2017 NESEA BuildingEnergy Boston

Using Whole Systems Thinking in High Performance Design: The New MacArthur Elementary School

Edward McGraw
Calvin Ahn
Michael McGough
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Course Description

In 2011 Hurricane Irene and Tropical Storm Lee caused the Susquehanna River to flood the city of Binghamton. The MacArthur Elementary School was inundated with contaminated flood waters and declared a total loss. With the help of federal and state funding the Binghamton City School District had the opportunity to rethink and create a new school for the 21st century.

The result was a new 125,000 square foot high performance elementary school with an EUI of 10 that embodied new models of educational engagement. State of the art systems, materials and site development created a LEED platinum (pending) project that incorporates both the quantitative and qualitative aspects of high performance and sustainability.

This presentation the design team will reveal the collaborative and integrated design process that engaged the Binghamton City School Board, administration, faculty, staff, student and the entire community in developing five overarching visions. These vision statements drove every decision during design and construction. A deeper look into the use of energy and daylight modeling to create an energy budget and select high performance systems for climate control, ventilation and lighting. The development of the site, the form of the building and the use of materials were driven by the philosophical underpinnings of the five overarching visions and the use of leading edge high performance and sustainable practices. The completed project reconnects a neighborhood, embraces the aspirations of the community, provides an exciting environment to deliver 21st century learning and is an example of high performance sustainability.

Commissioning, data collection, measurement and verification progress will show how the project is performing since its completion in late 2015. The design team will also share lessons learned and solicit feedback from session participants.

Learning Objectives

At the end of the this course, participants will be able to:

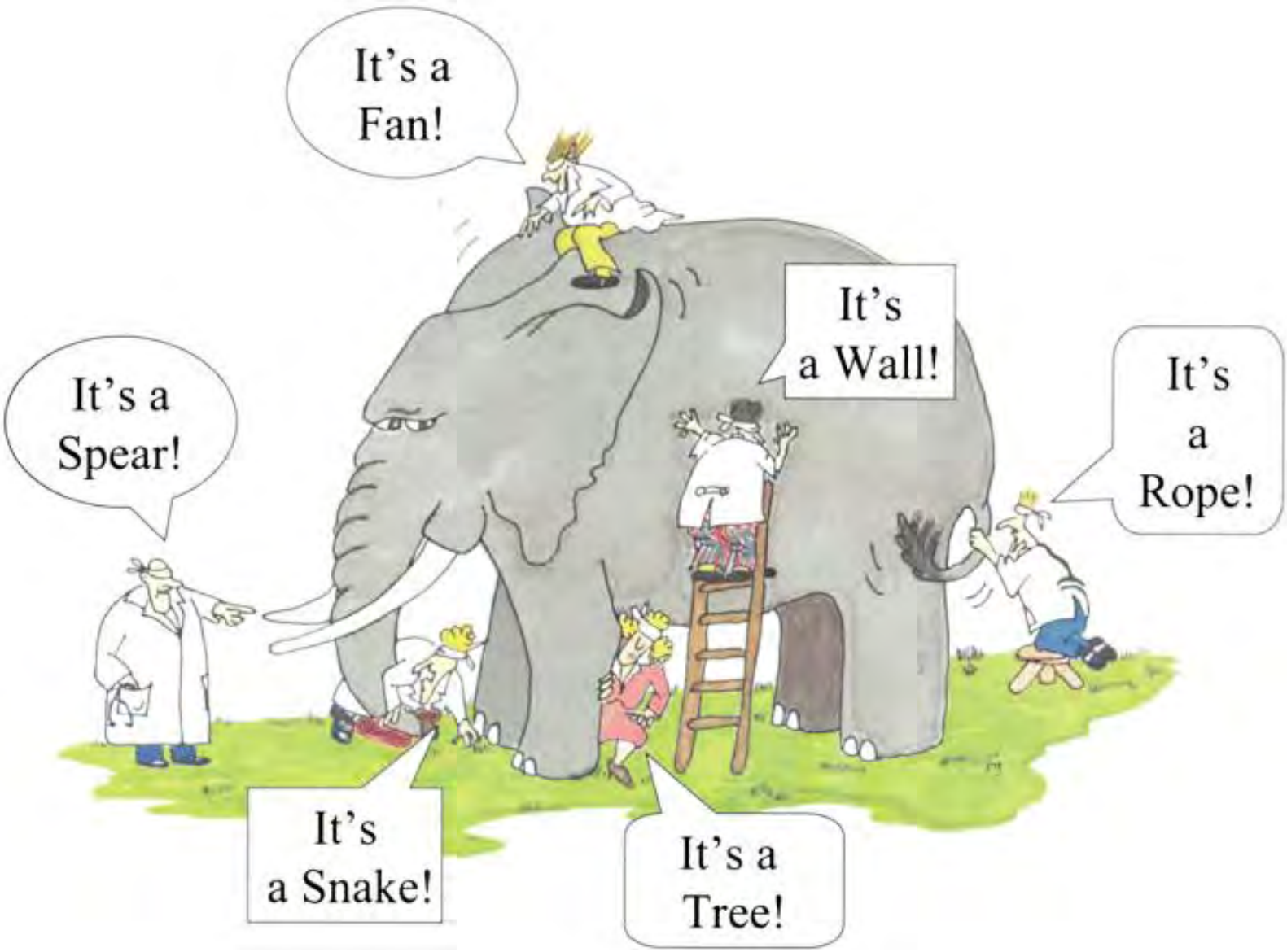
1. Participants will be able to apply a collaborative research and engagement process to identify the essence of their project resulting in aspirational overarching vision statements.

