



**35th ANNUAL CONFERENCE ON
SCHOOL FACILITIES HIGH PERFORMANCE STRAND**

Sustainable Post Occupancy Transition

...Herding **CATS Contractors
Architects
Teachers
Staff**

PANELISTS

Michal Healy

- Director of Facilities (Marysville Joint Unified School District)
- CHPS Operations and Metrics Committee

Julia Kistle

- Facilities Planner/Construction Supervisor (Chico Unified School District)
- CHPS projects post occupancy / Lessons learned

Anna Klovstad

- Sustainability & Project Supervisor (Tahoe Truckee Unified School District)
- Focus on District wide energy savings

MODERATOR

Rob Samish, AIA

- Senior Associate K -12 (Lionakis)
- CHPS Operations and Metrics Committee Chair



WHAT THIS SESSION IS ABOUT

1. Focus on the handoff from Design/Construction to Occupancy
 - Post Occupancy studies point to difficulties



Post Occupancy Survey: Agenda

Where have we come from?

What is the reality today?

- What's working?
- What can be improved?
- Lessons we've learned?

Roseville High School Modernization

WHAT THIS SESSION IS ABOUT

1. Focus on the handoff from design/construction to occupancy
 - Post Occupancy studies point to difficulties
2. CHPS National Criteria Zeroes in on the Transition phase
Compiling best practices - Michal
3. Hear from our three Districts: different approaches, efforts, stories and resulting best practices - All
4. Gain insights in the latest research in behavior change and how it plays a profound role in these efforts - Rob

Acknowledgement to Lindsay Baker



WHY WE TALK ABOUT BEHAVIOR

- “The building was designed to perform well, but the occupants keep messing with things...”
- Automated controls aren’t working for you
- You need a higher level of comfort for occupants
- You believe occupants should have a relationship with their buildings

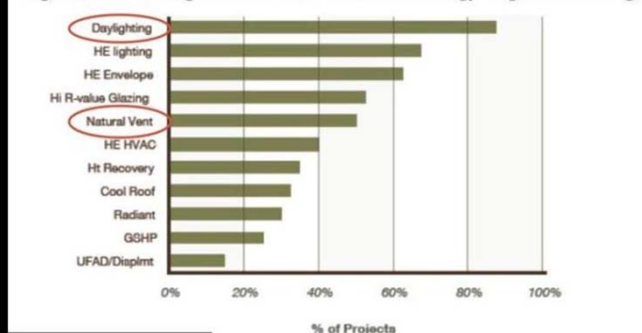
Occupants are tricky



WHY WE TALK ABOUT BEHAVIOR

Getting to net zero/positive impact...

Figure 3: Technologies used in ZEB and Zero Energy-Capable Buildings



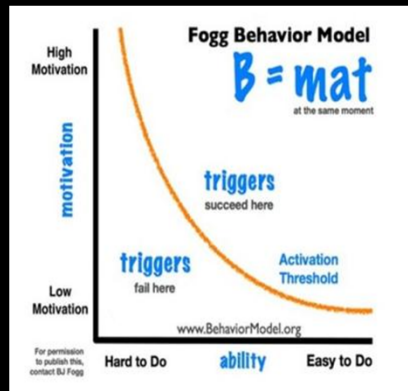
Research and graph courtesy of New Buildings Institute study on the 21 NZEBs: “Net Zero by 2030: Where do we stand with the policies, programs and projects necessary to achieve this goal?”



THE POPULAR PRESS...



SCIENTIFIC MODELS OF BEHAVIOR CHANGE



- Learning Theories (Skinner/Pavlov)
- Theory of Reasoned Action (Ajzen & Fishbein, 1975)
- Theory of Planned Behavior (Ajzen, 1991)
- Transtheoretical Model (Prochaska & DiClemente, 1997)
- Value/Belief/Norm Theory (Stern, 1999)

B.J. Fogg Behavior Model



MOTIVATION, ABILITY, TRIGGER

Motivation:

People need to WANT to act

Ability:

People need to BE ABLE to ACT (and know what exactly to do)

Trigger:

There needs to be a trigger, a clear request

Context (instead of Trigger):

Emphasizes the environmental aspects of changing behavior



MOTIVATION: What we know about people

Even if we care about doing the right thing...

