BLACK HILLS ENERGY LIVINGWISE® PROGRAM SUMMARY REPORT SOUTH DAKOTA SERVICE AREA

2016-2017

SUBMITTED BY:



Black Hills Energy LivingWise® Program Summary Report South Dakota Service Area 2016-2017

Made possible by:



Submitted by:



June 2017

"They loved the boxes of materials, but they really enjoyed discussions regarding energy and our environment."

Christy Hedderman, Teacher

Sturgis Elementary

Table of Contents

Executive Summary	5
Program Overview	9
Program Materials	11
Program Implementation	15
Program Team	17
Program Impact	19
A. Home Survey	19
B. Pre-Program and Post-Program Tests	20
C. Home Activities	21
D. Teacher Program Evaluation	22
E. Parent/Guardian Program Evaluation	24
F. Teacher Letters	26
G. Student Letters	28
Appendix A	34
Projected Savings from Showerhead Retrofit	34
Projected Savings from Kitchen Faucet Aerator Retrofit	35
Projected Savings from FilterTone® Alarm Installation	36
Projected Savings from LED Light Bulb Retrofit	37
Projected Savings from LimeLite® Night Light Installation	38
Appendix B	39
Home Check-Up	39
Home Activities	41
Appendix C	43
Participant List	43
Appendix D	46
Teacher Program Evaluation Data	46
Teacher Comment Data	47
Appendix E	49
Parent/Guardian Program Evaluation Data	49
Parent/Guardian Comment Data	50
Appendix F	51
Teacher Letters	51
Appendix G	53
Student Letters	

"As a parent, what I liked about the program was that it encouraged good stewardship of resources, environmental awareness and great ideas for people to put into practice."

W & M R, Parent
Custer Elementary

Executive Summary

Resource Action Programs® (RAP) is pleased to present this Program Summary Report to Black Hills Energy, which summarizes the 2016-2017 Black Hills Energy LivingWise® Program in the South Dakota Service Area. The program was implemented in the Black Hills Energy service area in the state of South Dakota by 1,202 teachers, students, and their families.

The following pages provide an overview of the program and materials, outline of program implementation, introduction to the program team, description of program enhancements, impact of the program, and summary of results from the home activities. In addition to this information, evaluations, letters, and comments are provided for a glimpse into actual participant feedback. Lastly, projected savings from the individual measures found within the LivingWise Kit are also included.

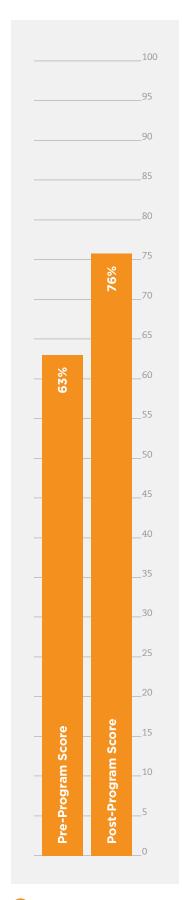
Participant Satisfaction

Resource Action Programs®

A successful program excites and engages participants. Students, parents, and teachers are asked to evaluate the program and provide personal comments. A sample of the feedback is given in the margin. >



Executive Summary



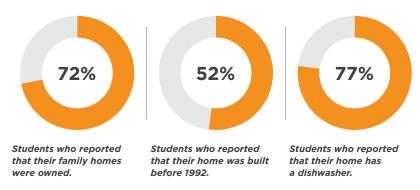
Knowledge Gained

Identical tests were administered to the students prior to the program and again upon program completion to measure knowledge gained. Scores and subject knowledge improved from 63% to 76%.

Data Obtained

Home surveys were taken by students and their families, which collected household demographic and consumption data along with program participation information.

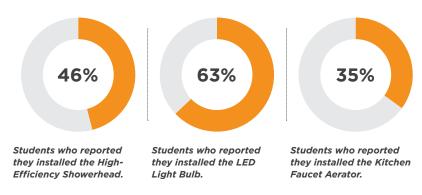
A summary of responses can be found in Appendix B.



Measures Installed

Students completed take-home activities as part of the program and reported on the kit measures they installed in their homes.

A summary of responses can be found in Appendix B.



Energy and Water Savings Results

In addition to educating students and their parents, a primary program goal is to generate cost-effective energy and water savings. Student home surveys not only provided the data used in the savings projections, but also reinforced the learning benefits.

Projected Resource Savings

A list of assumptions and formulas used for these calculations can be found in Appendix A.

PROJECT	ED ANNUAL SAVINGS
3,214,771	gallons of water saved
247,941	kWh of electricity saved
8,380	therms of gas saved
3,214,771	gallons of wastewater saved

PROJECT	ED LIFETIME SAVINGS
25,537,345	gallons of water saved
2,178,842	kWh of electricity saved
71,826	therms of gas saved
25,537,345	gallons of wastewater saved

PROJECTED ANNUAL SAVINGS PER HOME		
2,675	gallons of water saved	
206	kWh of electricity saved	
7	therms of gas saved	
2,675	gallons of wastewater saved	

PROJECTED LIFETIME SAVINGS PER HOME	
21,246	gallons of water saved
1,813	kWh of electricity saved
60	therms of gas saved
21,246	gallons of wastewater saved

Resource Action Programs® Executive Summary

"Participants and their parents/guardians realize actual water and energy savings within their home, benefitting two generations."

Program Overview

The Black Hills Energy LivingWise® Program, a school-based energy efficiency education program, is designed to generate immediate and long-term resource savings by bringing interactive, real-world education home to students and their families. The 2016-2017 program was taught in 5th grade throughout the Black Hills Energy service area in the state of South Dakota.

The Black Hills Energy LivingWise Program team identifies and enrolls students and teachers within the designated service area. The program physically begins with classroom discussions using a Student Guide that provides the foundations of using energy and water efficiently. It is followed by hands-on, creative, problem-solving activities led by the classroom teacher.

All program materials support state and national academic standards to allow the program to fit easily into a teacher's existing curriculum and requirements. The participating classroom teachers follow the Teacher Book and lesson plan. Information is given to guide lessons throughout the program in order to

satisfy each student's individual needs, whether they are visual, auditory, or kinesthetic learners.

The LivingWise Kit and Student Workbook comprise the take-home portion of the program. Students receive a kit containing highefficiency measures they use to install within their homes. With the help of their parents/guardians, students install the kit measures and complete a home survey. The act of installing and monitoring new energy efficiency devices in their homes allows students to put their learning into practice. Here, participants and their parents/guardians realize actual water and energy savings within their home, benefitting two generations.

A critical element of RAP program design is the use of new knowledge through reporting. At the end of the program, the Black Hills Energy program team tabulates all participant responses—including home survey information, teacher responses, student letters, and parent feedback—and generates this Program Summary Report.

Resource Action Programs® Program Overview

"For more than 24 years, Resource Action Programs (RAP) has designed and implemented Measure-Based Education® programs that inspire change in household energy and water use while delivering significant, measurable resource savings."

Program Materials

Each participant in the Black Hills Energy LivingWise® Program receives classroom materials and energy efficiency kits containing high-efficiency measures to perform the program's take-home activities. Program materials for students, parents/guardians, and teachers are outlined below.

Each Student & Teacher Receives

Student Guide

Student Workbook

Parent Letter/Pledge Form*

Student Survey Form

Certificate of Achievement

LivingWise Kit Containing:

- High-Efficiency Showerhead*
- Kitchen Faucet Aerator*
- LimeLite® Night Light
- LED Light Bulb
- FilterTone® Alarm*
- Digital Thermometer*
- Toilet Leak Detector Tablets
- Flow Rate Test Bag
- Natural Resource Fact Chart
- Mini Tape Measure
- Parent/Guardian Program Evaluation

"GetWise" Wristband

Program Website Access at Getwise.org

Toll-Free HELP Line

Each Teacher/Classroom Receives

Teacher Book

Step-by-Step Program Checklist

Lesson Plans

South Dakota State and National Academic

Standards Chart

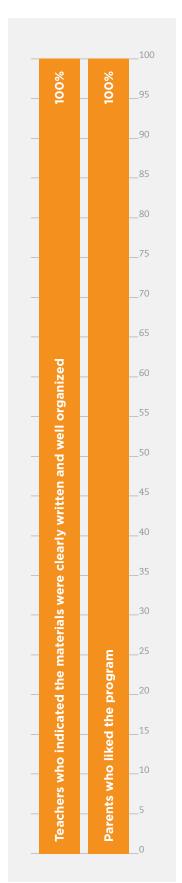
Teacher Survey Form

Pre/Post Student Survey Answer Keys

Electricity, Water, and Natural Gas Posters

Self-Addressed Postage-Paid Envelope

^{*} Materials / Installation Instructions provided in English and Spanish

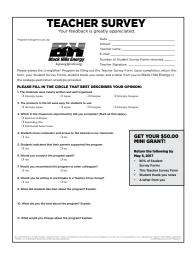


Custom Branding

In addition to increasing resource awareness and efficiency, the program has been designed to strengthen bonds between Black Hills Energy and the community. One of the steps taken to ensure the greatest possible exposure is to feature the Black Hills Energy logo throughout each LivingWise Kit. In addition to the kit, the Teacher Survey Form and Parent Letter/Pledge Form also feature Black Hills Energy branding.



