LITTLE DIPPER ELEMENTARY
AN INTERACTIVE CLIMATE EXPLORATORIUM

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PRESENTATION OVERVIEW

STUDIO BEGINNINGS

CONSTRAINTS & OPPORTUNITIES

BIG QUESTIONS

GOALS & GUIDELINES

DECATHLON CONTESTS

REFLECTION

CONCLUSION
TEAM POLARIS
Fig #7: Neighborhood relationships
INTRODUCTION

Constraints & Opportunities

Big Questions

Strategy Overview

Design Goals & Guidelines

CLIMATE (ZONE 3B)

ANNUAL AVERAGES

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>mean temp</td>
<td>63°F</td>
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<tr>
<td>design high</td>
<td>100°F</td>
</tr>
<tr>
<td>design low</td>
<td>18°F</td>
</tr>
<tr>
<td>precipitation</td>
<td>16&quot;</td>
</tr>
<tr>
<td>humidity</td>
<td>69%</td>
</tr>
<tr>
<td>wind</td>
<td>15 mph</td>
</tr>
<tr>
<td>snowfall</td>
<td>0&quot;</td>
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<tr>
<td>precipitation days</td>
<td>42 days</td>
</tr>
<tr>
<td>hours of sunshine</td>
<td>1000 hrs</td>
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<tr>
<td>heating degree days</td>
<td>2275</td>
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<tr>
<td>cooling degree days</td>
<td>939</td>
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Table #4: climate averages

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<tr>
<th>Year</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
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<th>September</th>
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<th>December</th>
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<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
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<td>70</td>
<td>80</td>
<td>90</td>
<td>100</td>
<td>110</td>
<td>120</td>
</tr>
</tbody>
</table>

Table #5: temperature range
INTRODUCTION

Constraints & Opportunities

Big Questions

Strategy Overview

Design Goals & Guidelines

Fig #8: country and city relationships
INTRODUCTION

Constraints & Opportunities
Big Questions
Strategy Overview
Design Goals & Guidelines

Fig #9: artwork on Tocote border by JR

Fig #10: satellite view Tocote, U.S...

Fig #11: satellite view Tocote, Mexico

Fig #12: neighborhood relationships

Fig #4: inhabitable threshold

Domestic

Organized clusters
Integrated open space
Clear circulation

Public

Industrial warehouses
Affordable materials
Scattered orientation

Elevating understood vernaculars
Celebrating how they come together

People
INTRODUCTION
Constraints & Opportunities
Big Questions
Strategy Overview
Design Goals & Guidelines

Solar Decathlon - Little Dipper Elementary
POLARIS - University of Oregon
HOW CAN WE TEACH CHILDREN ABOUT GLOBAL CHALLENGES?
HOW CAN DESIGN TEACH CHILDREN ABOUT GLOBAL CHALLENGES?
HOW CAN **DESIGN** TEACH CHILDREN ABOUT GLOBAL CHALLENGES?
WHAT IF WE BREAK DOWN GLOBAL CHALLENGES INTO “KID-SIZED” LEARNING MOMENTS?
LEARNING MOMENTS ON A NEUTRAL FIELD
LEARNING MOMENTS

- The sun changes so much during the day!
- I like moving my desk around!
- It’s fun to push the walls into place!
- Whatcha reading about?!
- Global warming!
- I can see the mountains from here!
INTRODUCTION
Constraints & Opportunities
Big Questions
Strategy Overview
Design Goals & Guidelines

LEARNING MOMENTS TO CLASSROOM

CLASSROOM UNIT

Fig #23: relationships in the classroom unit

Fig #84: classroom axon
INTERACTIVE SYSTEMS TO BUILDINGS

Fig #22: relationships in the classroom cluster
INTRODUCTION
Constraints & Opportunities
Big Questions
Strategy Overview
Design Goals & Guidelines

BUILDINGS TO SITE

OVERALL SITE

Fig #10: satellite view Tecate, U.S.
Fig #11: satellite view Tecate, Mexico
Fig #20: relationships on the site
A KIT OF PARTS
Unboxing the pieces of a responsive architectural and conceptual system. The project is organized by this conceptual kit of parts.

