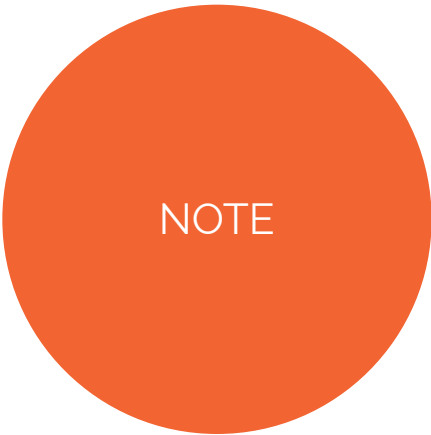




efargo

Energy Challenge 3.0

FOR TEACHERS



NOTE

efargo is a community-based, action-oriented, partnership between NDSU, the City of Fargo, Cass County Cooperative and Xcel Energy, created to make Fargo more energy efficient.

This booklet was developed to reduce energy use in municipal buildings. The K-12 Energy Challenge empowers the students, teachers, administrators and facility managers to reduce energy use in their school through educational projects and actions. Our goal is to reduce energy use throughout Fargo by educating and empowering our children to contribute their creativity, knowledge, enthusiasm and actions to create a better future for our community.

As a research group, efargo does not endorse any company or person selling or otherwise promoting products or services. Please feel free to contact us with any questions about efargo at info@efargo.org.



Opposite: Drawings of Waste-A-Watt by participants of Party for the Planet hosted by the Red River Zoo April 24, 2015.

© efargo 2017 www.efargo.org

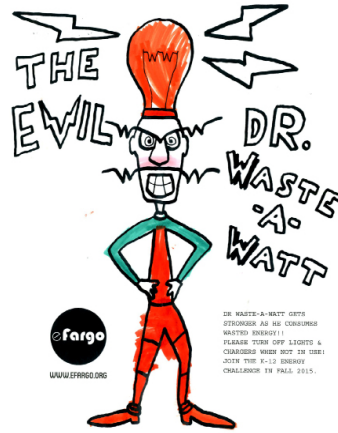
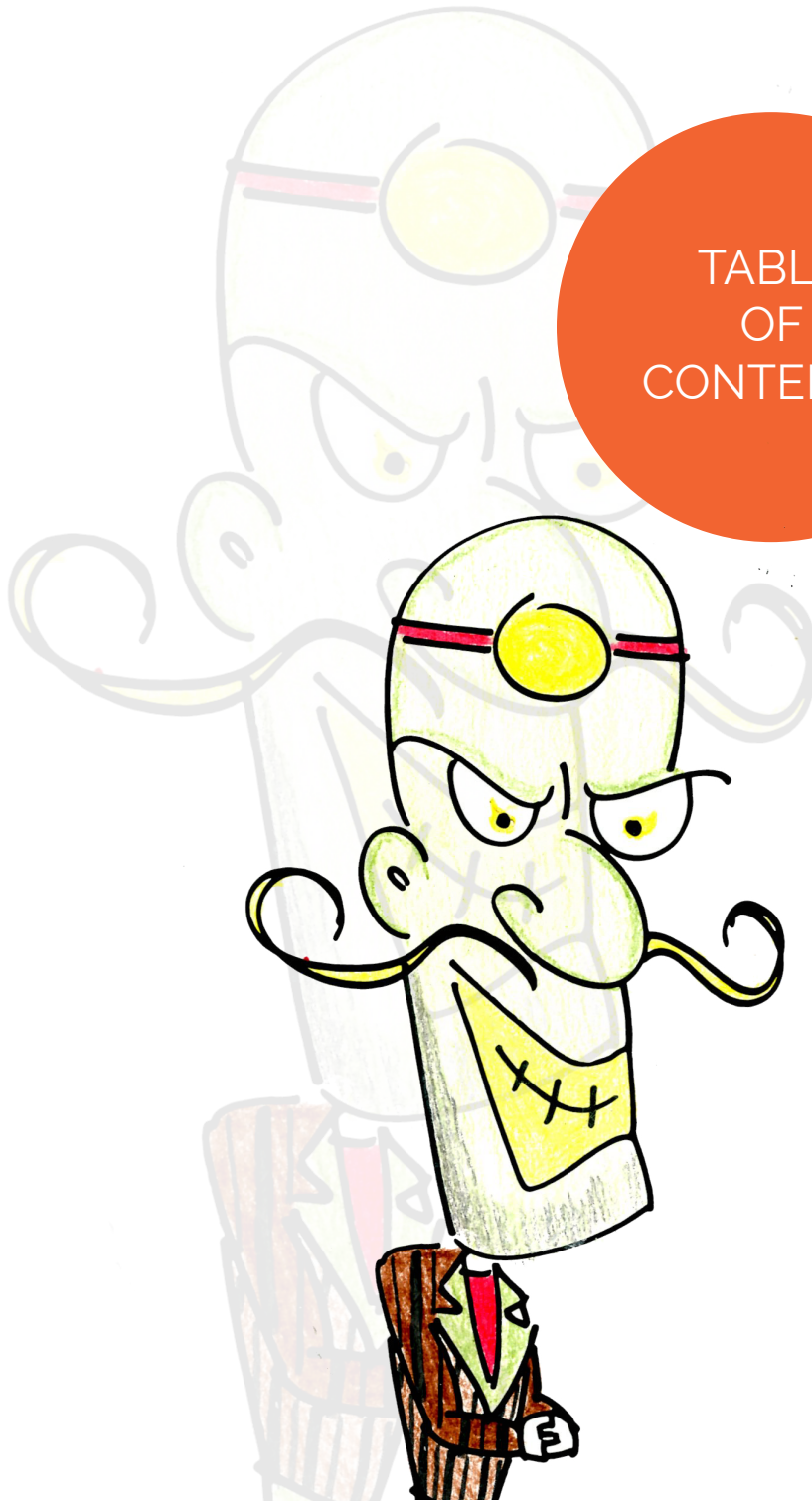