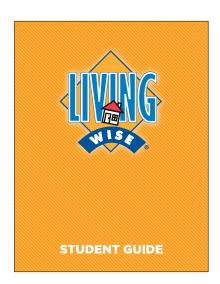
Program Materials

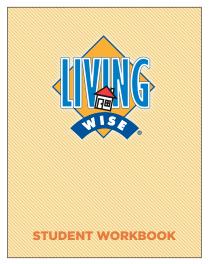


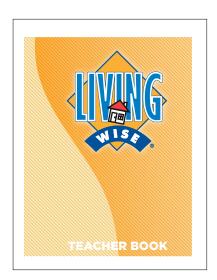
Teacher Survey Form



Parent Letter/Pledge Form



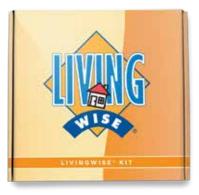




Student Guide Student Workbook Teacher Book



Certificate of Achievement



Kit Box



Kit Label

"I liked that the program is teaching the kids about conserving water, which is a great thing for them to learn about early on."

Sean Stafford, Parent

Vandenberg Elementary School

Program Implementation

The 2016-2017 Black Hills Energy LivingWise® Program followed this comprehensive implementation schedule:

- 1. Identification of South Dakota state and national academic standards & benchmarks
- 2. Curriculum development and refinement (completed annually)
- 3. Curriculum correlation to South Dakota state and national academic standards & benchmarks
- 4. Materials modification to incorporate Black Hills Energy branding
- 5. Incentive program development
- 6. Teacher/school identification—with Black Hills Energy approval
- 7. Teacher outreach and program introduction
- 8. Teachers enrolled in the program individually
- 9. Implementation dates scheduled with teachers
- 10. Program material delivered to coincide with desired implementation date
- 11. Delivery confirmation
- 12. Periodic contact to ensure implementation and teacher satisfaction
- 13. Program completion incentive offered
- 14. Results collection
- 15. Program completion incentive delivered to qualifying teachers
- 16. Thank you cards sent to participating teachers
- 17. Data analysis
- 18. Program Summary Report generated and distributed

Participating teachers are free to implement the program to coincide with their lesson plans and class schedules. Appendix C provides a comprehensive list of classrooms in grade 5 that participated during the 2016-2017 school year.

Resource Action Programs® Program Implementation

For more than 24 years, Resource Action Programs (RAP) has designed and implemented Measure-Based Education® programs that inspire change in household energy and water use while delivering significant, measurable resource savings. All RAP programs feature a proven blend of innovative education, comprehensive implementation services, and hands-on activities to put efficiency knowledge to work in students' homes.

RAP has a strong reputation for providing a high level of client service as part of a wide range of energy efficiency education solutions for utilities, municipalities, states, community agencies, corporations, and more. In 2013, RAP was the only conservation services provider honored by the American Council for an Energy-Efficient Economy (ACEEE) and the Alliance for Water Efficiency (AWE) as one of 12 top programs that provides sustained achievement. RAP was honored for market penetration, innovative design, and its ability to achieve substantial/sustained energy and water savings.





Program Team

RAP implements nearly 300 individual programs that serve more than 550,000 households each year. All-inclusive program delivery occurs in its 80,000 square-foot Nevada Program Center where implementation teams and support departments work together to provide:

- 1:1 teacher support
- Curriculum development
- Customized materials
- Data tracking and reporting
- Energy and water efficiency measures
- Graphic and web design
- Kit assembly
- Marketing communications
- Shipping
- Printing
- Program management
- Participant enrollment
- Warehousing

The Implementation Team

For the Black Hills Energy LivingWise® Program, RAP assigned a specific implementation team to Black Hills Energy made up of a PMP®-designated Program Manager, CEM®-designated energy analyst, graphic designer, outreach personnel, educator, and administrative staff. This team immersed themselves into the Black Hills Energy brand, and handled all program implementation for Black Hills Energy. Black Hills Energy also received the benefit of fully

staffed support departments, which worked with the implementation team to define success for Black Hills Energy. These departments include education, marketing, information technology, and warehouse/logistics.

Continuous Improvement

In addition to successful implementation of the Black Hills Energy LivingWise Program, RAP engages in continuous program improvement, as well as enhancements to educational materials, with modifications based on emerging technology, industry trends, and EM&V findings.

As part of this plan, RAP utilizes an extensive network of educators for program feedback. This feedback ensures that educational components meet the changing needs of educators, keep information relevant to students, and, in turn, provide increased water and energy literacy amongst program participants.

Resource Action Programs® Program Team

"Upon completion of the program, participating families are asked to complete a home survey to assess their resource use, verify product installation, provide demographic information, and measure participation rates."

Program Impact

The Black Hills Energy LivingWise® Program has had a significant impact within the community. As illustrated below, the program successfully educated participants about energy and water efficiency while generating resource savings through the installation of efficiency measures in homes. Home survey information was collected to track projected savings and provide household consumption and demographic data. Program evaluations and comments were collected from teachers, students, and parents.

A. Home Survey

the LimeLlite Night Light.

Upon completion of the program, participating families are asked to complete a home survey to assess their resource use, verify product installation, provide demographic information, and measure participation rates. A few samples of questions asked are below while a complete summary of all responses is included in the appendices.

Did your family install the LimeLite Night Light?

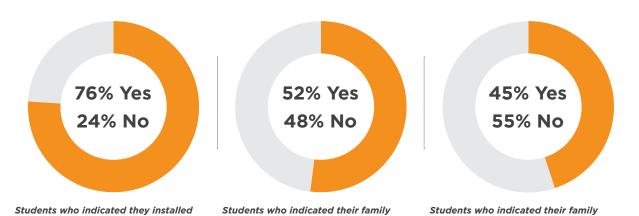
Did your family change the way they use energy?

Did your family change the way they use water?

Yes - 76%

Yes - 52%

Yes - 45%



Resource Action Programs® Program Impact

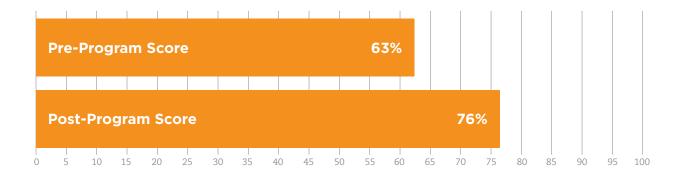
changed the way they use energy.

changed the way they use water.

B. Pre-Program and Post-Program Tests

Students were asked to complete a 10-question test before the program was introduced and then again after it was completed to determine the knowledge gained through the program. The average student answered **6.3** questions correctly prior to being involved in the program and then improved to answer **7.6** questions correctly following participation.

Scores improved from 63% to 76%.



C. Home Activities

As part of the program, parents and students installed resource efficiency measures in their homes. They also measured the pre-existing devices to calculate savings that they generated. Using the family habits collected from the home survey as the basis for this calculation, 1,202 households are expected to save the following resource totals. Savings from these actions and new behaviors will continue for many years to come.

Projected Resource Savings

A list of assumptions and formulas used for these calculations can be found in Appendix A.