2. Participants will be able to use qualitative vision statements to develop site design strategies, building form, material and system selections.

3. Participants will assess the use of data to influence design, comparing how energy modeling and daylight studies are used from concept, through design, construction and occupancy. Audience members will be asked to share and contrast their own experiences using data in the design/build/live process.

4. Participants will define and compare quantitative and qualitative performance metrics in a high performance building. Critiquing why and how qualitative vision statements can be tracked and measured.

System Thinking



MacArthur Elementary Property (Prior to Flood)

Flooding related to Tropical Storm Lee
September 2011

‘High Performance Building’ Definition

a building that integrates and optimizes on a life cycle basis all major high performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

Energy Independence and Security Act of 2007

life expectancy

weight

recyclability

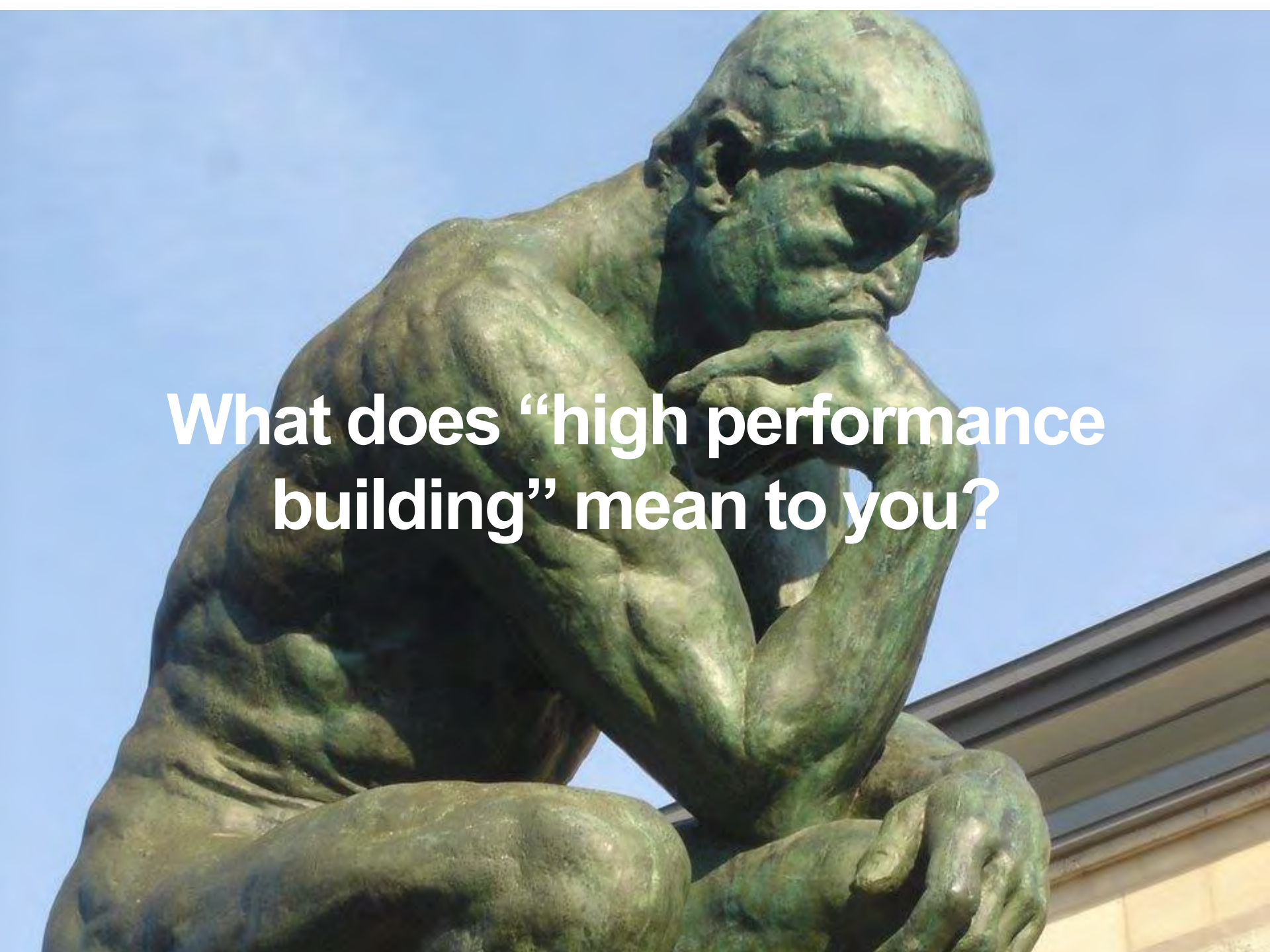
QUANTITATIVE

source

embodied energy

energy usage

Cost ($)


What does “high performance building” mean to you?