- We don't always know what it is
- It isn't our highest priority

Decision Fatigue

- Finding the sweet spot between too much information and not enough

The goal is to make interactions with building systems **Comfortable** and **Habitual**



MOTIVATION:

Education

- Peer pressure
- Identifying with environmental causes
- Dispelling myths and rumors
 - Dummy thermostats
 - Overstated claims of impacts

Persistence

- Competitions
- Incentives
- Making habits
- Open communication



MOTIVATION: Getting the tone right

Persistent

Prize-oriented, extreme competitions can often leave people exactly where they started.

Positive (but not saccharin)

"Many organizations have managed to reduce energy use by 20% or more, when everyone helps out, from facilities staff to custodians to employees."

Jargon-free

"Leaving your monitor on at night is equivalent to **5 pounds of coal burned** per year!"

Respect, not patronizing

Avoid: "Save the planet, turn off your monitor"

Avoid: "Turning off lights is simple! Just make sure every time you leave a room, you turn off the lights!"

Collaborative, avoiding blame

Avoid: "We've taken a big risk and investment in these top-of-the-line waste bins. Now we just need you to do your part to put everything in the right bin."

Connect with people on the things they care about

pop culture references, use **humor**



ABILITY: Usability, Legibility

Which is better?



Behavior of Operators, not just Occupants

Are Occupants comfortable to begin with?



ABILITY: Waste Disposal

What does this mean for designers? ...Be occupant-focused



34% improvement in diversion rate with intuitive design



TRIGGER

CONTEXT: Setting Defaults

Educate

"In 2011, we used 6758 gallons of water per Googler in Mountain View! This year, we are hoping to reduce by 250 gallons per Googler. That would be a 3.6% decrease in water consumption."

Suggest specific actions (*where possible, defaults*)

"If you could eat it, it can be thrown into the compost."

"To turn this light off, hold down the button for 2 seconds. Otherwise it stays on and wastes energy!"

Make the behavior you want as easy as possible

Simple. Intuitive. Repeat with Variation.



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SCHOOL FACILITIES HIGH PERFORMANCE STRAND**

**Post Occupancy
and
CHPS**

**Michal Healy, Director of Facilities
Marysville Joint Unified School District**



OVERVIEW

- Collaboration for High Performance Schools (CHPS)
 - Operations and Metrics
 - New category within CHPS
 - Focuses on Post Occupancy - the people who take care of the building, use the building, and plan for future buildings
 - How districts can use this to their advantage
 - Why did CHPS do this?
 - Lessons Learned
 - Revisit the site more than once and talk to staff
 - Think creatively to solve problems
 - Know the personalities of the people you are training and who they will respond to most effectively




NEW CLASSROOM BUILDINGS



Johnson Park Classroom Building






CHPS OPERATIONS AND METRICS

Prerequisite:

- Facility Staff and Occupant Training
 - Training for maintenance, grounds, teachers, administrators, custodians, school secretary, and STUDENTS!
 - Take employees on a tour during construction
 - Encourage them ask questions

Credits:

- Post Occupancy Transition Survey
 - Ask all users about their experiences with the building – good and bad
 - Retrain / Explain



CHPS OPERATIONS AND METRICS



Credits:

- High Performance Operations
 - CHPS Operations Report Card
 - Designate a permanent energy and water manager
 - Designate a school-based advocate who teaches and promotes behavioral change



CHPS OPERATIONS AND METRICS

Credits:

- Systems Maintenance Plan
 - Identifies the regularly scheduled preventative and routine maintenance for equipment
- HVAC
- Hot Water Systems
- EMS
- Lighting Controls
- Greywater Systems
- Plumbing Systems
- Fire Sprinklers/
Tanks



Dobbins Fire Water Tank and Pump House

MJUSD POST OCCUPANCY

- Verify staff know how to use the installed equipment and that it works as intended

- AV Lights
- Projector
- Audio System
- Mechanical Window Coverings
- EMS Door Sensors
- Daylight Sensors
- HVAC Displacement Ventilation



Yuba Feather Classroom

MJUSD TROUBLESHOOTING

- Identify the problem
 - Be specific
- Define the problem
 - Analyze
- Formulate a plan
 - Dialogue, brainstorm, seek other perspectives
- Choose a solution
 - Select the most appropriate person to implement that solution
- Follow-up
 - Acquire feedback from your team and from the school site