TABLE
OF
CONTENTS



OVERVIEW

5

Introduction

7

Waste-a-Watt's Story

9

Teachers' Roles

11

Proposed Timeline

ACTIVITIES

15

Bonus Activities

16

Lighting Activities

17

Devices Activities

18

Heating/Cooling Activities

MEET

19

Science Standards

DISCOVER

21

Online Resources



INTRODUCTION

CHALLENGE

All classrooms are invited to participate in a three-week energy-saving CHALLENGE organized by efargo to promote energy-efficiency and provide opportunities for the sustainability leaders of tomorrow.



GOALS

1. Educate students about the science of energy production, transmission, consumption, and resulting impacts.
2. Empower students to create and sustain change to their own environments through everyday energy-use practices.
3. Reduce the impact that our schools have on the environment by reducing energy use in school buildings.
4. Help Fargo become a more energy-efficient community.

TEAM

1. Class-based team (students, teachers, facilities managers and staff, principals, and administrators)
2. CHALLENGE events can be incorporated into a classroom activity or school-wide activity. Each school should have one **project champion** that is either a teacher, facility manager or administrator. We strongly encourage each classroom to also have a **student leader**.



RECOGNITION

A tree will be planted at a location chosen by the winning classroom.

If donations are received, all CHALLENGE participants will receive tree saplings.

Student leaders will receive recognition certificates.

WASTE-A-WATT'S STORY



Waste-A-Watt is a greedy super-villain who gains power from energy that is wasted. When energy is wasted throughout the city, Waste-a-Watt grows stronger. His goal is to make us waste more energy so he can become super-powerful and take over the city. Luckily, we have the ability to stop him in his tracks!



With efargo, we can dream and make possible an energy-saving Fargo where no energy is wasted! We can come together to end energy waste and stop Waste-A-Watt dead in his tracks before he conquers Fargo. As we waste less, he becomes weak. He is getting weaker due to energy savings in 2016 + 2017. Let's work to eliminate him!



All we need to do is make sure that we are not wasting energy. It can be as simple as turning the lights off when leaving a room or unplugging unused electronics.



efargo is inviting all schools to help defend the City of Fargo and surrounding community and defeat the evil Waste-a-Watt. Take the role of Energy Superheroines and Superheroes to push your class and your school to become more energy-saving. We have the power to make a big change!