SPECIMENS ON A FIELD
Like samples on a petri dish, students learn about passive climate systems, culture, and play through vibrant objects on a neutral field.

INTERACTIVE RELATIONSHIPS
Students take an active role in controlling their environment by interacting with educational elements.

RECIROCAL ENERGY

KIDS AS STEWARDS

INHABITABLE THRESHOLD

EMERGENT PLAY

BEAUTY IS FOR EVERYONE
In order to provide you with an appropriate comparison for your building, we need to know how spaces in this building will be used. If your building has multiple uses, add them below.

**Selected Use Type(s):**
- Commercial
- Residential
- K-12 School

**Energy Overview**

**EUI TARGET**

<table>
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<tr>
<th>competition requirement</th>
<th>max target site energy</th>
<th>estimated school site energy</th>
<th>estimated produced site energy</th>
<th>estimated total energy</th>
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</thead>
<tbody>
<tr>
<td>57 kBtu/ft² / yr</td>
<td>17.5 EUI</td>
<td>13 EUI **</td>
<td>23 EUI **</td>
<td>-10 EUI **</td>
</tr>
</tbody>
</table>

**Based on IESVE estimations with a radiant floor heating system and passive chilled beams.**

Table #6 : Zero Tool output
MINIMIZE CONDITIONED SPACE

AREA ANALYSIS

| sheltered outdoor area | conditioned area | 8,516 sf |
| conditioned space / covered space | 22,600 sf | 73% |

MINIMIZE CONDITIONED SPACE

RADIATION ANALYSIS - EXTERIOR

winter solstice  | equinox  | summer solstice

Fig #25: classroom radiation analysis

Fig #24: site radiation analysis

Minimizing conditioned space by utilizing covered outdoor circulation reduces the school’s energy use significantly.
UTILIZE PASSIVE CLIMATE SYSTEMS
SIMPLIFY CONSTRUCTION, MATERIAL USE, AND OPERATIONS
ENERGY PERFORMANCE

ENERGY ANALYSIS

**EUI TARGET**

- Competition requirement: 57 kBtu/ft²/yr
- Max target site energy: 17.5 EUI
- Estimated school site energy: 13 EUI**
- Estimated produced site energy: 23 EUI
- Estimated total energy: -10 EUI**

Table #2: EUI target

** based on IESVE estimations with a radiant floor heating system and passive chilled beams.
ON-SITE GENERATION

SOLAR ENERGY

PV SYSTEM

- total collection area: 6030 sf
- efficiency: 18.3 %
- power rating: 355 W
- estimated total energy: 23 EUI

Table #17: PV system

Classroom PV Collection

Community PV Collection

Fig #28: Classroom roof monitor solar

Fig #29: Community roof solar panels

D6M355E4A 355W
Mono-Crystalline Photovoltaic Module

Community PV Collection

Battery reserve excess energy flow path

Common excess energy flow path

BATTERY
INVERTER
E-PANEL
METER
GRID

Fig #29: Community roof solar panels
ON-SITE GENERATION

WIND ENERGY

Fig #30: Makani Kite

Fig #4: Inhabitable threshold
ENGINEERED SYSTEMS ON DISPLAY SHOW STUDENTS THE REALITY OF HOW BUILDINGS PROVIDE SHELTER, ONE PART OF THE STUDENTS’ JOURNEY TO BECOME RESPONSIBLE STEWARDS OF THE ENVIRONMENT.
CELEBRATING SIMPLE CONSTRUCTION

CLASSROOMS

laminated wood beams

wood-framed walls with CMU exterior

Fig #32: classroom structure
CELEBRATING SIMPLE CONSTRUCTION

COMMUNITY BUILDINGS

- pavilions
- perils
- steel trusses

Fig #33 - Community buildings structure
INSTALLATION INSTRUCTIONS responding to your unique conditions

WHAT YOU SUPPLY
foundation
labor
tools
connection detail
HSS frames

MODULAR PAVILIONS
CELEBRATING SIMPLE CONSTRUCTION

Fig #34: pavilion structure
CLASSROOM MECHANICAL SYSTEMS

North facing windows U-value = 0.2

Passive Chilled Beams:
The Linear Passive Chilled Beam (PCBL)