MARYSVILLE JOINT UNIFIED SCHOOL DISTRICT

Michal Healy

Architect, LEED AP BD+C

Director of Facilities

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Design & Construction to Occupancy

**Julie Kistle, Facilities Planner-Construction Supervisor
Chico Unified School District**



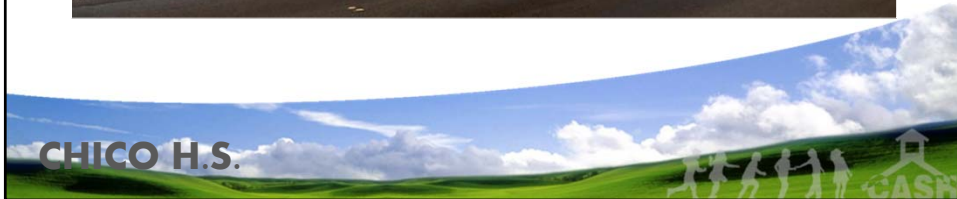
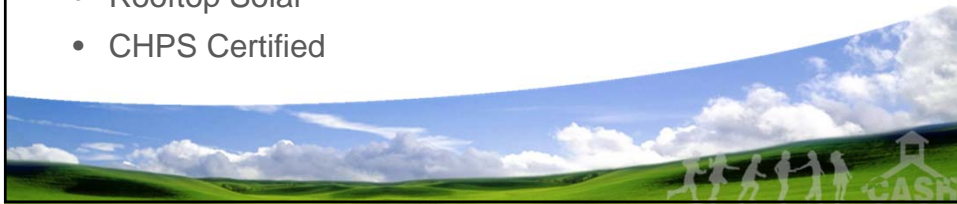
OVERVIEW

- Discuss two CHPS designed projects and the post occupancy results of the following systems:
 1. Daylighting
 2. HVAC Systems
 3. Landscaping
 4. Educational Displays



CHICO HIGH SCHOOL HP FEATURES

- Two-Story Classroom Building – 21 Classrooms
- High Efficiency Displacement Ventilation HVAC System
 - Evaporative Cooling
- Architectural Exterior Sun Shading
- Occupancy Sensors for Lighting
- Drought Tolerant Landscaping
- Rooftop Solar
- CHPS Certified



PLEASANT VALLEY HIGH SCHOOL HP FEATURES

- Two-Story Classroom Building – 24 Classrooms
- High Efficiency Displacement Ventilation HVAC System
 - Evaporative Cooling
- Architectural Exterior Sun Shading
- Occupancy Sensors for Lighting
- Drought Tolerant Landscaping
- Future Solar in Parking Lot
- Fully Automated Window Shading System
- CHPS Certification in Progress



DAYLIGHTING

High Performance Feature:

- Architectural Sun Shading

South Face



North Face



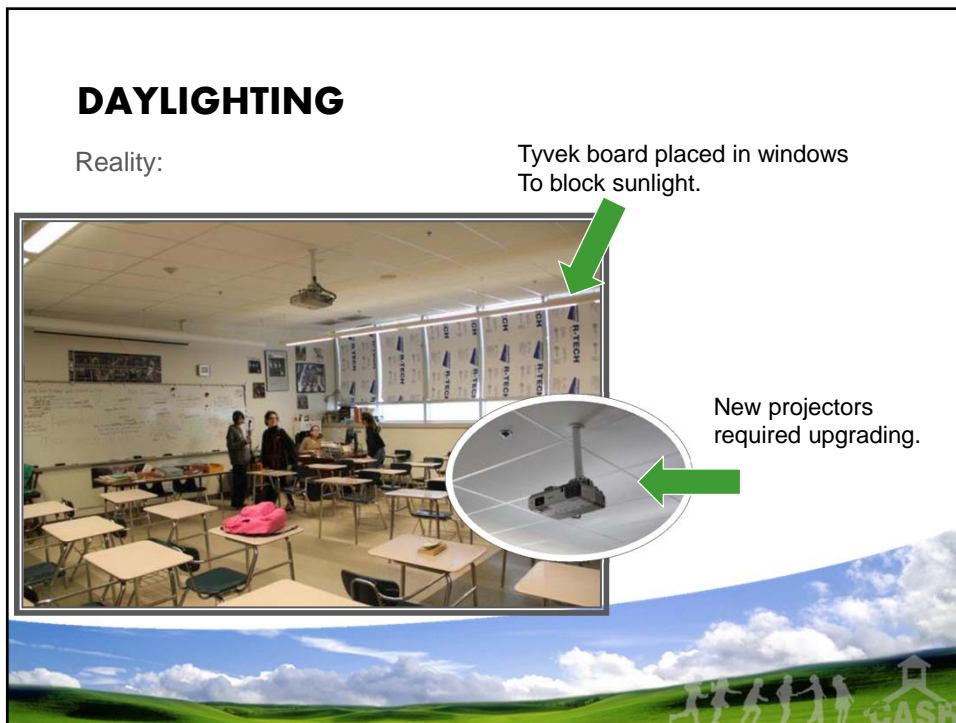
DAYLIGHTING

Reality:

Tyvek board placed in windows
To block sunlight.

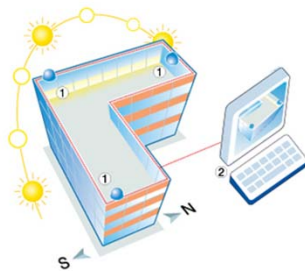


New projectors
required upgrading.



LESSONS LEARNED:

- Ultra Short Throw Projectors
- Fully Automated Window Shades
- Staff Training

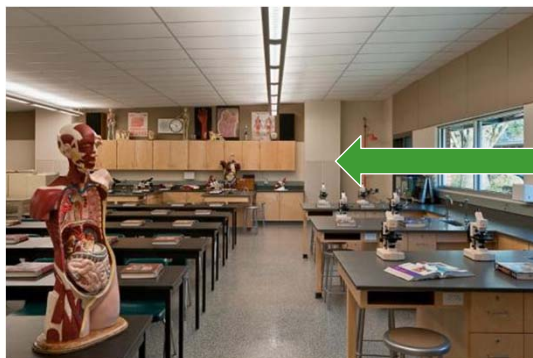


- Roof mounted sensors monitor sky conditions in real time.
- When cloudy, the shades are raised.
- When clear the shade position is adjusted according to the sun's angle in the sky.
- **CODE RED** switch shuts all window shades 100%.

HVAC SYSTEMS

High Performance Feature:

- Displacement Ventilation System
 - Very Quiet and Healthy Clean Air



Supply Air Diffuser

Reality:

- Effectiveness of system effected by blocked diffusers



Diffusers blocked with clutter and posters!

Lessons Learned:

- Communication is the key to successful implementation of this high performance feature.
- Staff training is critical.



LANDSCAPING

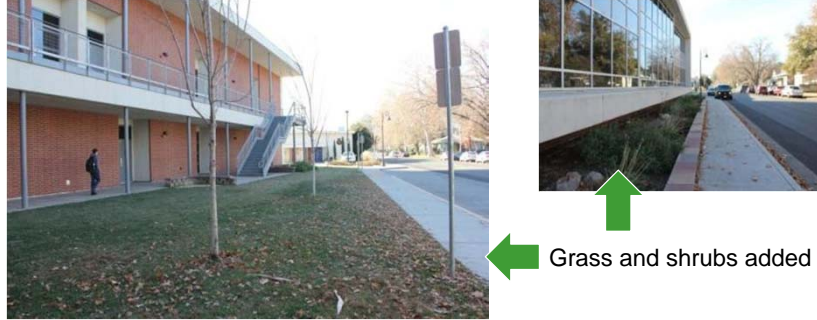
High Performance Feature:

- Drought Tolerant Landscaping



Reality:

- Plants died in the winter months
- In lieu of warranty replacement, school opted to re-landscape!



Lessons Learned:

- Communication is the key to successful implementation of this high performance feature.
- Staff training is critical.

EDUCATIONAL DISPLAYS

High Performance Feature:

- Enable users to learn about the high performance design elements of the building.

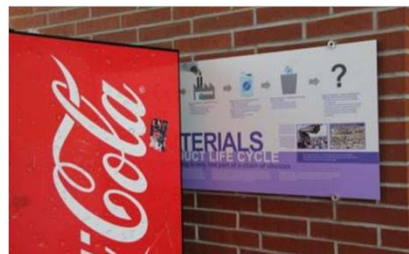




EDUCATIONAL DISPLAYS

Reality:

- Display is too wordy
- Display is not used for educational purposes!