control &
variability

meaning

contextual

patterns

QUALITATIVE

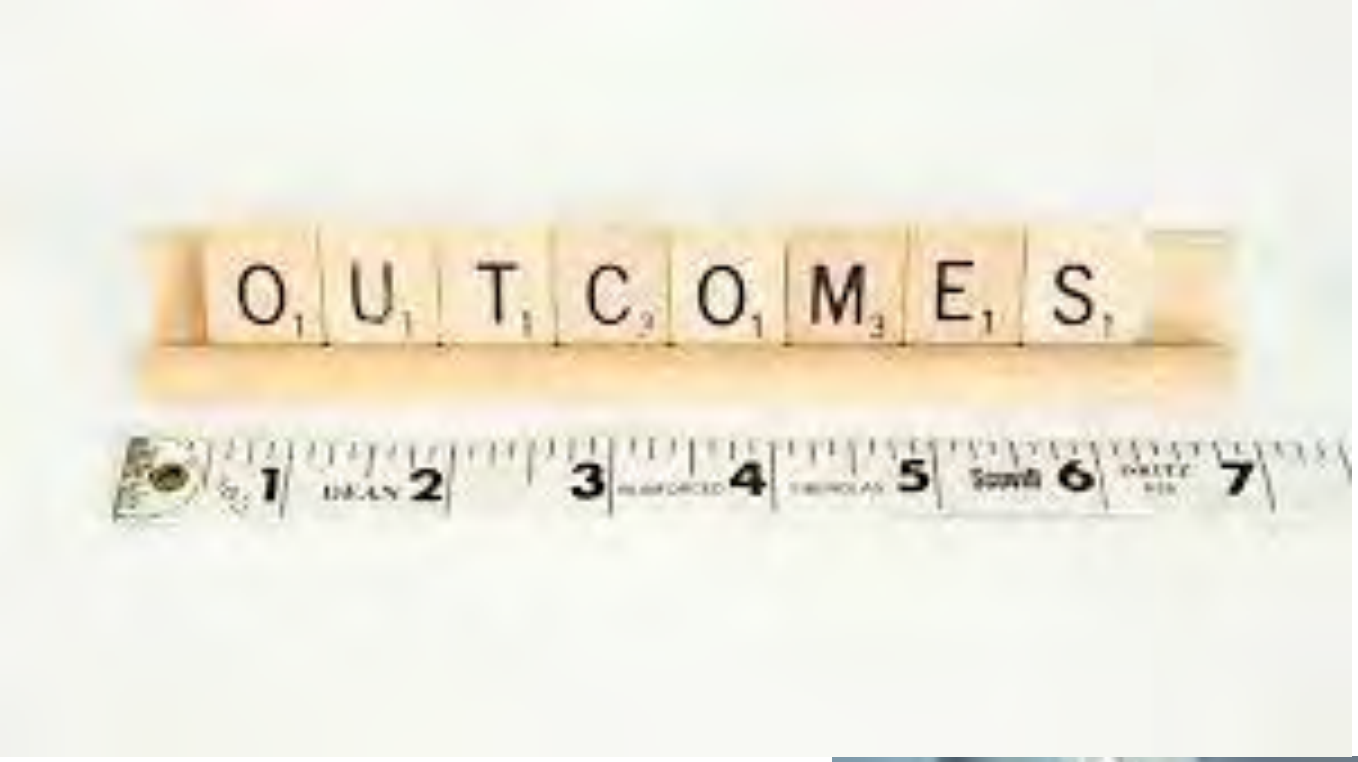
gradients

resilience

comfort

visions

memory


OUTCOMES

&

how do you engage in new thinking?

visioning

reimagining the whole
rather than upgrading the parts

(a vehicle to achieve synthesis)

[testing] vision

can’t picture it

can be realized in many ways

multidimensional

Next Steps (Jan 2012)