Hot Water Boiler:
QAHV Hot Water Heat Pump capacity: 136480 Btu/hr

photo-voltaic panels

passive chilled beams

solar water heater

panelized interactive pin-up between classes

radiant heat concrete slab

classroom cluster section A - thermal control systems
CLASSROOM MECHANICAL SYSTEMS

- Perforated rain screen
- Insulated CMU walls R-value = 28.1
- Operable windows for stack ventilation
- Continuous insulation layer
- (ERV) Energy Recovery Ventilation
- (UFAD) under floor air distribution plenum

(ERV) Energy Recovery Ventilator LZ-H080BGA5
470 CFM

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COMMUNITY BUILDINGS MECHANICAL SYSTEMS

Fig #41: north/south community building section

Fig #42: east/west community building section

Fig #43: community HVAC plan
SECTIONS: CONTINUOUS LAYER OF INSULATION

CommUNITY WALL

R-value = 31 ft²°F/Btu
U-value = 0.032 Btu/ft²°F

Fig #47: Community wall section
SECTIONS: CONTINUOUS LAYER OF INSULATION

- R-value = 28.1 ft²·°F·h/Btu
- U-value = 0.036 Btu/h·ft²·F

Fig #44: typical classroom wall section

CLASSROOM WALL

- 2x4 steel studs with batt insulation
- Air & vapor barrier
- Mineral wool insulation
- 1/2" gypsum
- Stucco finish coat
- Stucco skim coat
- 8" CMU solid grout
- Skim coat
- Stucco
- Envelope Design
- Structural Systems
- Mechanical Systems
- Financiual Feasibility
- Construction
- Resilience
- Architecture
- Comfort & Env. Quality
- Innovation
RAINWATER CAPTURE & REDUCED WATER USE

WATER CYCLE & RAINWATER COLLECTION

<table>
<thead>
<tr>
<th>Collection surface: 23,000 sq.ft</th>
<th>Avg. annual rainfall: 10.34 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total rainwater collection potential:</td>
<td>148,000 gallons/yr</td>
</tr>
</tbody>
</table>

Rainwater collected on the roofs of clusters and community buildings runs off into water cisterns below the mechanical room of each cluster.

BASE CALCULATION

For schools with a cafeteria, a gym, no showers:

- 20 gallons/user x 380 users = 7,600 gallons
- 7,600 gallons x 180 school days in CA = 1,368,000 gallons/yr

LITTLE DIPPER ELEMENTARY

- Sinks: 380 users x 5 (amount of hand washes per user/day) = 1,900 (daily uses)
- 1,900 (daily uses) x 0.2 (duration) x 0.5 (flow rate) = 190 gallons
- 190 gallons x 180 (school days in CA) = 34,200 gallons/yr

- Drinking + Cooking: 380 users x 180 (school days in CA) x 2 gallons = 136,800 gallons

**TOTAL (per year):**

34,200 gallons + 136,800 gallons = 171,000 gallons/yr

**TOTAL (per day):**

171,000 g/yr / 180 (school days in CA) / 380 users = 2.5 gallons/user/day

Composting toilets: https://www.go-gba.org/resources/green-building-methods/composting-toilets/
https://bullittcenter.org/2012/06/14/composting-toilets-at-the-bullitt-center/
https://serc.carleton.edu/integrate/teaching_materials/energy_sustain/student_materials/composting_toil.html
https://peng-future.org/roc/case-studies/perkins-seed-classroom/#place
Kitchen appliances: https://unifiedbrands.net/equipment-by-brand/

Fig 44B : water use summary
Students maintain classrooms low maintenance active systems

Student participation in daily maintenance and operations is integrated into the curriculum. This minimizes custodial responsibilities, thus reducing maintenance cost.

Exclusive use of native vegetation reduces maintenance cost due to their climatic adaptation.

The low-impact active systems in the classrooms have few moving parts and require little maintenance or repairs.

The community buildings use low-cost, durable industrial materials inspired by the local vernacular. This means that maintenance and repairs can be contracted locally.

Passive systems require little maintenance and help reduce energy consumption/operations cost.

Outdoor circulation reduces maintenance and operations costs by minimizing the square footage of enclosed, conditioned space.