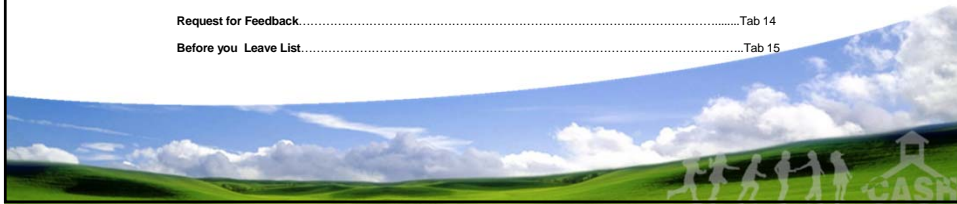
Lessons Learned: Learned

- Display should be interactive.
- Need to provide an immediate snapshot of the information being portrayed.

PLANS FOR TRAINING

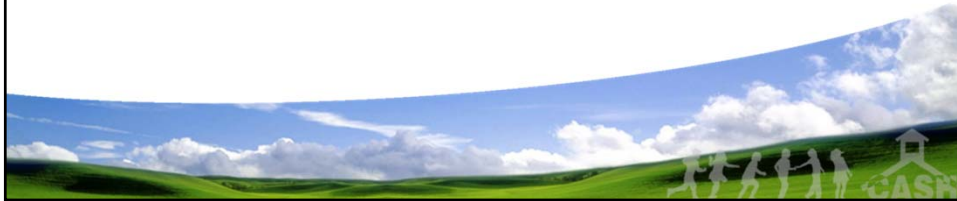
TABLE OF CONTENTS Yale Building Classroom User Manual

| | |
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| Lighting-Programming/Timing | Tab 1 |
| Window Coverings..... | Tab 2 |
| Audio/Visual and Wireless | Tab 3 |
| Elevator..... | Tab 4 |
| HVAC Setpoints/Schedule..... | Tab 5 |
| Water Bottle Filler..... | Tab 6 |
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| Book Storage..... | Tab 8 |
| Bike Storage..... | Tab 9 |
| Energy Savings Savings by Design..... | Tab 10 |
| Movable Wall..... | Tab 11 |
| Furniture and Floor Care..... | Tab 12 |
| Cabinets Keys and Locks..... | Tab 13 |
| Request for Feedback..... | Tab 14 |
| Before you Leave List..... | Tab 15 |



THANK YOU!

QUESTIONS?





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Tahoe Truckee Unified School District

Sustainable
Post Occupancy Transition
Anna Klovstad, C.E.M.



***SUSTAINABLE* POST OCCUPANCY TRANSITION**

Key components:

- Starts before occupancy
- Requires Diligence
- Involvement
- Training
- Documentation
- Reminders
- Thinking from the end
- Problems vs. opportunities

What is critical?

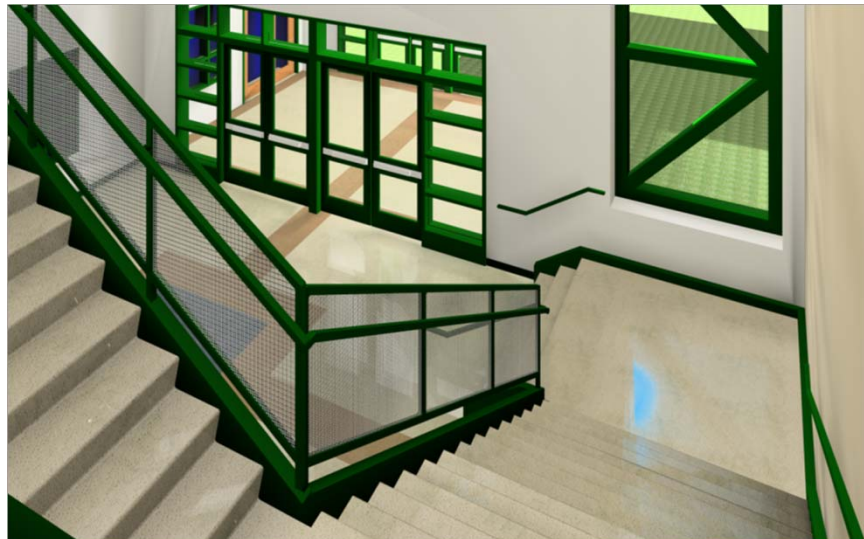
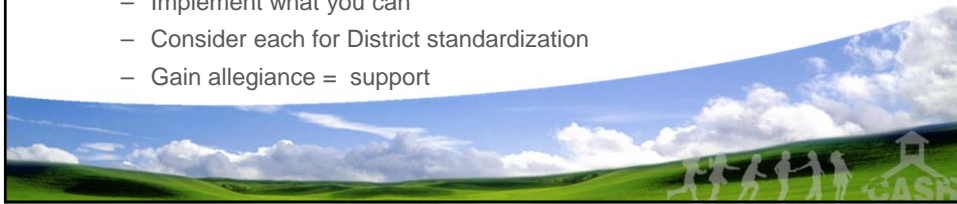
- Critical Training
- Critical Thinking
- Critical Involvement