stakeholder engagement

- board
- MacArthur staff
- MacArthur students
- community

creating a big tent

Student Visioning
5.3.12

visioning

- we will respect the energy of the site

- we will heal our relationship with the river

- we will create a net zero fossil fuel building

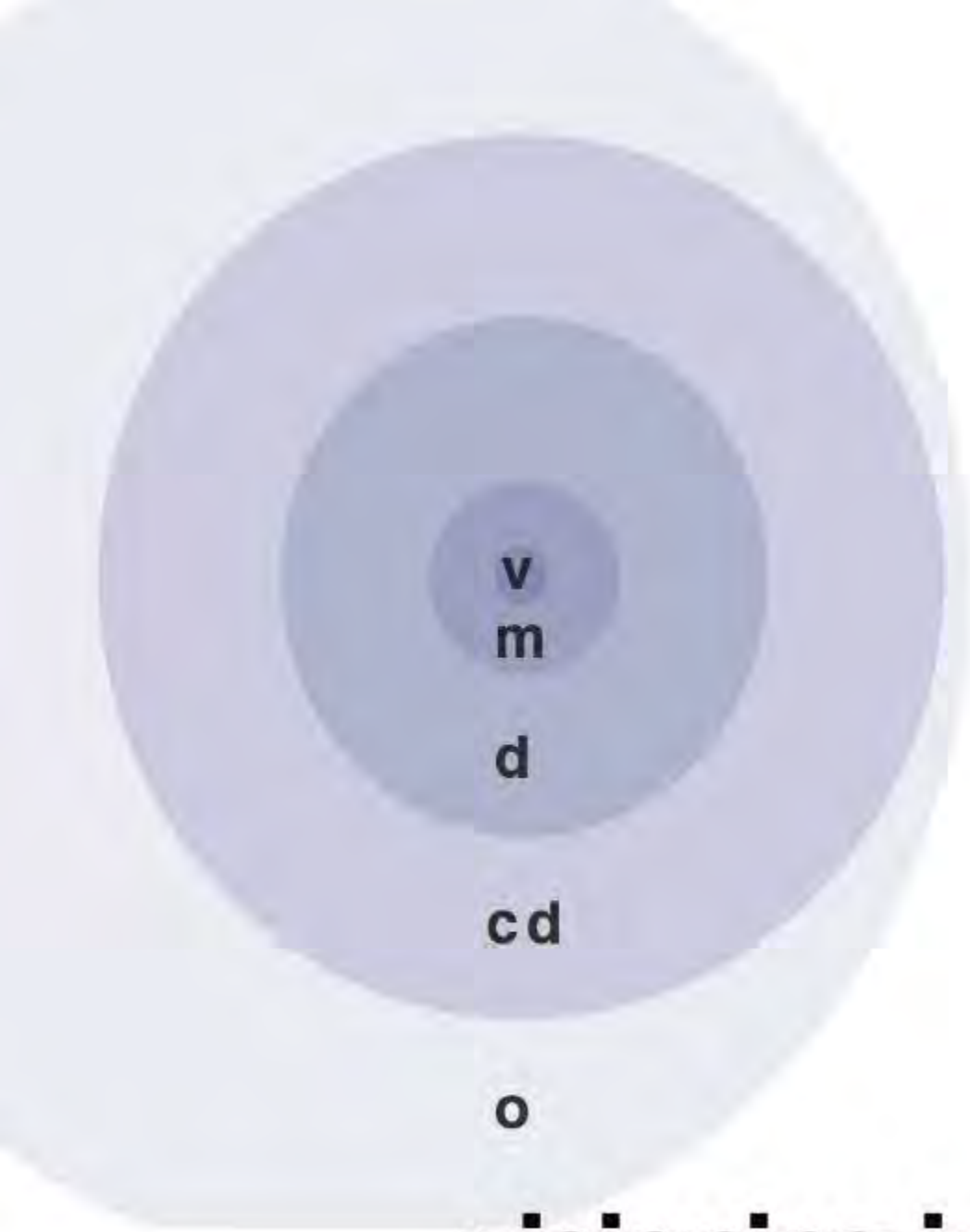
- we will teach

- we will create a safe and welcoming place for students and the community

NOW WHAT?

mediating the vision statements

june/july 2012



visioning

mediation

development

construction **d**ocs
+ admin.

operations

visioning in design process

ask yourself :

how does this help realize a vison ?