Number of Participants:	1,202	
	Annual	Lifetime
Projected reduction from Showerhead retrofit:	1,892,698	18,926,982 gallons
Product Life: 10 years	115,684	1,156,840 kWh
	4,635	46,354 therms
Projected reduction from Kitchen Faucet Aerator retrofit:	1,322,073	6,610,363 gallons
Product Life: 5 years	58,370	291,848 kWh
	2,395	11,974 therms
Projected reduction from LED Lightbulb retrofit: Product Life: 20 years	34,870	339,975 kWh
Projected reduction from LimeLite® Night Light installation: Product Life: 10,000 hours	27,769	277,695 kWh
Projected reduction from FilterTone® installation:	11,248	112,484 kWh
Product Life: 10 years	1,350	13,498 therms
TOTAL PROGRAM SAVINGS:	3,214,771	25,537,345 gallons
	247,941	2,178,842 kWh
	8,380	71,826 therms
TOTAL PROGRAM SAVINGS PER HOUSEHOLD:	2,675	21,246 gallons
	206	1,813 kWh
	7	60 therms

Resource Action Programs® Program Impact 2

D. Teacher Program Evaluation

Program improvements are based on participant feedback received. One of the types of feedback obtained is from participating teachers via a Teacher Program Evaluation Form. They are asked to evaluate relevant aspects of the program and each response is reviewed for pertinent information. The following is feedback from the Teacher Program Evaluation for the Black Hills Energy LivingWise Program.

Teacher Response

(A summary of responses can be found in Appendix D)

100% of participating teachers indicated they would conduct the program again given the opportunity.

100% of participating teachers indicated they would recommend the program to their colleagues.

What did the students like best about the program? Explain.

"The students enjoyed taking home the supplies that were included in the kit and doing the experiments."

Nancy Mulcahy, Hot Springs Elementary

"Students loved the items in the kit, couldn't wait to take them home to parents."

Josh Wilson, Piedmont Valley Elementary School

"The kit to take home and the in-class experiments."

Koreen Hammel, Hot Springs Elementary

"Looking through the kits."

Paige Guy, Piedmont Valley Elementary School

"They really enjoyed installing their kits at home and saving money by doing so."

Kelsey Trimble, Vandenberg Elementary School

"The free materials to install at home."

Kelli Vigil, Rapid City Adventist Elementary School

"The fun activity worksheets."

Michelle Wysuph, South Park Elementary School

"They loved the box of goodies to take HOME!"

Cathleen Denekamp, Vandenberg Elementary School

"Getting the livingwise kit. They were impressed by the \$50 value and excited to help at home." Christina Freeman, Knollwood Heights Elementary School

"The experiments and having their own booklet."

Connie Ahrens, Knollwood Heights Elementary School

Teacher Response

(A summary of responses can be found in Appendix D)

What did you like best about the program? Explain.

"Easiness of the program. Didn't have to come up with everything on my own."

Philip Miller, St Paul's Lutheran School

"I liked how the lessons were set up this year. It made it easier to use in the classroom."

Koreen Hammel, Hot Springs Elementary

"Organized and easy to use."

Paige Guy, Piedmont Valley Elementary School

"The workbooks and experiments are outlined clearly and very user friendly."

Kelli Vigil, Rapid City Adventist Elementary School

"I appreciated the standards being linked to concepts and the format of the lessons."

Lorie Meade, Vandenberg Elementary School

"Teaching students to be conscious of their resources and its' use."

Shawna Delaney, Vandenberg Elementary School

"Students being excited to try things at home with their families."

Ann Solinsky, Zion Lutheran School

"Pre-planned lessons & booklets to read along with."

Andrea Miller, Pinedale Elementary School

"1) Ability to complete tasks/ activities with parents at home. 2) Kits to install at home!"

Andrea Miller, Pinedale Elementary School

What would you change about the program? Explain.

"Worked well so far."

Josh Wilson, Piedmont Valley Elementary School

"More in class hands-on."

Michelle Wysuph, South Park Elementary School

"Nothing, it is an excellent program!"

Tricia Summers, Robbinsdale Elementary School

"I would like to see more about safety with energy."

Christy Hedderman, Sturgis Elementary

Resource Action Programs® Program Impact 2

E. Parent/Guardian Program Evaluation

Parent involvement with program activities and their children is of paramount interest to both utilities and teachers in the program. When parents take an active role in their child's education it helps the schools and strengthens the educational process considerably. When students successfully engage their families in retrofit, installation, and home energy efficiency projects, efficiency messages are powerfully delivered to two generations in the same household. The program is a catalyst for this family interaction, which is demonstrated by feedback from Parent/Guardian Program Evaluations in each program. The following is feedback from the Parent/Guardian Program Evaluations for the Black Hills Energy LivingWise Program.

Parent Response

(A summary of responses can be found in Appendix E)

100% of participating parents indicated that the program was easy to use.

100% of participating parents indicated they would continue to use the kit items after the completion of the program.

100% of participating parents indicated they would like to see this program continued in local schools.

As a parent, which aspect of the program did you like best?

"The lessons learned about conserving energy and the interest it sparked in the kids."

Jenn and Nate Renner, Black Hawk Elementary School

"Showerhead and LED light bulb."

Bob Henman, Custer Elementary

"Actually being about installing some of the items makes the project more real and more fun!"

Melissa Rupert, Hill City Elementary School

"Education for water/electric usage."

Jamie Sawahe, Hot Springs Elementary

"Was simple and helpful!"

Dustin Parham, Knollwood Heights Elementary School

"The water facts and natural resource facts. My son was surprised by some of the facts on there."

Kristine Green, Knollwood Heights Elementary School

"Easy to use, informative to the students - we all learned things I don't know before the info was provided."

Tessa, Knollwood Heights Elementary School

"The home kit and the workbooks."

Marlene Kullbom, Piedmont Valley Elementary School



Parent Response

(A summary of responses can be found in Appendix E)

"Water savings."

Kristina Simonds, St. Elizabeth Ann Seton Elementary School

"All of it."

Carolyn Hegstrom, Sturgis Elementary

"So the children can see how to save energy and parents that don't already."

Dwight Griffee, Sturgis Elementary

"It was fun to watch him experience ways to save energy in our home."

Amber Wichmann, Vandenberg Elementary School

"It motivated her to conserve."

Anita Roberts, Vandenberg Elementary School

"It was all free and taught us SO much about everyday ways to save money at home."

Cassidy Jones, Vandenberg Elementary School

"That it helps the child be more aware of saving energy and money."

Hieldi Sowers, Vandenberg Elementary School

"Doing it with kids. They had fun with it. Bringing fun into education is important."

Lee and Amber Kruse, Vandenberg Elementary School

"Teaching the kids about conserving water, which is a great thing for them to learn about early on."

Sean Stafford, Vandenberg Elementary School

Are there any comments you would like to express to your child's program sponsor?

"We greatly appreciate the energy efficient kit. Thank you and I love learning!"

Kristina Simonds, St. Elizabeth Ann Seton Elementary School

"We really really enjoyed all the different at home activities. SO MUCH FUN! THANK YOU!" Cassidy Jones, Vandenberg Elementary School

"Thank you! Lots of fun and useful learning."

Carolyn Hegstrom, Sturgis Elementary

"I hope more people took advantage of this program."

Lee and Amber Kruse, Vandenberg Elementary School

Resource Action Programs® Program Impact 2

F. Teacher Letters

(A summary of responses can be found in Appendix F)

RAPID CITY AREA SCHOOL DISTRICT 51/4

Pinedale Elementary 4901 West Chicago Street Rapid City, SD 57702

Dear Black Hills Energy,

May 26, 2017

Thank you for the opportunity for my class to participate in the LivingWise Program. It was a great learning experience for myself and my students as we learned about energy and water, and the many ways that we can make a difference for our families, community, and our world.

The products that came with the kit for students to install with their families created a great sense of excitement and enthusiasm. Gasps could be heard when students opened their kits to reveal the brand-new products inside – that were free and just for them! They couldn't wait to take these home and install them with their families. The pride they felt by knowing they'd be helping their family save money was a joy to see. Although several students seemed down about not being able to use some of the products since their families already owned and used high-efficiency showerheads, LED lightbulbs, and a few of the other products, the discussions they had with their parents were valuable and may not have happened if it wasn't for this program. They soon realized that they were proud of their families for already taking action to conserve water and energy.

The classroom lessons and workbooks were very easy to use, thorough, and clearly aligned with our standards. Students enjoyed having their personal workbooks that they could follow along in, annotate, and color-code.

Overall, we were all thrilled to be a part of this excellent opportunity. The planning that went into the lessons and the generosity of giving each and every student a kit full of great (and FREE) products to use at home were very much appreciated. The learning that students did and the difference they realized they were able to make was immeasurable. We can't thank you enough for inviting us to participate in the LivingWise Program provided by Black Hills Energy. We hope you'll invite us back in the future!

Sincerely, Andrea Miller 5th Grade Teacher Pinedale Elementary

"An Equal Opportunity Employer"



Teacher Letters

(A summary of responses can be found in Appendix F)

John Oleson Vandenberg Elementary Box Elder, SD 57719 John Oleson@kl2.sd.us

April 28, 2017

Dear Black Hills Energy.

