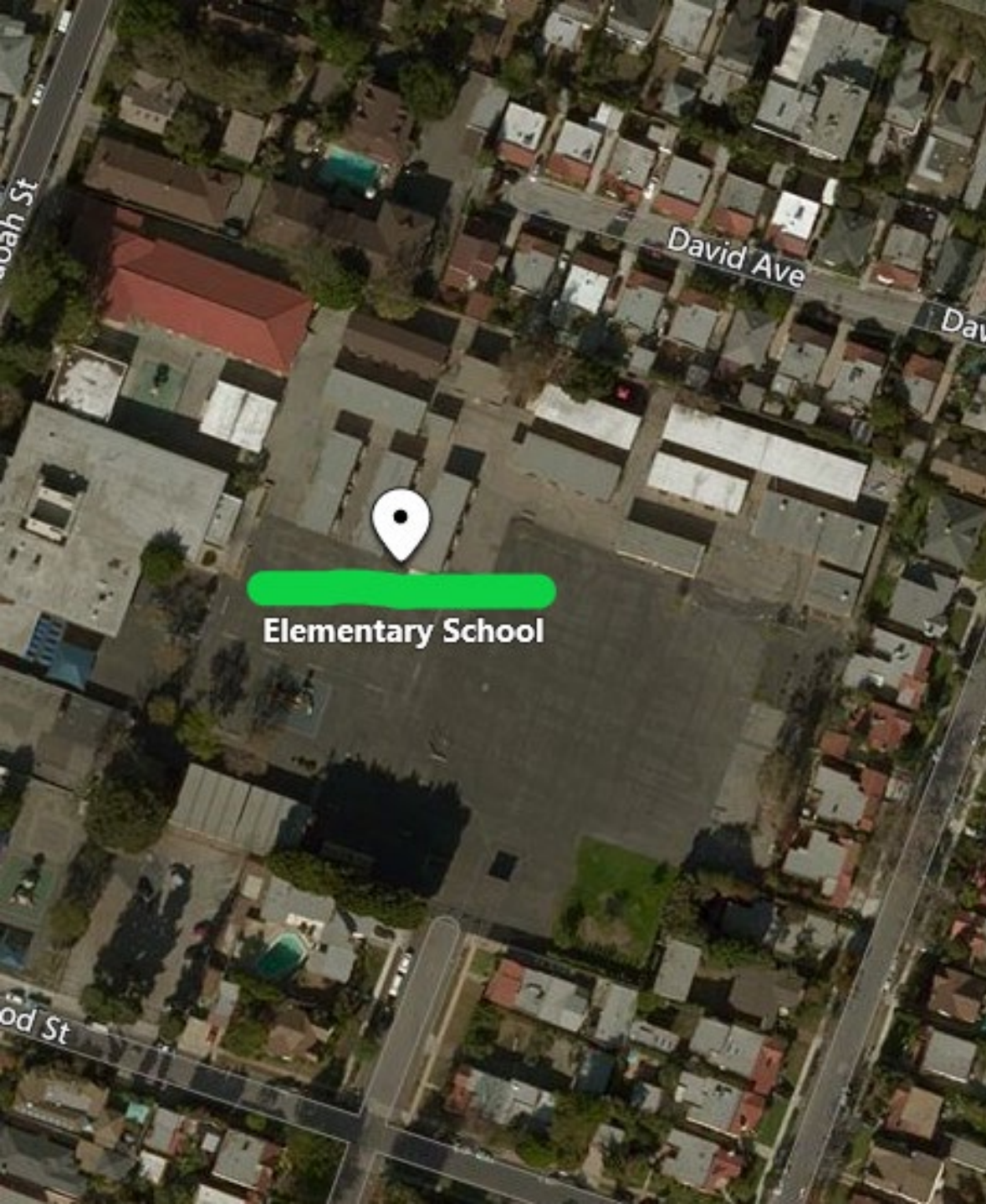
...with a practical application!

A photograph of a modern office interior, featuring desks, computers, and plants. The image is overlaid with a teal gradient on the left and a blue gradient on the right. The text is positioned on the left side, over the teal gradient.

LEONA
KETTERL,
AIA, ALEP, LEED,
BD+C

Senior Architect

Rainforth Grau
Architects



Cool coatings

**Shading via
trees and
shelters**

INITIAL SCHEMATIC SITE PLAN



INITIAL SCHEMATIC SITE PLAN



CONTEXT AND PLACEMAKING



LANDSCAPE AND PLANTING

RIVER ISLANDS - LAKESIDE EAST DISTRICT
NEIGHBORHOOD DEVELOPMENT PLAN

The image displays a comprehensive landscape architectural site plan for a park, centered around a large circular area labeled 'LRC' (likely a lake or pond). The plan includes various zones and features:

- Central Area:** A large circular area labeled 'LRC' (Lake or Pond) with a 'bench/stage' area. Surrounding it are 'Turf Field' and 'Soccer Field' areas.
- Top Left:** A rectangular area labeled 'M.P.' (Main Plaza) with a 'TAXI STOP' nearby.
- Top Right:** A 'Playground' area with a 'Bench' and 'Stage'.
- Right Side:** A series of rectangular plots labeled 'CR' (Community Room) and 'SBC' (Sports Building).
- Bottom Left:** A 'Turf Field' and a 'Soccer Field'.
- Bottom Center:** A 'Turf Field' and a 'Soccer Field'.
- Bottom Right:** A 'Turf Field' and a 'Soccer Field'.
- Surrounding Areas:** Various other plots labeled 'CR', 'SBC', and 'M.P.' are scattered around the central area.