TRAINING

~Best Practices~

- Start training during design
- Invite to design sessions:
Administration, Maintenance & custodial staff:
 - Find out what is important to them
 - Maintenance: Lights at AHU
 - Custodial: wanted certain kind of keyed light switch
 - Secretary: heat register on them
 - Administer: ability to see entrance from desk
 - Implement what you can
 - Consider each for District standardization
 - Gain allegiance = support

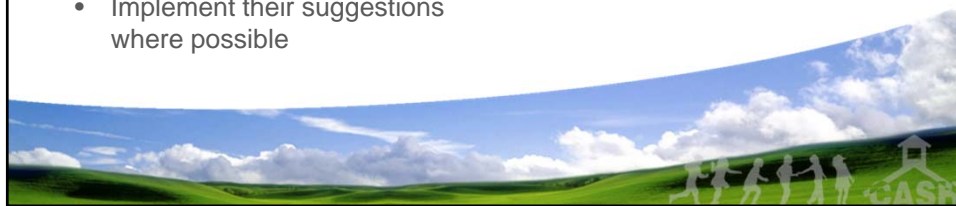


VISUAL AIDS FOR USERS



TRAINING DURING CONSTRUCTION

- Continue training during construction
- Do construction tours
 - Admin
 - Maintenance
 - Custodial
 - Staff
- Not everyone can read a set of plans
- Implement their suggestions where possible



OCCUPANCY TRAINING

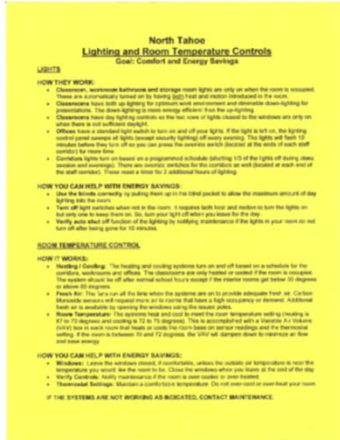
- Video tape trainings
- Have sign-in sheets
- Make it hands on where possible
- Test their knowledge



- Reference material:
 - Binder with training material
 - Design intent document
 - Single line diagrams
 - Lighting control schedule and zones
 - Shut off locations
 - Sequence of operations
 - Binder of materials list with samples and manufacturer contact info
 - Shut down procedure



PROVIDE A BUILDING USER GUIDE



One page overview of systems

- How the lighting works in the different spaces
- How the heating / cooling system works
- Window's and shades
- How the occupant can influence energy usage and savings through effective use of these systems

~I send this to new occupants every year~

REMINDERS

Beginning of each year:

- “Welcome back”
- Any updates / changes from summer projects
- Any continuing project info
- Who to contact with questions
- Work order system instruction
- Empower occupants to do something

(this requires responding to their comments / requests)

Mid Year:

- Notice of change from cooling to heating season and expected impacts
- Shut down procedures before holidays
- Report energy savings – keep them inspired
- Update on projects

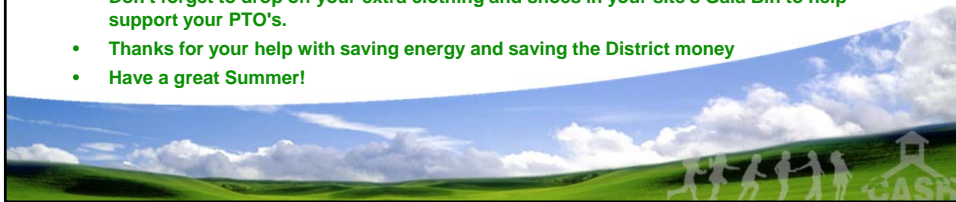
Repeat before summer vacation

BEFORE YOU LEAVE.....