**SAVINGS:** $15-25%

**SAVINGS:** 26-50%

**SAVINGS:** 50%+

**SAVINGS:** $1

**SAVINGS:** $$

**SAVINGS:** $$$

**SAVINGS:** $5

**SAVINGS:** $3

**SAVINGS:** $6

CAPEX: Construction Cost

OPEX: Operations + Maintenance Cost

Fig #50: Native species

Fig #49: Financial feasibility strategy
In addition to using easily sourced, low-cost materials, classrooms are prefabricated off-site. This results in a significant reduction in labor and material cost.

**FINANCIAL FEASIBILITY**

**Construction Cost**
- Material cost: $2-3M
- Systems cost: $700K-1M
- On-site labor + transportsations cost: $500-800K
- Off-site labor savings: $75-150K

**CONSTRUCTION COST ESTIMATE**
- Total: $3-4.75M
- $130-207/sf

**PREFABRICATED CLASSROOM**

Fig #61: Prefabricated classroom (see appendix)
THE SITE FUNCTIONS UNDER DIVERSE CIRCUMSTANCES, THIS CAPABILITY TO ADAPT EDUCATES USERS ON HOW TO SUPPORT EACH OTHER DURING DIFFICULT TIMES, ONE PART OF THE STUDENTS’ JOURNEY TO BECOME RESPONSIBLE STEWARDS OF THE ENVIRONMENT.
SHELTER FOR COMMUNITY

For families living on ranches isolated in the mountains

For students and staff who use and maintain the school

For government staff and truck drivers who might be far from home

For citizens in Tecate, Mexico who might not have adequate shelter

Fig #64: Community routes to the site
STORING ENERGY

Gym’s mechanical room: excess solar energy from a select unit of PV panels is stored in solar batteries.

Battery reserve excess energy flow path

Common excess energy flow path

Battery → Inverter → E-Panel → Meter → Grid
SITE SECURITY

site security: various panel ends can be chosen to provide security to the clusters.

- Secure wall edges: The solid edges of the clusters act as the primary security barrier. These planes do not allow for any type of egress or entry, therefore making points of access clear and monitor-able.  
  - Indicates secure cluster
  - Indicates secure site

- Optional end panels: Constructed from a modular system of simple frames, various frame infill panels can be chosen depending on what is desired by the users to secure unenclosed edges.  
  - Indicates secure egress location

- Visual transparency: Monitoring the students and the surroundings is an important method of security, not only in the case of outside threat, but for daily safety of students. Limiting places to hide or narrow hallways, a sense of safety through transparency is created.
IMPACT ON GLOBAL WARMING

Measured in kg CO2e, Fig# describes the distribution of greenhouse gas (GHG) emissions by life cycle stages. Fig# describes the distribution of GHG emissions by material classification and Fig# by specific material. These two metrics are combined in Fig# for a holistic view of global warming contribution within the project.

Fig #68: Global warming sankey diagram

Fig #69: Global warming pie charts

Fig #70: Global warming bubble chart
INTENTIONAL RELATIONSHIPS BETWEEN BUILDING AND OBJECTS TEACH STUDENTS THE VALUE OF INTERACTION AND COLLABORATION, ONE PART OF THE STUDENTS’ JOURNEY TO BECOME RESPONSIBLE STEWARDS OF THE ENVIRONMENT.
**Architectural Zones**

### Student Learning Area
- Size: +/- 36,795 sf
- Features: +/– 1,567 sf
- Held: +/- 26,232 sf

### Community Use Area
- **Learning Zone**
- **Play Zone**
- **Primary Classroom Zone**
- **Secondary Classroom Zone**
- **Primary Cluster Zone**
- **Secondary Cluster Zone**
- **Primary Community Zone**
- **Secondary Community Zone**

---

**Fig #73: Zones of Use Diagram**

- **Solar Decathlon - Little Dipper Elementary**
- **POLARIS - University of Oregon**
SPATIAL ZONES

sheltered exterior area | 8,516 sf
interior area | 22,600 sf

Fig #74: spatial zones diagram
GROUND COVER

<table>
<thead>
<tr>
<th>Ground Cover Type</th>
<th>Coverage Area</th>
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<tbody>
<tr>
<td>dirt/no intervention</td>
<td>101,577 sf</td>
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<td>grass/sod</td>
<td>25,674 sf</td>
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<tr>
<td>tree(s) + gravel</td>
<td>13,940 sf</td>
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<tr>
<td>planted + rocks</td>
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<tr>
<td>concrete</td>
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Fig #75: ground cover diagram
CREATING PLACE FOR COMMUNITY