How awesome, to have such a program at our fingertips, which benefits our Earth and our students! The students really loved having the kits, looking at everything inside and excited to go home and be able to work with a parent to make their home Energy Wise. The boxes had sat in our room for some time, but I wanted to wait to begin the program until we were ready for Earth Day, which drove the kids nuts, as they wanted to work on 'science experiments'.

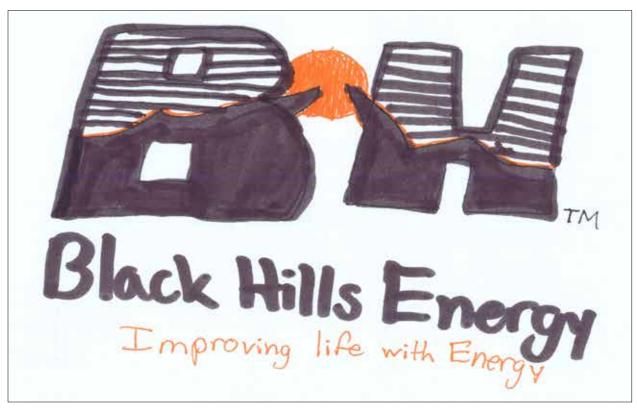
I loved hearing back from the students, the very next day, finding out what items they had worked on, replaced, or were going to get done once there was time with mom and dad. The nightlight and LED bulb were a hit, as the students could do those items easily. They all seemed so proud of being able to help save money at home, by reducing the amounts of water and electricity being used, each and every day in their house. The students were amazed by the idea that there could be such a thing called 'Phantom Load'; they were shocked!

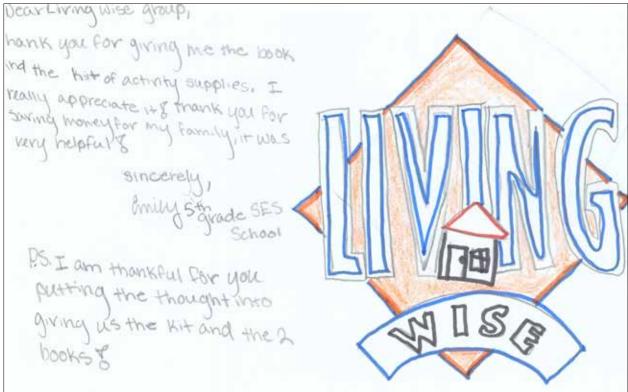
I loved that the students were so excited about conservation, (and science) and the fact that they had already covered most of this information from our science lessons. They were proud of themselves, for remembering renewable and nonrenewable resources, kinetic and potential energy, but were also excited to learn something new...electricity. Everything was very well laid out, easy to follow (especially the lesson plans), and I appreciate that the students held all of the ownership of his/her learning within this program. I highly recommend this program, and look forward to using it again this coming (new) school year!

Resource Action Programs® Program Impact

G. Student Letters

(A summary of responses can be found in Appendix G)





Student Letters

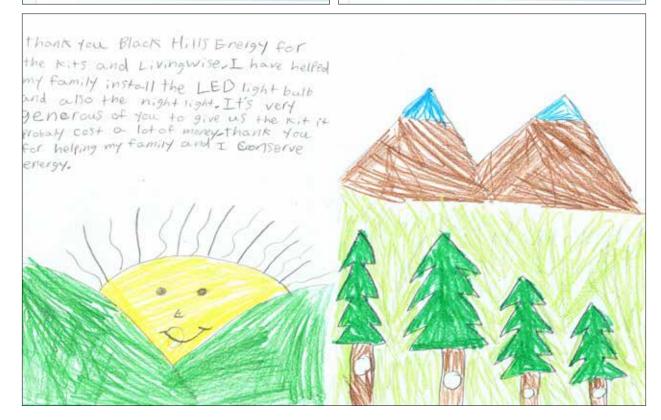
(A summary of responses can be found in Appendix G)

Dear Living Wise program. I thank you for I ship us all that stiff It is very helpful and so far we have installed the might light hater heater, and the tark measure. The Night is amesone it doesn't give too much light but not a lot It cally does save engine we installed it ufstace in the light way the water heater also works for the tempative in the coom, so sometimes in a companie the ream so sometimes in a real we put it their if we don't have something that sides us the tempative. We put it in the kitchen.

The tape measure is really cute! It works really well. I use it to some times help with home work when it's about measurent. We put it upstairs in the tool droom.

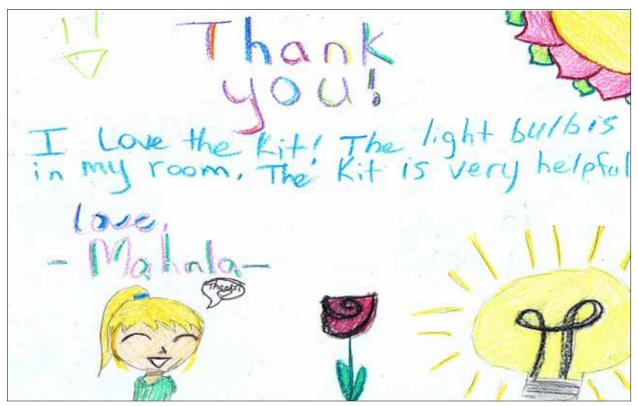
It always comes in handy. It always comes it handy. the blue tablets and the light bulb. Thank you so much! SINCERELY,

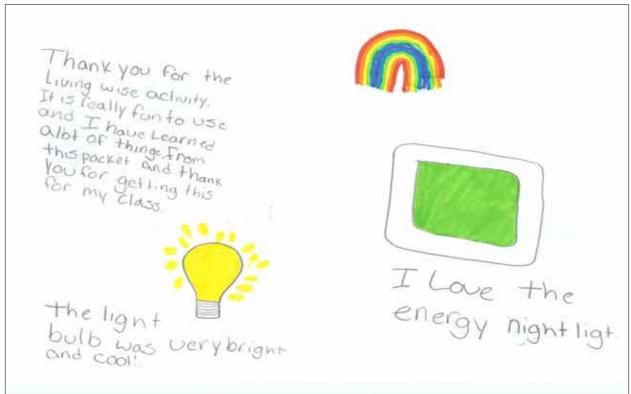
Dear Living wise Program, that you gave me. I have installed that you gave me. I have installed the night by my from I also installed the night by my from I also installed the fridge and also we installed the higher facuet in the kitchen. They all york year great and recome going to install the shover head after the one that we have not a feel on high the great show then install the gift have greated about to have enough, time to because we have a burnt out lightbulle we also hank you for all of the a burnt out lightbulb we also weed a tablet and our toilet is not leaking and we are using it all property. Sincorly, Jayden Rahn



Student Letters

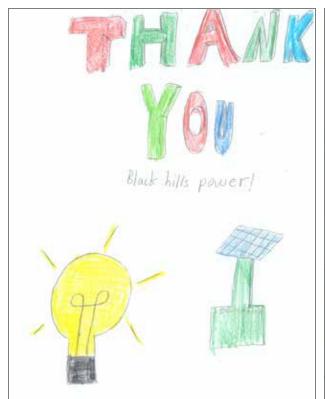
(A summary of responses can be found in Appendix G)



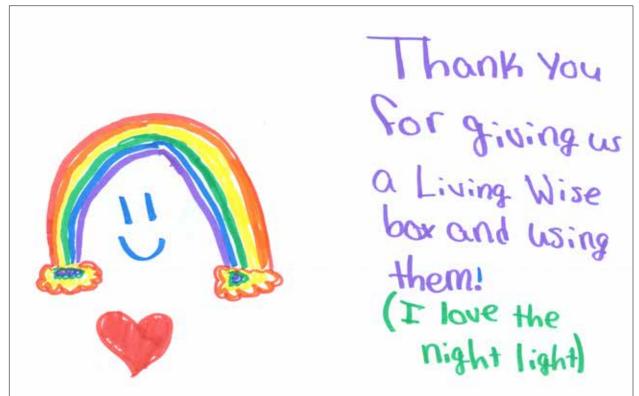


Student Letters

(A summary of responses can be found in Appendix G)







Resource Action Programs® Program Impact 31

"As a teacher, what I liked about the program was that it was very easy to follow and use, which made it enjoyable to implement."