- Thanks for your help in saving an additional \$35,000 last year. We now save approximately \$440,000 per year on gas and electricity plus an additional \$56,000 on disposal costs.

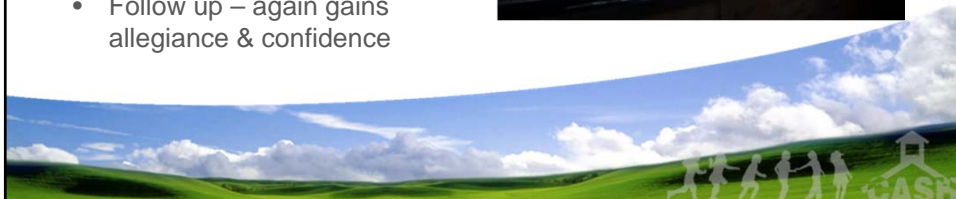
Let's keep it going - before you leave, please remember to:

- Unplug all computers, printers, copiers, scanners, appliances, cd players, chargers, and power strips.
- Turn off all lights, fans, space heaters, etc.
- Make sure your windows are tightly closed and your blinds are closed.
- Empty your refrigerators and unplug them if possible.
- Remind your co-workers to do the above.
- Custodians:
 - Please check each room for the above.
 - Make sure all exterior doors are tightly closed.
 - Notify me if rooms are warm next week (that means something is running when it should not be).
- Don't forget to drop off your extra clothing and shoes in your site's Gaia Bin to help support your PTO's.
- Thanks for your help with saving energy and saving the District money
- Have a great Summer!



PROCEDURES

- Work order system
- All should have access
- Develop a troubleshooting procedure (who, when, how)
- Must respond to each call or e-mail! No matter how small or silly or you teach indifference
- Thank the person each time they send a work order or notify you of an issue.
- Follow up – again gains allegiance & confidence





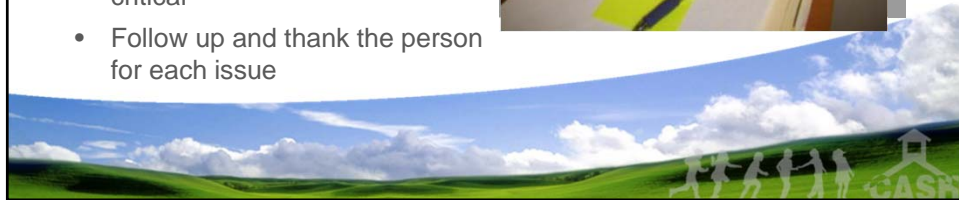
THINKING FROM THE END

- How will this be used?
- What can go wrong?
- Is there a back up plan?
- Is this the best we can do for efficiency?
- Should this system be automated or not?



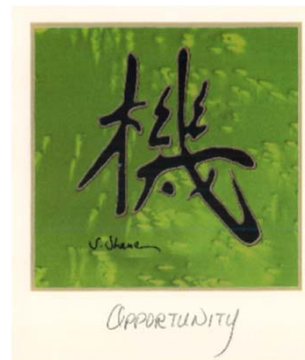
CRITICAL THINKING

- Teach the occupants to think
 - Did you turn up the thermostat?
 - Did you check the windows?
 - Has the custodian checked the boiler?
 - Is air flowing?
 - Is it plugged in?
- Respond to each – its critical
- Empower the occupant – to be critical
- Follow up and thank the person for each issue



PROBLEMS VS. OPPORTUNITIES

- Problems overwhelm, drain
- Seen as negative
- There are no problems.....
Just **opportunities**
- Opportunities – galvanize & inspire
- Look for the opportunity to improve:
 - Project
 - Procedure
 - The plan
 - Yourself



**“Strive for success,
not perfection”**