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<th>Metric</th>
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<tr>
<td>Envelope area</td>
<td>39,968 sf</td>
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<td>Volume</td>
<td>226,055 ft³</td>
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<tr>
<td>Window area</td>
<td>2,493 sf</td>
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<tr>
<td>Wall area</td>
<td>9,590 sf</td>
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<tr>
<td>Skylight area</td>
<td>612 sf</td>
</tr>
<tr>
<td>Floor area</td>
<td>11,682 sf</td>
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Table #18: Community cluster metrics

Fig #78: Community cluster plan
Flexible elements: things like sliding walls, movable storage, and flippable panels give students and staff the opportunity to adapt their learning space to fit their needs while being simple to use.

Photovoltaic: pv panels on the roof of the clusters provide enough energy to send power to the grid during low occupancy times like summer, allowing net zero to be achieved even if power has to be taken from the grid during peak hours. Select panels send energy to battery storage in case of disaster or power outage.

Skylight: ample daylighting allows for users to enjoy light filled spaces while reducing energy loads.

Solar Decathlon - Little Dipper Elementary
POLARIS - University of Oregon
INTERACTIVE RELATIONSHIPS

<p>| | | | |</p>
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<tr>
<th></th>
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<td>exterior circulation</td>
<td>2,153 sf</td>
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<td>2,153 sf</td>
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<tr>
<td>total enclosed area</td>
<td>3,486 sf</td>
<td>3,486 sf</td>
<td>3,486 sf</td>
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<tr>
<td>(1) classroom</td>
<td>782 sf</td>
<td>782 sf</td>
<td>782 sf</td>
</tr>
<tr>
<td>mechanical room</td>
<td>116 sf</td>
<td>116 sf</td>
<td>116 sf</td>
</tr>
<tr>
<td>restroom</td>
<td>242 sf</td>
<td>242 sf</td>
<td>242 sf</td>
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Table #19: classroom cluster metrics
play objects: students have the opportunity to use their imagination and explore their spatial surroundings through large scale objects that invite climbing without telling how exactly to climb.

being net-zero is so cool!

rainscreen + cooling pond: evaporative cooling

sunshade: operable, users to manually adjust as needed

open air circulation: circulating outside not only reducing the energy load on buildings, but reconnects users to their community and context, fostering awareness of their surroundings

panelized movable display wall: interactive pin-up space between classrooms provides a place to share work and provide a sense of privacy while maintaining transparency between classes.
CELEBRATING PASSIVE SYSTEMS

- photovoltaic: harvest enough energy to support class systems
- monitor: primary lighting for classrooms
- clouds: light control + facilitate student awareness of systems
- rainscreen + cooling pond: evaporative cooling
- chilled beams: temperature control for cooling degree days
- play objects: elements to move around and use in different ways
- flexible elements: provide variety of space configurations
- massing walls: use of thermal lag to regulate temperature swings
- radiant floor: temperature control for heating degree days
- green wall: evaporative cooling + potential for edible harvests
- ventilation recovery center: control fresh air

**Table #20: classroom unit metrics**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>envelope area</td>
<td>2,761 sf</td>
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<tr>
<td>volume</td>
<td>9,345 ft³</td>
</tr>
<tr>
<td>window area</td>
<td>332 sf</td>
</tr>
<tr>
<td>wall area</td>
<td>865 sf</td>
</tr>
<tr>
<td>skylight area</td>
<td>150 sf</td>
</tr>
<tr>
<td>floor area</td>
<td>782 sf</td>
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</tbody>
</table>

**Fig #84: classroom axon**

Solar Decathlon - Little Dipper Elementary
POLARIS - University of Oregon
i like moving my desk around!

it's fun to push the walls into place!