Kelsey Trimble, Teacher
Vandenberg Elementary School

Appendices

Appendix A Projected Savings from Showerhead Retrofit 34 Projected Savings from Kitchen Faucet Aerator Retrofit35 Projected Savings from FilterTone® Alarm Installation...... 36 Projected Savings from LED Light Bulb Retrofit37 Projected Savings from LimeLite® Night Light Installation........... 38 Appendix B Home Activities......41 Appendix C Participant List43 Appendix D Teacher Program Evaluation Data......46 Teacher Comment Data......47 Appendix E Parent/Guardian Program Evaluation Data 49 Parent/Guardian Comment Data 50 Appendix F Teacher Letters......51 **Appendix G** Student Letters53

Projected Savings from Showerhead Retrofit

Showerhead retrofit inputs and assumptions:

4.67	people ¹
2.04	full bathrooms per home ¹
37.28 %	1
46.52%	1
45.74%	1
2.50	gallons per minute ²
1.75	gallons per minute ³
1,202	1
	2.04 37.28% 46.52% 45.74% 2.50

Shower duration: 8.20 minutes per day² Showers per day per person: **0.67** showers per day²

Product life: 10.00 years3

Projected Water Savings:

1,892,698 gallons4 Showerhead retrofit projects an **annual** reduction of: Showerhead retrofit projects a **lifetime** reduction of: **18,926,982** gallons⁵

Projected Electricity Savings:

Showerhead retrofit projects an annual reduction of: 115,684 kWh^{2,6} Showerhead retrofit projects a **lifetime** reduction of: 1,156,840 kWh^{2,7}

Projected Natural Gas Savings:

Showerhead retrofit projects an annual reduction of: 4,635 therms^{2,8} Showerhead retrofit projects a **lifetime** reduction of: **46,354** therms^{2,9}

- 2 (March 4, 2010). EPA WaterSense® Specification for Showerheads Supporting Statement. Retrieved from http://www.epa.gov/WaterSense/docs/showerheads_ finalsuppstat508.pdf
- 3 Provided by manufacturer.
- 4 [(Average Household Size x Shower Duration x Showers per Day per Person) ÷ Average Number of Full Bathrooms per Home] x (Average Showerhead Flow Rate Retrofit Showerhead Flow Rate) x Number of Participants x Installation Rate x 365 days
- 5 [(Average Household Size x Shower Duration x Showers per Day per Person) ÷ Average Number of Full Bathrooms per Home] x (Average Showerhead Flow Rate Retrofit Showerhead Flow Rate) x Number of Participants x Installation Rate x 365 days x Product Life
- $6\ Projected\ Annual\ Water\ Savings\ x\ Percent\ of\ Water\ that\ is\ Hot\ Water\ x\ 0.18\ kWh/gal\ x\ \%\ of\ Water\ Heated\ by\ Electricity$
- 7 Projected Annual Water Savings x Percent of Water that is Hot Water x 0.18 kWh/gal x % of Water Heated by Electricity x Product Life
- 8 Projected Annual Water Savings x Percent of Water that is Hot Water x 0.009 Therms/gal x % of Water Heated by Natural Gas
- 9 Projected Annual Water Savings x Percent of Water that is Hot Water x 0.009 Therms/gal x % of Water Heated by Natural Gas x Product Life

¹ Data Reported by Program Participants.

Projected Savings from Kitchen Faucet Aerator Retrofit

Kitchen Faucet Aerator retrofit inputs and assumptions:

Average household size:	4.67	people ¹
% of homes with a dishwasher:	77.10%	1
% of homes without a dishwasher:	22.90%	1
% of water heated by gas:	37.28%	1
% of water heated by electricity:	46.52%	1
Installation / participation rate of:	34.96%	1
Number of participants:	1,202	1
Average Kitchen Faucet Aerator has a flow rate of:	2.50	gallons per minute ²
Retrofit Kitchen Faucet Aerator has flow rate of:	1.50	gallons per minute ³
Product life:	5.00	years ³
Length of use without dishwasher:	15.00	minutes per day ⁴
Length of use without dishwasher (each family member):	1.00	minute per day ⁴
Length of use with dishwasher:	3.00	minutes per day ⁴
Length of use with dishwasher (each family member):	0.50	minutes per day ⁴

Projected Water Savings:

Kitchen Faucet Aerator retrofit projects an annual reduction of:	1,322,073	gallons
Kitchen Faucet Aerator retrofit projects a lifetime reduction of:	6,610,363	gallons ⁶

Projected Electricity Savings:

Kitchen Faucet Aerator retrofit projects an annual reduction of:	58,370	$\mathrm{kWh}^{4,7}$
Kitchen Faucet Aerator retrofit projects a lifetime reduction of:	291,848	$kWh^{4,8}$

Projected Natural Gas Savings:

Kitchen Faucet Aerator retrofit projects an annual reduction of:	2,395	therms ^{4,9}
Kitchen Faucet Aerator retrofit projects a lifetime reduction of:	11,974	therms ^{4,10}

¹ Data Reported by Program Participants.

² Vickers, Amy (2002). Water Use and Conservation. Amherst, MA: WaterPlow Press.

³ Provided by manufacturer.

⁴ Quantec, LLC. (2008). Impact of Flipping the Switch: Evaluating the Effectiveness of Low Income Residential Energy Education Programs. Portland: Drakos, Jamie et al.

^{5 {}Length of use without dishwasher + [Average household size x Length of use without dishwasher (each family member))] x % of homes without dishwasher} + {Length of use with dishwasher + [Average household size x Length of use with dishwasher (each family member))] x % of homes with dishwasher} x [Average Kitchen Aerator flow rate – Retrofit Kitchen Aerator flow rate] x Number of participants x Installation rate x 365 days

^{6 (}Length of use without dishwasher + [Average household size x Length of use without dishwasher (each family member))] x % of homes without dishwasher} + {Length of use with dishwasher + [Average household size x Length of use with dishwasher (each family member))] x % of homes with dishwasher} x [Average Kitchen Aerator flow rate – Retrofit Kitchen Aerator flow rate] x Number of participants x Installation rate x 365 days x Product Life

⁷ Projected Annual Water Savings x [(8.33lbs. / gallon x 35°FAT) ÷ (3413 x water heater efficiency (0.90)] x % of Water Heated by Electricity

 $^{8 \} Projected \ Lifetime \ Water \ Savings \ x \ [(8.33lbs./gallon \ x \ 35^\circ F\Delta T) \ \div \ (3413 \ x \ water \ heater \ efficiency \ (0.90)] \ x \ \% \ of \ Water \ Heated \ by \ Electricity \ Additional Projected \ Additional Pr$

⁹ Projected Annual Water Savings x [(8.33lbs. / gallon x $35^{\circ}F\Delta T$) \div (100,000 x water heater efficiency (0.60)] x % of Water Heated by Natural Gas

 $^{10\} Projected\ Lifetime\ Water\ Savings\ x\ [(8.33lbs.\ /\ gallon\ x\ 35^\circ F\Delta T)\ \div\ (100,000\ x\ water\ heater\ efficiency\ (0.60)]\ x\ \%\ of\ Water\ Heated\ by\ Natural\ Gas$

Projected Savings from FilterTone® Alarm Installation

FilterTone® installation inputs and assumptions:

Annual energy (electricity) use by a central system air conditioner:	2,414	kWh^1
Annual energy (natural gas) use by central space heating or furnace:	551	$therms^1$
Projected increase in efficiency (electricity):	1.75%	2
Projected increase in efficiency (natural gas):	0.92%	2
Product life:	10	years ³
Installation / participation rate of:	2.15%	4
Number of participants:	1,202	4

Projected Electricity Savings:

The FilterTone installation projects an annual reduction of:	11,248	kWh5
The FilterTone installation projects a lifetime reduction of:	112,484	kWh6

Projected Natural Gas Savings:

The FilterTone installation projects an **annual** reduction of: 1,350 therms⁷
The FilterTone installation projects a **lifetime** reduction of: 13,498 therms⁸

- 2 Reichmuth P.E., Howard. (1999). Engineering Review and Savings Estimates for the 'Filtertone' Filter Restriction Alarm.
- 3 Provided by manufacturer.
- 4 Data reported by program participants.
- 5 Annual energy (electricity) use by a central air conditioner, heat pump or furnace x Projected increase in efficiency (electricity) x Installation rate x Number of participants
- 6 Annual energy (electricity) use by a central air conditioner, heat pump or furnace x Projected increase in efficiency (electricity) x Installation rate x Number of participants x Product life
- 7 Annual energy (natural gas) use by a central air conditioner, heat pump or furnace x Projected increase in efficiency (natural gas) x Installation rate x Number of narticipants
- 8 Annual energy (natural gas) use by a central air conditioner, heat pump or furnace x Projected increase in efficiency (natural gas) x Installation rate x Number of participants x Product life

¹ U.S. Department of Energy, Energy Information Administration 2005 Residential Energy Consumption Web site for Mountain West States: http://www.eia.gov/consumption/residential/data/2005/

Projected Savings from LED Light Bulb Retrofit

LED Light Bulb retrofit inputs and assumptions:

Product life:

Watts used by the LED light bulb:

9 watts¹

Hours of operation per day: 2.81 hours per day²

Average watts used by the replaced light bulb: 54.08 watts³

Installation / participation rate of: 62.74% ³
Number of participants: 1,202 ³

Projected Electricity Savings:

The LED Light Bulb retrofit projects an **annual** reduction of: 34,870 kWh^{2,4}
The LED Light Bulb retrofit projects a **lifetime** reduction of: 339,975 kWh^{2,5}

¹ Provided by manufacturer.