TEACHERS' ROLES

TEACHERS AS HELPERS



Expect students to come to you for help when they see this apple next to an activity in their booklet.

Lighting, Devices, Heating/Cooling, and Bonus activities that require your help are listed on pages 15-18 of this booklet.

We recommend that you take a look at the students' book to see the rest of the activities that they will be engaged in!



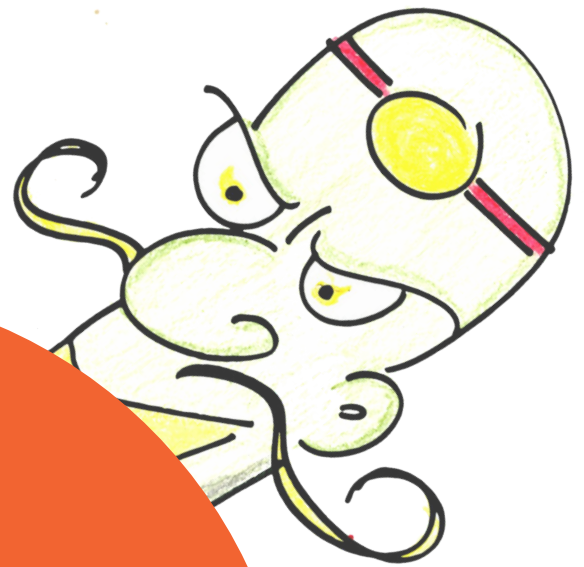
TEACHERS AS PHOTOGRAPHERS



While students are engaged in activities, we encourage you to observe and **take images** of them. These images help the efargo team evaluate how interested and involved students are in certain activities.

The efargo team would love to see how the CHALLENGE unfolds in your classroom!

Send images to: info@efargo.org



PROPOSED TIMELINE

PRE-GAME SURVEY

Ask students to fill out the surveys. The eFargo team will collect them at the end of the CHALLENGE. These surveys help us derive game statistics and efficiently redesign the ENERGY CHALLENGE.



These activities give your students bonus points!

WEEK 1

PREPARING & LEARNING

Help your students follow these events to prepare for the CHALLENGE!

MONDAY

1. SET UP:

Students will set up by hanging the game board up.

2. APPOINT A STUDENT LEADER:



Help your students appoint a student leader who will lead the entire class through this CHALLENGE.

1. Explain the leader's duties: helping record points, following the timeline, and tracking energy-use.
2. Ask interested students to write their names on a piece of paper and add it to the pile of other students' names.
3. Randomly pick a name -- that student will be the leader.

TUESDAY

3. VISUAL LEARNING:

These activities are intended to visually educate the students about areas of energy consumption and waste in a school environment.

Your students have 3 options (pg. 15) to pick from or they can choose to use all three!

VIRTUAL REALITY



ENERGY CARDS



ONLINE TOUR

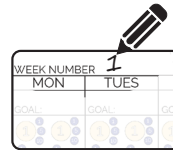


WEDNESDAY

4. SET GOALS:



Help your students set daily and weekly goals on the dashboard. Encourage them to aim for a large goal during the second week.



WEEK NUMBER	1	WEEKLY GOAL	170	
MON	TUES	WED	THURS	FRI
GOAL: 30	GOAL: 30	GOAL: 30	GOAL: 30	GOAL: 50

THURSDAY

5. EXPERT TALKS:



Energy-related local professional will deliver talks. After the presentations, engage the students by asking them what they learned from these talks.

6. TAG THE WASTE:



With what you've learned about energy waste so far, use the stickers in the game box to tag areas in your classroom that waste energy.

FRIDAY

7. TAKE A PLEDGE:



Ask your students to write on the board one way in which they intend to reduce their classroom's energy consumption to help defeat Waste-a-Watt.

8. HOME GAME:



Students can take this game home to play it with their families to learn about energy consumption in a home environment.