the sun changes so much during the day!
ENGAGING OPERATIONS, STUDENTS LEARN HOW CLIMATE CONTROL WORKS BY DIRECT INTERACTION, ONE PART OF THE STUDENTS’ JOURNEY TO BECOME RESPONSIBLE STEWARDS OF THE ENVIRONMENT.
REGULAR CONTROLS
A CONNECTION WITH THE LOCAL COMMUNITY BENEFITS EVERYONE WHEN ALL STAKEHOLDERS AIM TO BECOME RESPONSIBLE STEWARDS OF THE ENVIRONMENT.
CONSTRUCT - A - CLASSROOM

Fig #90: Classroom construction (see appendix)

Prefabricated
Site Specific
Community Engagement

Fig #91: Classroom catalog (see appendix)

Solar Decathlon - Little Dipper Elementary
POLARIS - University of Oregon
7 MARKET POTENTIAL

Prefabricated
Site Specific
Community Engagement

6 COMFORT & ENV. QUALITY

9 INNOVATION

1 ENERGY PERFORMANCE

2 ENGINEERING

3 FINANCIAL FEASIBILITY

4 RESILIENCE

5 ARCHITECTURE

6 OPERATIONS

BUSINESSES KEY

394 FT EVANART: Steel fabricator
1.2 MI CEMEX: Concrete manufacturer + supplier
1.3 MI SMI SAND: Building materials supplier
1.4 MI BAJA ROCK: Landscape designers
1.6 MI DIAZ CONSTRUCTION: Building materials supplier
2.1 MI EMC: Commercial HVAC Contractor
2.3 MI MG TALLER: Electrician
4.1 MI WESTSTAR: General contractors

Fig 9-4: potential collaborators
Daylighting Analysis
Acoustic Performance/ Design
Indoor Air Quality

ENGINEERED SYSTEMS ON DISPLAY TEACH STUDENTS THE REALITY OF HOW BUILDINGS PROVIDE SHELTER, ONE PART OF THE STUDENTS’ JOURNEY TO BECOME RESPONSIBLE STEWARDS OF THE ENVIRONMENT.

DGP = 19% (Imperceptible)

Fig #95: classroom daylighting

Solar Decathlon - Little Dipper Elementary
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CLASSROOM CLUSTERS

DAYLIGHT FACTOR % ANALYSIS
100% workplane area above DF threshold (5%)

RADIATION ANALYSIS - EXTERIOR
- winter solstice
- equinox
- summer solstice

Fig #96: classroom radiation analysis

Daylighting Analysis
Acoustic Performance/ Design
Indoor Air Quality

COMFORT & QUALITY

ENERGY PERFORMANCE
ENGINEERING
FINANCIAL FEASIBILITY
RESILIENCE
ARCHITECTURE
OPERATIONS
MARKET POTENTIAL

ENERGY PERFORMANCE
ENGINEERING
FINANCIAL FEASIBILITY
RESILIENCE
ARCHITECTURE
OPERATIONS
MARKET POTENTIAL

Solar Decathlon - Little Dipper Elementary
POLARIS - University of Oregon
COMMUNITY CLUSTER

DAYLIGHT FACTOR % ANALYSIS

100% workplane area above DF threshold (5%)

RADIATION ANALYSIS - EXTERIOR

winter solstice     equinox     summer solstice

Fig #57: community cluster radiation analysis
AUDIBLE EXPERIMENTS

0.6 RT (reverberation time)
Acoustic clouds raised high enough to not interfere with ball sports, but absorb play sounds.