² Frontier Associates. (2011). Oncor's LivingWise Program: Measurement & Verification Update.

³ Data reported by program participants.

^{4 {[(}Average wattage of light bulb replaced - Wattage of LED light bulb) x Hours of operation per day x 365 Days] + 1,000} x Number of participants x Installation rate

^{5 {[(}Average wattage of light bulb replaced - Wattage of LED light bulb) x Product Life] ÷ 1,000} x Number of participants x Installation rate

Projected Savings from LimeLite® Night Light Installation

LimeLite® Night Light installation inputs and assumptions:

Average length of use:

Average night light uses:

Retrofit night light uses:

Product life:

Energy saved per year:

Energy saved over life expectancy:

Installation / participation rate of:

4,380 hours per year¹

watts

0.03 watts

10 years²

11 kWh per year

305 kWh

Number of participants: 75.88% 3

Projected Electricity Savings:

The LimeLite Night Light installation projects an **annual** reduction of: 27,769 kWh
The LimeLite Night Light installation projects a **lifetime** reduction of: 277,695 kWh

¹ Assumption (12 hours per day)

² Product life provided by manufacturer

³ Data reported by program participants

Home Check-Up

1 How many kids live in your home (age 0-17)?	
1	16%
2	38%
3	25%
4	13%
5	8%
2 How many adults live in your home (age 18+)?	
1	14%
2	71%
3	9%
4	4%
5+	1%
3 How is your water heated?	
Natural Gas	37%
Electricity	47%
Propane	16%
4 Does your home have a dishwasher?	
Yes	77%
No	23%
	25 70
5 How many half-bathrooms are in your home?	
0	74%
1	20%
2	4%
3	1%
4+	0%
6 How many full bathrooms are in your home?	
1	27%
2	46%
3	22%
4	3%
5+	1%

Home Check-Up

Natural Gas	33%
Electricity	46%
Heating Oil	1%
Wood	5%
Propane	12%
Other	3%
8 What type of air conditioning unit do you have?	
Central Air Conditioner	61%
Evaporative Cooler	3%
Room Unit	22%
Don't Have One	15%
9 What type of home do you live in?	
Single Family home	77%
Multi-Family (2-4 units)	14%
Multi-Family (5-20 units)	8%
Multi-Family (21+ units)	1%
10 Was your home built before 1992?	
Yes	52%
No	48%
11 Is your home owned or rented?	
Owned	72%
Rented	28%

Home Activities

1 Did you install the new High-Efficiency Showerhead?	
Yes	46%
No	54%
2 Did your family install the new Kitchen Faucet Aerator?	
Yes	35%
No	65%
3 Was your toilet leaking?	
Yes	11%
No	89%
4 If you answered "yes" to question 3, were the leaks repaired?	
Yes	23%
No	77%
E Did your family install the LED Light Rulb?	
5 Did your family install the LED Light Bulb? Yes	63%
No	37%
	37 70
6 If you answered "yes" to question 5, what was the wattage of the incandescent bulb you replaced?	
40-watt	10%
60-watt	35%
75-watt	14%
100-watt	4%
Other	37%
7 Did your family install the FilterTone Alarm?	
Yes	22%
No	78%
8 How much did your family turn down the thermostat in winter for heating?	
1 - 2 Degrees	11%
3 - 4 Degrees	11%
5+ Degrees	13%
Didn't Adjust Thermostat	65%
9 How much did your family turn up the thermostat in summer for cooling?	
1 - 2 Degrees	12%
3 - 4 Degrees	11%
5+ Degrees	12%
Didn't Adjust Thermostat	65%
10 Did your family install the LimeLite Night Light?	
Yes	76%
No	24%

Due to rounding of numbers, percentages may not add up to 100%

Home Activities

(continued)

11 Did your family lower your water heater settings?

Yes 15% No 85%

12 Did your family raise the temperature on your refrigerator?

Yes 14% No 86%

13 Did you work with your family on this program?

Yes 70% No 30%

14 Did your family change the way they use water?

Yes 45% No 55%

15 Did your family change the way they use energy?

Yes 52% No 48%

16 How would you rate the LivingWise Program?

Great 42%
Pretty Good 34%
Okay 20%
Not So Good 5%

Participant List

SCHOOL	TEACHER	T	S
Black Hawk Elementary School	Nicholas McGeehon	1	22
Black Hawk Elementary School	Connie Johns	1	23
Black Hawk Elementary School	Rachel Barbaruolo	1	22
Custer Elementary	Isaac Parsons	1	23
Custer Elementary	Lucy Goebel	1	8
Custer Elementary	Jennifer Doyle	1	24
Edgemont Elementary School	Michelle Urban	1	15
Hill City Elementary School	Colleen Clapper	1	21
Hill City Elementary School	Matthew Henderson	1	20
Hot Springs Elementary	Nancy Mulcahy	1	22
Hot Springs Elementary	Todd Phelps	1	22
Hot Springs Elementary	Koreen Hammel	1	21
Knollwood Heights Elementary School	Connie Ahrens	1	22
Knollwood Heights Elementary School	Christina Freeman	1	22
Knollwood Heights Elementary School	Alyssa Whitney	1	22
Meadowbrook Elementary	Beth Chalberg	1	25
Meadowbrook Elementary	Patti Mitzel	1	25
Meadowbrook Elementary	Andrew Thimgan	1	25
Newell Elementary/Middle School	Robert Hill	1	24
Piedmont Valley Elementary School	Josh Wilson	1	27
Piedmont Valley Elementary School	Cooper Stanforth	1	27
Piedmont Valley Elementary School	Paige Guy	1	27
Pinedale Elementary School	Andrea Miller	1	25

Note: "T" represents number of teachers and "S" represents number of students

Participant List

(continued)

school	TEACHER	т	S
Pinedale Elementary School	Jessica Campbell	1	26
Pinedale Elementary School	Julie Flack	1	25
Rapid City Adventist Elementary School	Kelli Vigil	1	1
Robbinsdale Elementary School	Tricia Summers	1	27
Robbinsdale Elementary School	Paige Haukaas	1	28
South Park Elementary School	Michelle Wysuph	1	28
South Park Elementary School	Amanda Smith	1	26
South Park Elementary School	Joy Lundgern	1	26
St Paul's Lutheran School	Philip Miller	1	10
St. Elizabeth Ann Seton Elementary School	Heather Eldridge	1	40
Sturgis Elementary	Adam Fitzpatrick	1	27
Sturgis Elementary	Christy Hedderman	1	24
Sturgis Elementary	Jennifer Mayer	1	30
Sturgis Elementary	Elizabeth Stetson	1	26
Sturgis Elementary	Mike Abell	1	24
Sturgis Elementary	Sara Frasier	1	24
Vandenberg Elementary School	Zion Schmidt	1	23
Vandenberg Elementary School	John Oleson	1	22
Vandenberg Elementary School	Brandi Marler	1	22
Vandenberg Elementary School	Ronald Mays	1	24
Vandenberg Elementary School	Shawna Delaney	1	23
Vandenberg Elementary School	Sherry Nelson	1	23
Vandenberg Elementary School	Lorie Meade	1	22

Note: "T" represents number of teachers and "S" represents number of students



Participant List

SCHOOL	TEACHER	т	s
Vandenberg Elementary School	Cathleen Denekamp	1	23
Vandenberg Elementary School	Wendee Casto	1	23
Vandenberg Elementary School	Kelsey Trimble	1	22
Zion Lutheran School	Ann Solinsky	1	19
	TOTALS	50	1,152
	TOTAL PARTICIPANTS	1,2	02

Teacher Program Evaluation Data

5 Would you recommend this program to other colleagues?

1 The materials were clearly written and well organized.	
Strongly Agree	50%
Agree	45%
Disagree	5%
Strongly Disagree	0%
2 The products in the Kit were easy for students to use.	
Strongly Agree	59%
Agree	41%
Disagree	0%
Strongly Disagree	0%
3 Students indicated that their parents supported the program.	
Yes	100%
No	0%
4 Would you conduct this Program again?	
Yes	100%
No	0%

Yes

No

100%

0%

Teacher Comment Data

(continued from page 22)

What did students like best about the program? Explain.