WEEK 2 PLAY

Suggested Daily Activities

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

-  Bonus pages 16-17
-  Lighting pages 18-19
-  Devices pages 20-21
-  Heating/Cooling pages 22-23

B10

L1 L2 L4

D1 D2
D3 D4

HC1
HC2
HC3

L1 L2

D1 D2
D3 D4

HC1
HC2
HC3

L1 L2 L3

D1 D2
D3 D4

HC1
HC2
HC3
HC4

L1 L2 L5

D1 D2
D3 D4
D6

HC1
HC2
HC3
HC5

L1 L2 L5

D1 D2
D3 D4
D5

HC1
HC2
HC3

Replace your dashboard with a new one from the box!

RECORD

1 point activity or action →

5 point activity or action →

10 point activity or action →

1-4 students participated →

5-9 students participated →

10+ students participated →

SCORE

WEEK NUMBER MON

GOAL: 30 GOA

1 1 1

5 5 5


10 10 10

10*5-15

This activity earned you 15 points total!

Total up your points daily and weekly!

SUBMIT



Send an image of your dashboard to eFargo!

WEEK 3 PLAY

Suggested Daily Activities

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY



Bonus
pages 16-17



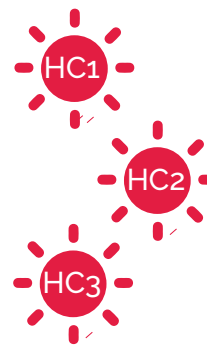
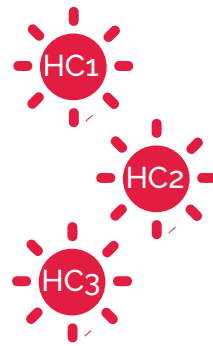
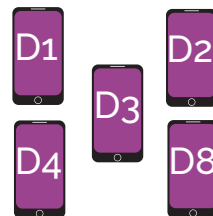
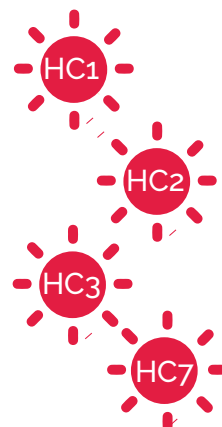
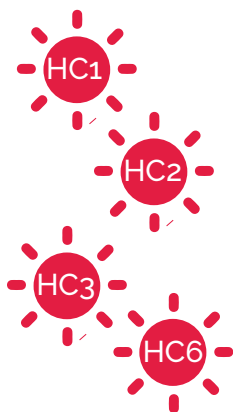
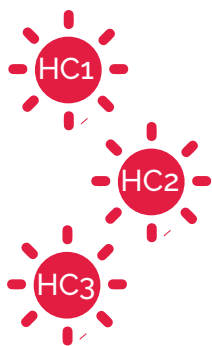
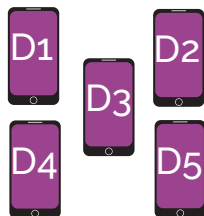
Lighting
pages 18-19



Devices
pages 20-21



Heating/
Cooling
pages 22-23



RECORD

1 point activity or action

5 point activity or action

10 point activity or action

1-4 students participated

5-9 students participated

10+ students participated

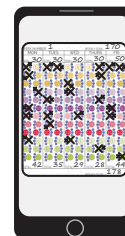
SCORE

Total up your points daily and weekly!

10*5=15

This activity earned you 15 points total!

SUBMIT



Send an image of your dashboard to efergo!

All the activities are listed in the students' booklet.

Bonus



POSTER CONTEST

B10

Help students create signs and posters that remind them and their classmates about energy saving actions. Hang these all around the school: in classrooms, rest rooms, gyms, etc. Teachers are encouraged to sketch and put up some posters too!

VIRTUAL REALITY

B2

Help your students scan the QR code with a mobile device and place it in the designated spot in the VR glasses.



ENERGY CARDS

B3

Help your students align the cards to create a continuous panoramic view.

ONLINE TOUR

B4

Help your students access this online link and walk through the tour with them:

efargo.org/360



CLASSROOM DESIGN

L5

Help your students re-arrange the desks and chairs to maximize natural day-lighting. They can orient their desks toward windows to minimize the use of lighting throughout the day. After your design rearrangement, try to switch off a few lights to show students the direct energy saving result of re-designing their classroom.

LIGHT BULB COMPARISON

L6

This activity is intended to help students compare incandescent, CFL, and LED bulbs along with their respective energy use, costs, and carbon emissions.