susquehanna
vestal parkway
moderate
major
2011
community

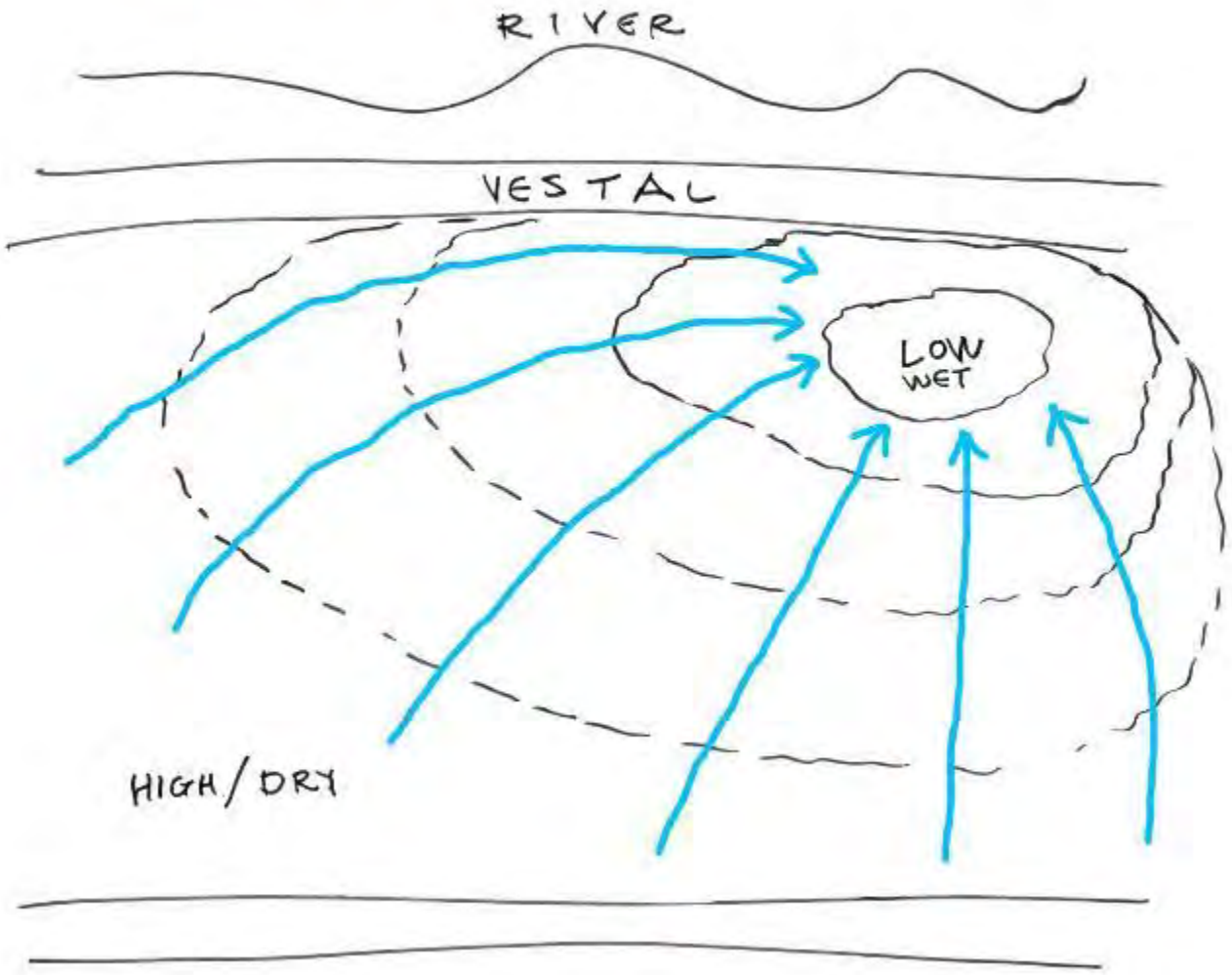
we will respect the energy of the site


MACARTHUR SCHOOL

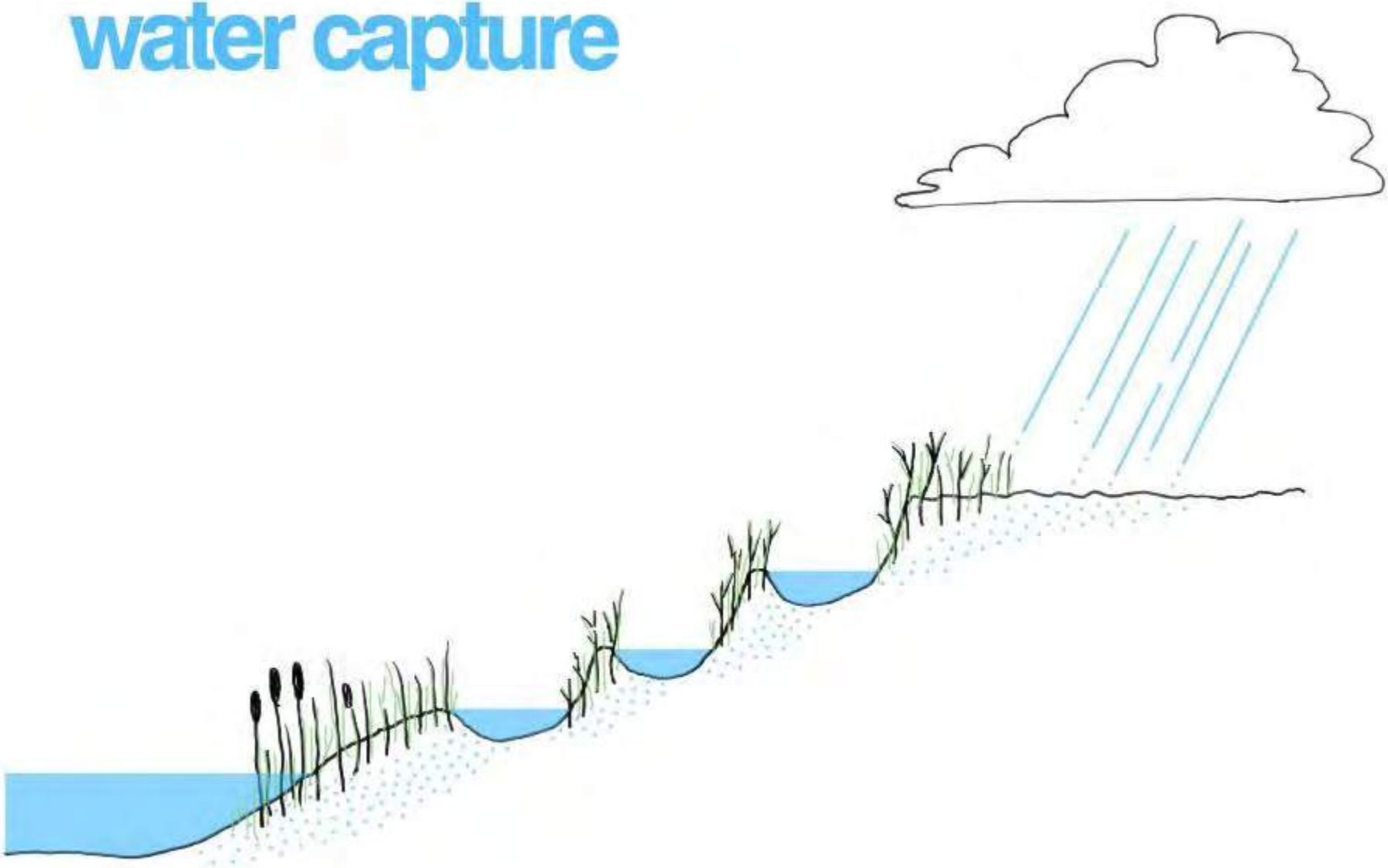

MacARTHUR
WE'LL
BE BACK!
READ EVERY DAY