"The students loved the kits and telling how they used the kits at home." Patti Mitzel, Meadowbrook Elementary

"The kits to take home." Jennifer Doyle, Custer Elementary

"Getting to put it all together; the kit! Got to learn more." John Oleson, Vandenberg Elementary School

"They like the kit and seeing results and then talking about it at school." Sherry Nelson, Vandenberg Elementary School

"The opportunity to install all of the fixtures in their home." **Tricia Summers, Robbinsdale Elementary School**

"They enjoyed already knowing some about energy and how they also can personally save energy." Lorie Meade, Vandenberg Elementary School

"The hands-on component, and learning about things they use every day." Shawna Delaney, Vandenberg Elementary School

"They liked the puzzles in the book and measuring water flow." Ann Solinsky, Zion Lutheran School

What did you like best about the program? Explain.

"It gave me an opportunity to discuss scientific ideas and relate them to their everyday lives." Connie Ahrens, Knollwood Heights Elementary School

"The excitement that the kids have about the kits and some of the learning on how they can help to save and make a difference." Patti Mitzel, Meadowbrook Elementary

"The kits." Jennifer Doyle, Custer Elementary

"Reinforcement of all our science concepts." John Oleson, Vandenberg Elementary School

Appendix D

Teacher Comment Data

(continued)

"How it reinforced our science unit on conservation and covered science standards."

Sherry Nelson, Vandenberg Elementary School

"The student activity books and the classroom experiment ideas."

Tricia Summers, Robbinsdale Elementary School

What would you change about the program? Explain.

"Have an online component, maybe scenarios online. Have someone available to talk to kids about the box 1/2 hour to an hour."

Philip Miller, St Paul's Lutheran School

"Nothing. Good program."

Paige Guy, Piedmont Valley Elementary School

"My classroom is a unique situation in that I have a multi-grade room. It being limited to 5th grade made it hard for my situation, but I understand that my set-up is different." Kelli Vigil, Rapid City Adventist Elementary School

"Probably the deadline for the project as we do our SBAC testing in April and don't have much time to do this after."

Patti Mitzel, Meadowbrook Elementary

"Shortened time period & more focus on fewer 'key' components."

Andrea Miller, Pinedale Elementary School

"Nothing!"

Shawna Delaney, Vandenberg Elementary School

Parent/Guardian Program Evaluation Data

Yes	100%
No	0%

2 Will you continue to use the Kit items after the completion of the Program?

Yes 100% No 0%

3 Would you like to see this Program continued in local schools?

Yes 100% No 0%

Parent/Guardian Comment Data

(continued from page 24)

As a parent, which aspect of the program did you like best?

"Using the digital thermometer in the fridge and freezer. (food safety) Conserving water at home using highefficiency showerhead."

Nancy Mulcahy, Hot Springs Elementary

"Their excitement about saving money."

Josh Wilson, Piedmont Valley Elementary School

"The activities."

Michelle Wysuph, South Park Elementary School

"It really made them aware of conservation!"

Cathleen Denekamp, Vandenberg Elementary School

"The pacing and comprehensive format."

Christina Freeman, Knollwood Heights Elementary School

Are there any comments you would like to express to your child's program sponsor?

"Thank you!"

Bob Henman, Custer Elementary

"Thanks!"

Melissa Rupert, Hill City Elementary School

"Thank you! Great program!"

Jamie Sawahe, Hot Springs Elementary

"Thank you!"

Kristine Green, Knollwood Heights Elementary School

"Great program!"

Marlene Kullbom, Piedmont Valley Elementary School

Teacher Letters

(continued from page 26)

Dear Black Hills Energy, We appreciate being part of your Living Wise program. We are a small hristian School + I have a muttigrade classroom with 5th-8th grade 1 tagether. I only have one 5th grader this year, so she lit up like tras tree when receiving the bit getting to do activities special just Thank you for helping School, Black Hills !

Teacher Letters

(continued)

Black Hills Energy-

Thank you so much for the opportunity to share this great information with my students. Not only did they learn great ways to save energy but they were having fun and excited to do this! It was great to see every day they wanted to learn more about conserving energy and were disappointed when the lessons ended. It was such a wonderful experience to give to students and show them that they can make a difference in the world around them. I hope that you continue sharing this experience with other students in years to come. I know that I will be eagerly waiting to do so next year! Thanks again.

Sincerely,

Kelsey Trimble

5th Grade Teacher

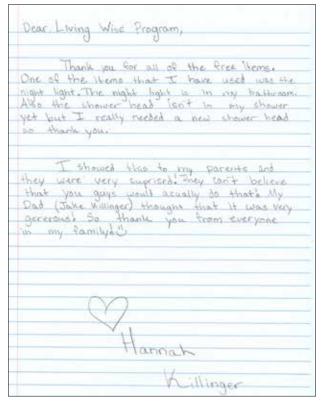
Vandenberg Elementary

Shorts for all the educational materials.

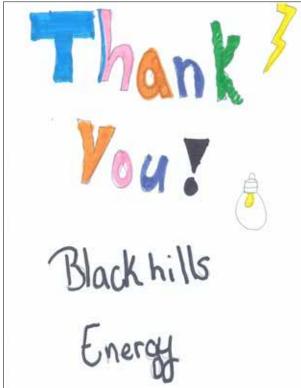
It think the students learned also and it reinforced what we learned in Science!

No wipupl South Park Elementary

(continued from page 28)



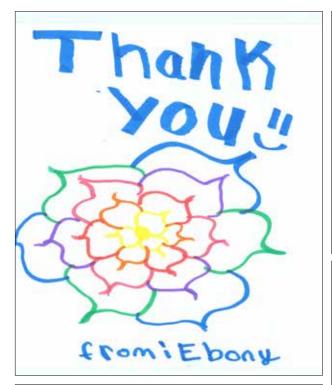






Resource Action Programs®

(continued)



Dear Sponson of Living Wise,
Thank you for what you sent to help us learn about swing water and energy. It will defeatly help my family I also learned alot about to save water and electricity.

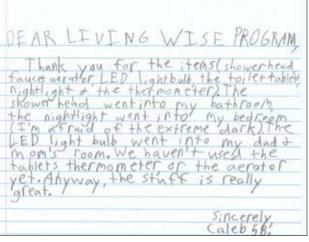
Thank You, Hayley

Dear Sponsors of living Wise,

Thank you for sending us the booklet it really helped learn about saveing things. Thank you for sponsering living Wise program. Thank you for sending the package full of the helpful things me and my family will really use them.

Thank you,

Grace Antonsen



Dear sponses of Living Wise,

Thank you for providing the money so that
we could use the kit. I lowned a lot, about
how to use energy, electricity, and water more
wisely. It was very interesting and the
worksheets were coa.

Thanks You,
Hannah

Dear, livewise Sponsor,

It has know for the livewise change with the shower head,

mus. We used the shower head,

mus. We used the shower head,

My holy, out the source of the line nightlight that we put the line nightlight that we put the line room he put the LED and my nom.

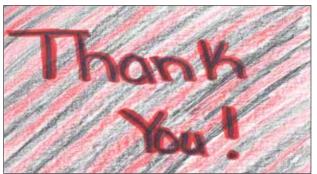
Once again, thankyou.