1. Open this link: <https://climatekids.nasa.gov/light-bulbs/>
2. Project it for the students on the board or make print outs for them.
3. Read through it with them to help them learn about the different types of light bulbs.
4. Encourage the students to go around the room/school and identify the different types of light bulbs used.



KILL-A-WATT METERS

D8

This activity will help students learn about the amount of electricity being used by a device when it is turned on and off. Kill-a-Watt Meters are devices that can measure, monitor, and assess how efficient your appliances are. Bring to the students' attention how a device like this can help cut down on electricity bills at school and at home.

1. Use a Kill-a-Watt Meter given in the efargo box and plug it into an outlet.
2. Plug a device into the meter and demonstrate to students the difference in electricity consumption between devices when they are on (in use), off (unplugged), or in stand-by mode (plugged but not in use).
3. Encourage students to go around the classroom and measure more devices.



INSULATION EXPERIMENTS

HC6

This activity will allow students to investigate the insulating properties of different materials.

1. Start by using ice or hot water in a container wrapped by different materials (cloth, fabric, bubble wrap, etc).
2. Project this video for the classroom, which explains building insulation at home and ways in which students can improve their home's insulation performance: <https://bit.ly/2unNqDk>
3. After the video, ask students about how they can improve insulation in their classroom/school building.

SOLAR COOKERS

HC7

This activity will teach your students about the power of solar energy and the ease with which we can make direct use of it. Solar cookers are devices that use the energy of direct sunlight to heat its contents. Making solar cookers can be a great outdoor activity for your students!



1. Follow the steps in this video tutorial to make a solar cooker: <https://bit.ly/2DYrgeK>
2. Encourage the students to heat a snack in their solar cookers so they could see that it actually works!

The background features a white page with various colorful scribbles in shades of yellow, purple, and blue. A large, solid orange circle is centered on the page, containing the text. The scribbles are scattered around the circle, with some overlapping its edges.

Next Generation Science Standards


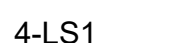



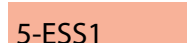
Next Generation Science Integration

The efargo Energy Challenge integrates science learning standards to create a project-based learning experience for the schools.

-  included
-  closely related



Standards are arranged by disciplinary core ideas:

Fourth Grade	 4-PS3	Energy
	 4-PS4	Waves and Their Application in Technologies for Information Transfer
	 4-LS1	From Molecules to Organisms: Structures and Processes
	 4-ESS1	Earth's Place in the Universe
	 4-ESS2	Earth's Systems
	 4-ESS3	Earth and Human Activity
Fifth Grade	 5-PS1	Matter and its Interactions
	 5-PS2	Motion and Stability: Forces and Interactions
	 5-PS3	Energy
	 5-LS1	From Molecules to Organisms: Structures and Processes
	 5-LS2	Ecosystems: Interactions, Energy, and Dynamics
	 5-ESS1	Earth's Place in the Universe
	 5-ESS2	Earth's Systems
	 5-ESS3	Earth and Human Activity
	 3-5-ETS1	Engineering Design



Additional Online
Resources:

CITY OF FARGO MUNICIPAL ENERGY USE

Fargo Schools consume more than 30% of electricity used by the City of Fargo.

LOCAL LEARNING RESOURCES

Local actions and projects implementing energy reduction and energy conservation measures.

OTHER COMPETITIONS

References to regional and global competitions engaging the community in energy + resource reduction.

ENERGY-USE BREAKDOWN IN K12 SCHOOLS BY SOURCE

A break-down of energy-use in schools by energy sources, including heating, cooling, lighting, and office equipment. This helps direct efforts in order to maximize potential reduction

TOP TEN **NO-COST** SCHOOL ENERGY SAVING TIPS

10 simple ways energy can be saved without incurring additional operating costs or investments. These actions are primarily focused on energy-awareness and energy-use planning.

TOP TEN **LONG-TERM** SCHOOL FACILITIES IMPROVEMENTS

10 ways that encourage thinking about different ways that energy is used in schools and on school-grounds. Their costs may vary but are relatively inexpensive and bring return on investment over time.

Check out the efargo page: <http://efargo.org/k12challenge3-0>