we will heal our relationship with the river

water capture

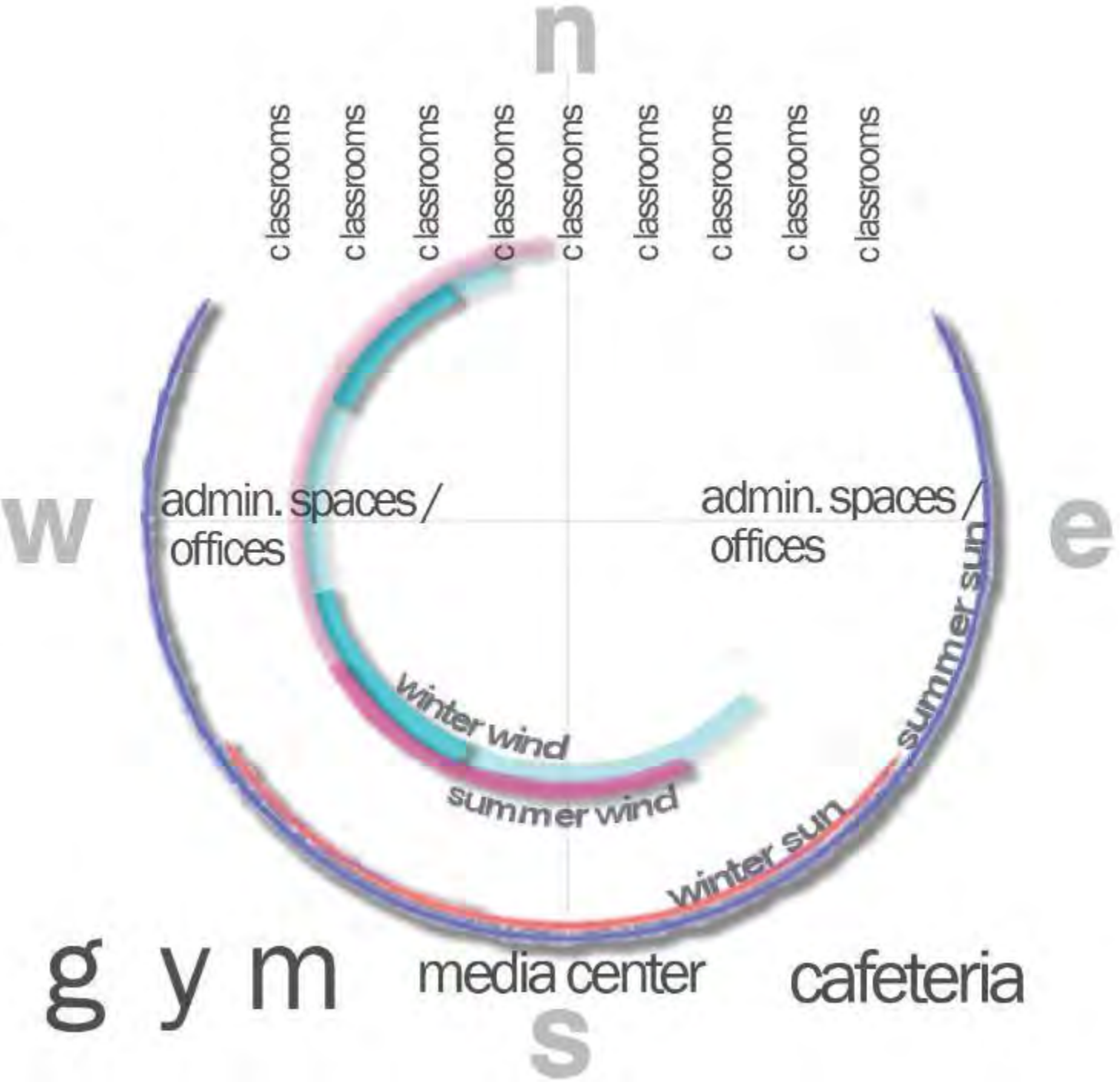


water capture



we will create a net zero fossil fuel building


winter wind
summer wind
winter sun
summer sun
N


n
classrooms
classrooms
classrooms
classrooms
classrooms
classrooms
classrooms
classrooms
classrooms
w
admin. spaces / offices
admin. spaces / offices
e
winter wind
summer wind
winter sun
summer sun
g y m
media center
cafeteria
s

we will teach