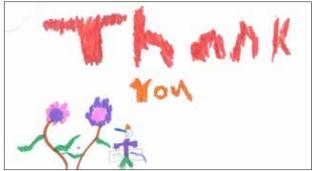
Sinsceirly,

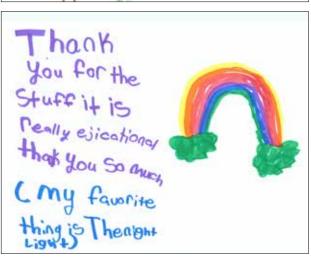
Landin Parasnik



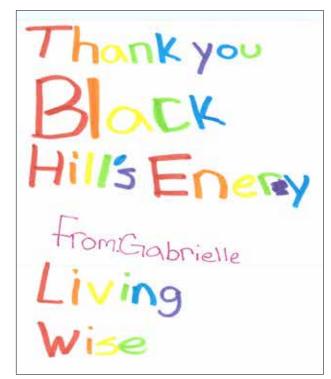


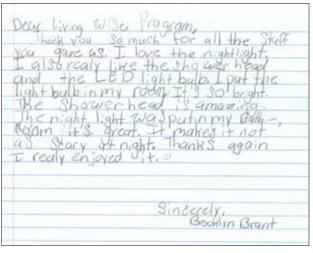




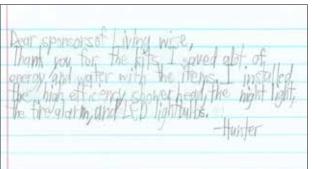




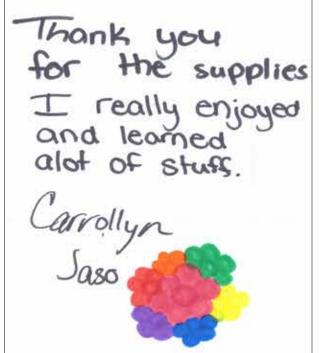




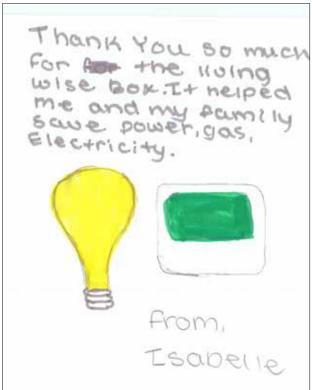


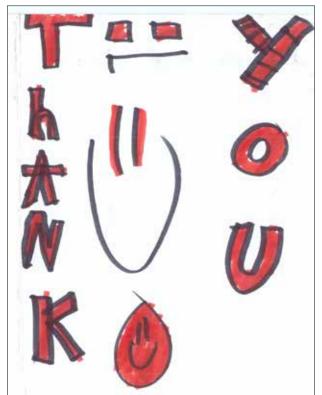


	r Living Wise Program,
Deco	rank you for the Dree Hems. I like the tope mass use it work very well and I like the size of it. Also like how the night light is a knight relaying in we might inshall the LED light. I like how of the stall is nice quality and can be used useful through I I do a project I will probe useful through I I do a project I will probe useful through the tage massurer me gave me. The warms you gave me will not go to noste!
	Sincerely,

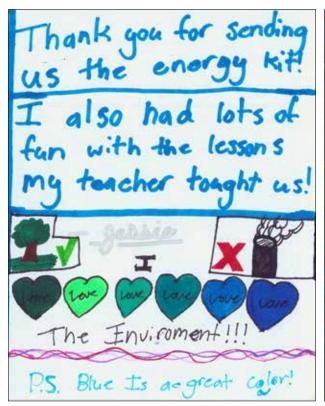








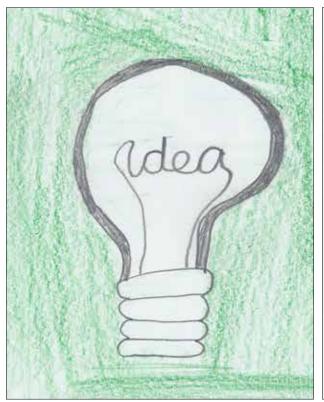


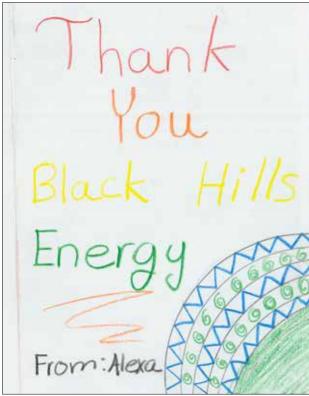


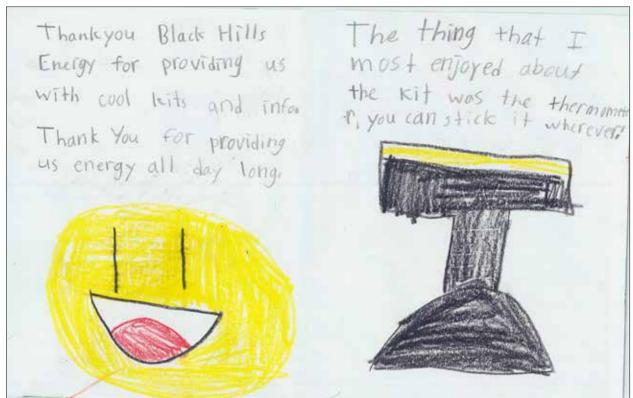




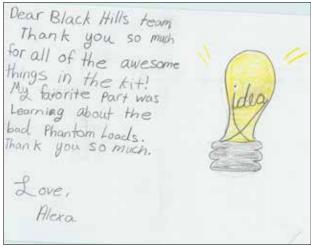






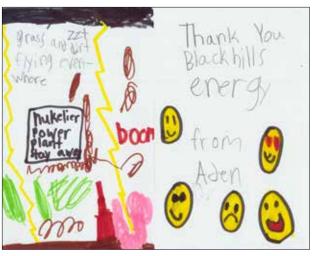




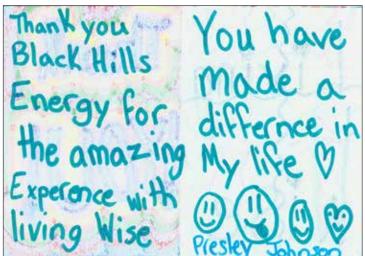




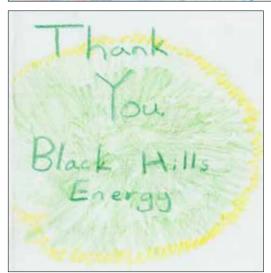


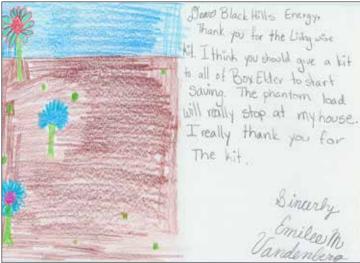


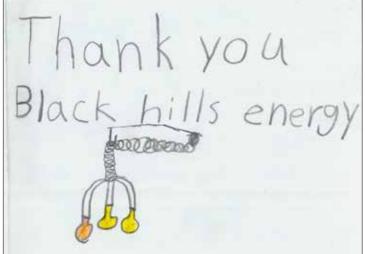


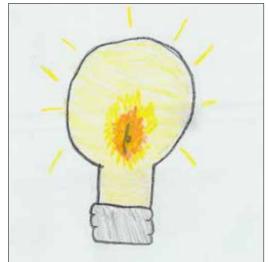






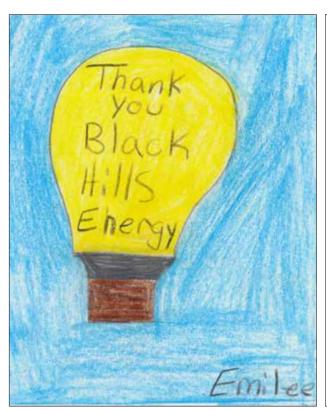


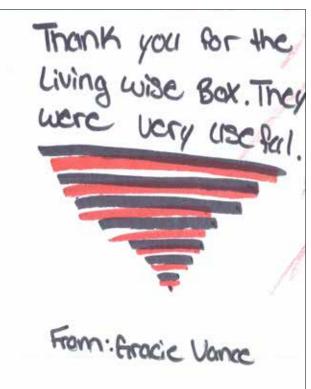


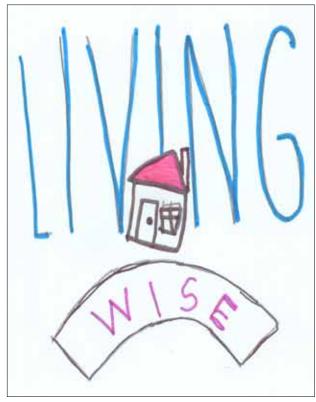




















A FRANKLIN ENERGY COMPANY

976 United Circle • Sparks, NV 89431 www.resourceaction.com • (888) 438-9473 ©2017 Resource Action Programs®