The plan is annotated with numerous plant symbols (circles with crosses) and landscape features like 'bushes', 'trees', and 'grass'. A scale bar indicates '1:30'.

Surrounding the plan are several photographs illustrating different landscape elements:

- Top Left:** A photograph of a large, circular, open area with a low wall and people sitting on the ground.
- Top Right:** A photograph of a modern building with a glass facade and a small structure with a colorful sign.
- Middle Left:** A photograph of a playground area with a large, curved, metallic structure.
- Middle Right:** A photograph of a path leading through a lush, green landscape with trees and bushes.
- Bottom Left:** A photograph of a small, blue, boat-like structure on a wooden platform over a body of water.
- Bottom Center:** A photograph of a person standing on a series of wooden logs or stumps in a grassy area.
- Bottom Right:** A photograph of a large, open area with a low wall and people sitting on the ground.

In the top right corner, there is a cross-section diagram titled 'ZONES OF A VEGETATED FRESHWATER WETLAND'. It shows the vertical profile of a wetland, including the 'UPLAND', 'RIPARIAN', 'EMERGENT', and 'LITTORAL' zones, with various plant species and water levels indicated.

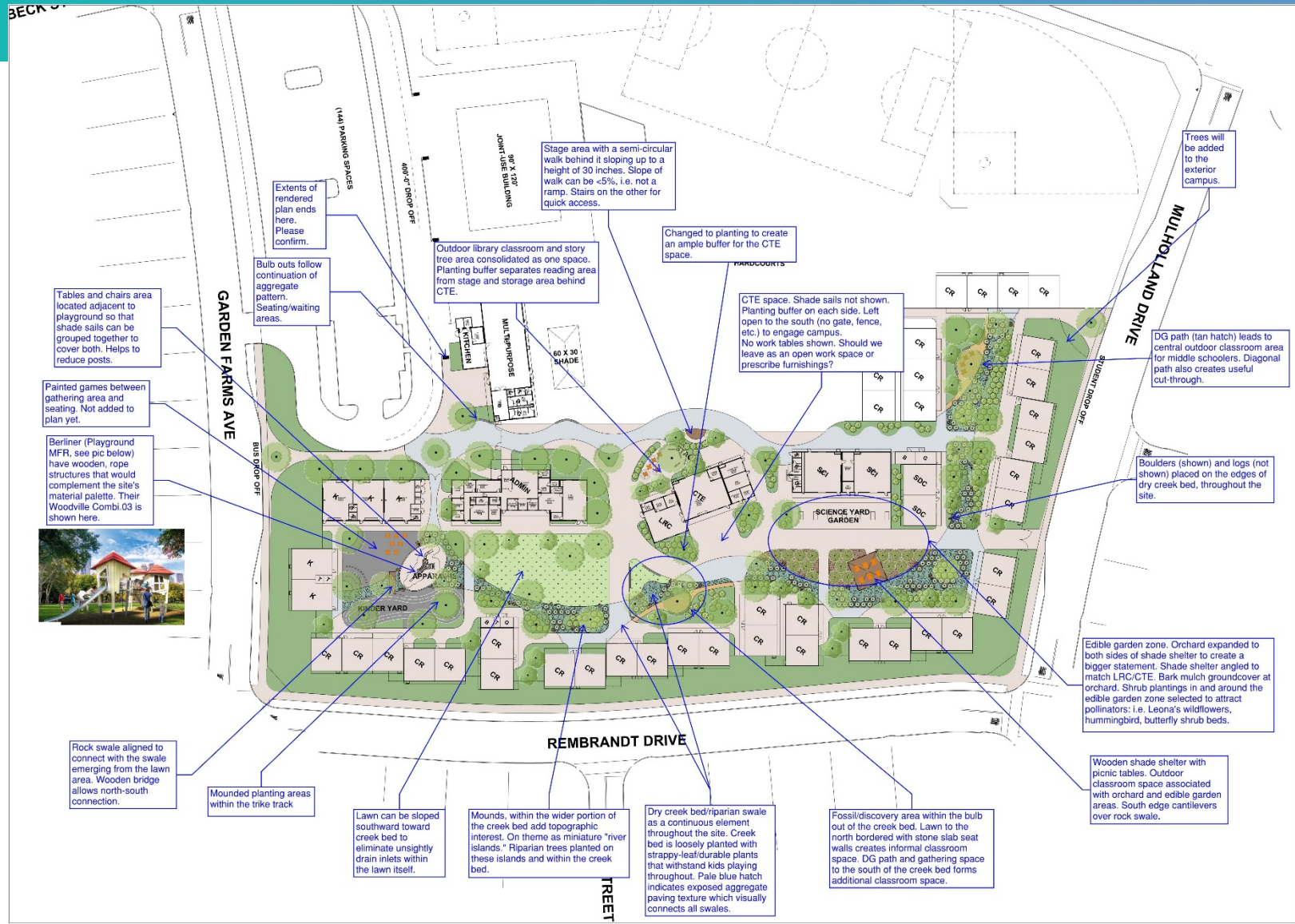
REVISED CONCEPTUAL SCHEMATIC



LANDSCAPE ARCHITECT'S TRANSLATION



LANDSCAPE ARCHITECT'S TRANSLATION





ENTRY

- SHADED WAITING
- BEGINS "FLOW" OF RIVER



PLANTING BEDS

- HANDS ON EXPLORATION
- RESPONSIBILITY
- GET DIRTY



SHELTER

- EDIBLE GARDEN
- OUTDOOR CLASSROOM
- CORNER OF SHELTER CANTILEVERED OVER ROCK SWALE



DRY CREEK BED

- FOSSIL HUNT
- INFORMAL SEATING
- ROCK HOPPING



THANK YOU

QUESTIONS?