0.45 RT
Acoustic clouds lowered to reduce reverberation for conversation or assemblies.

1.2 RT
Acoustic clouds pulled to the very top of the space to create a live sound, good for orchestral concerts.

Fig #98: community acoustic operations
**COMFORT & QUALITY**

Daylighting Analysis
Acoustic Performance/ Design
Indoor Air Quality

**MARKET POTENTIAL**

Architectural Design
Market Potential

**ARCHITECTURE**

Operations
Market Potential
Architectural Design

**INNOVATION**

Operations
Market Potential
Architectural Design

**RESILIENCE**

Operations
Market Potential
Architectural Design

**ENERGY PERFORMANCE**

Operations
Market Potential
Architectural Design

**ENGINEERING**

Operations
Market Potential
Architectural Design

**FINANCIAL FEASIBILITY**

Operations
Market Potential
Architectural Design

**FINANCIAL FEASIBILITY**

Energy Performance
Financial Feasibility

**ENGINEERING**

Operations
Market Potential
Architectural Design

**FIG #100**: Nightflush cooling diagram

**FIG #101**: Material swatches

**FIG #102**: Monitor axon - ventilation

**REDD LIST**

Living Building Challenge
Red List Materials & Chemicals

- Allylphenals
- Asbestos
- Bisphenol A (BPA)
- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated Polyethylene
- Chlorobenzenes
- Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs)
- Chloroprene (Neoprene)
- Chromium VI
- Chlorinated Polyvinyl Chloride (CPVC)
- Formaldehyde (added)
- Halogenated Flame Retardants (HFRs)
- Lead (added)
- Mercury
- Polychlorinated Biphenyls (PCBs)
- Perfluorinated Compounds (PFCs)
- Phthalates
- Polyvinyl Chloride (PVC)
- Polyvinylidene Chloride (PVDC)
- Short Chain Chlorinated Paraffins
- Wood treatments containing Creosote, Asbestos, or Perchlorophenol
- Volatile Organic Compounds (VOCs) in wet-applied products

**Non-toxic, VOC free wood sealer for flooring**

**100% Wool Carpet for classrooms**

**Non-toxic, VOC free concrete sealant**

**EcoDeco® VOC free stucco product**

**AFM Safecoat zero-VOC interior paint**

**Tinted milk paint for colored elements**

**Solar Decathlon - Little Dipper Elementary**

**Polaris - University of Oregon**
INTENTIONAL SPACES AND INTERACTIVE SYSTEMS CREATE AN ENVIRONMENT OF HANDS-ON LEARNING, A COHESIVE GUIDE ALONG THE STUDENTS’ JOURNEY TO BECOME RESPONSIBLE STEWARDS OF THE ENVIRONMENT.
INSPIRED BY SUCCESS

MATERIALS
- Responsible Materials
- No Red List Materials
- Responsible Sourcing
- Living Economy Sourcing
- Net Positive Waste

WATER
- Responsible Water Use
- Net Positive Water

ENERGY
- Energy + Carbon Reduction
- Net Positive Carbon

HEALTH & HAPPINESS
- Healthy Indoor Environment
- Healthy Interior Performance
- Access to Nature

PLACE
- Ecology of Place
- Urban Agriculture
- Habitat Exchange
- Human-Scaled Living

BEAUTY
- Beauty + Biophilia:
  Inspiration + Education:

EQUITY
- Universal Access
- Inclusion

INNOVATION
- Living Building Challenge
- Kit of Parts
- Specimens on a Field
- Interactive Relationships

INSPIRED BY SUCCESS

- Solar Decathlon - Little Dipper Elementary
- POLARIS - University of Oregon

Fig #103: Living building challenge axon
INNOVATION

Living Building Challenge
Kit of Parts
Specimens on a Field
Interactive Relationships

PRE-FAB VS SPECIFIC

Fig #105: pre-fab vs site specific construction
BREAKING DOWN COMPLEX IDEAS

CLOUD UP + LIGHT ON
Maintain general lighting conditions in response to daylighting

CLOUD DOWN + LIGHT ON
Illuminate detail oriented tasks with more direct light

CLOUD UP + LIGHT OFF
Diffuse daylighting with cloud for even interior illumination

VENTS OPEN
Facilitate ventilation and heating through vents

Living Building Challenge
Kit of Parts
Specimens on a Field
Interactive Relationships
being net-zero is so cool!

heating mode

talking / listening

i like moving my desk around!

It's fun to push the walls into place!

the sun changes so much during the day!

i can see the mountains from here!

whatcha reading about?!

global warming!

I like moving my desk around!

It’s fun to push the walls into place!

the sun changes so much during the day!

whatcha reading about?!

global warming!

i can see the mountains from here!

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global warming!
REFLECTION
HOW CAN DESIGN INSPIRE CHILDREN TO BE RESPONSIBLE STEWARDS?
Thank You

U.S. Department of Energy
Solar Decathlon Organizers
Solar Decathlon Jurors

Ihab Elzeyadi
University of Oregon
Net-Zero studio Winter 2020 and reviewers

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Katherine Marple
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