

Facilitating Lasting Changes at an Elementary School

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Abstract


The purpose of this study was to determine how to minimize waste in a school setting by reducing, reusing, recycling, and composting waste products. Specifically, the desire was to identify what steps could be taken to decrease waste practices at a Title I elementary school. Through the Washington Green Schools certification process, a Waste and Recycling Assessment and Characterization Audit allowed for the collection of data. The assessment examined how much and what types of waste products were disposed of at the school. Based on the audit, 93% of waste products in the cafeteria were recyclable or compostable. The results provided ways for the students and staff to take action resulting in behavioral changes that taught and modeled environmental conservation. This study can help revolutionize school communities by serving as a prototype for environmental sustainability enhancing an eco-friendly citizenry.

Keywords: Conservation, Eco-friendly, Natural resources, Recycle, Sustainability.

Introduction

In our rapidly changing world, there has been a need to understand how actions of today impact issues of using natural resources for tomorrow. Changing individual behaviors is essential to achieving a sustainable future. Sustainability creates and maintains the conditions so there will be enough resources to protect the environment for years to come (Environmental Protection Agency, 2015). To promote practical sustainability and waste reduction there must be individuals willing to do what is best for communicating the importance of environmental responsibility to those within the school community (Redman, 2013).

Educational institutes are centers for change and can lead to a revolution in the way people view the natural world and maintain it for future generations. School settings can provide students and staff with concrete opportunities to contribute to sustainable living while demonstrating best practices (TerraCycle, 2015). Infusing sustainable behaviors into daily activities a school requires the support of all stakeholders within the school culture (Schelly et al., 2012). Given that more than one million people spend their days in K-12 schools in Washington State, these institutions can play a significant role in

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advancing sustainability awareness and interventions in a community (Washington Green Schools, 2015).

Environmental education is often seen as a hobby for those who have the time and money to support this lifestyle. To support the current needs of elementary students, educators need to look for additional funding to enhance instructional services and activities for the entire school. Providing environmental education and awareness for young students leads to enduring understanding learned through ongoing practices. Communication and shared decision making are important threads linking conservation and educational goals (Schelly et al., 2012). Therefore, the intent is to help students develop habits by taking an active role in what they learn and can do.

Broadening Understanding of Waste Reduction at School

Going “green” at school means students develop and demonstrate an understanding necessary to make ecologically driven decisions and model waste reduction. A school-wide approach is key for all stakeholders to work together to make a lasting change (Griffiths, Richards, & Winters, 2007). To reduce environmental impact through waste reduction, every person can make a difference by improving conservation practices and helping to protect the environment. Changing individual behaviors is essential to achieving a promising green future and a central motivation of sustainable education (Frisk & Larson, 2011).

Why is conservation education necessary in the school setting? Conservation education supports academic success meeting students’ current and future needs (Office of Superintendent of Public Instruction, 2015). School settings represent a part of society and have the potential for creating change through promoting conservation. Developing quality educational systems require students to adapt and learn continuously (Frisk & Larson, 2011). Each action of today is a step towards creating a better tomorrow (United Nations Educational, Scientific and Cultural Organization, 1997). The principles and practices developed for long-term effects on the environment should promote green solutions in the community. Because of this, Washington State developed, implemented, and supported environmental sustainability needs in education programs (Nolet & Wheeler, 2010).

Purpose of the Study

The purpose was to identify methods to decrease waste and transform the school setting. After establishing a need for this study, the following questions were asked. What steps are necessary to reduce waste at school? What resources are available for stakeholders to implement in a school setting? Could students participating in a school-wide recycling and composting program make a lasting change?

Each year schools accumulate tons of waste from paper to electronics to food, making them an ideal intervention point for targeted environmental change. Elementary schools face the same stumbling blocks as any other organization attempting to create an organizational culture that values natural resources (Schelly et al., 2012). That is why there is a need to model the desired behaviors to create opportunities for lasting change leading to altering habits focusing on how to reduce, reuse, recycle, and compost.

Past research has indicated that recycling can benefit a community and help sustain the environment for future generations (Environmental Protection Agency, 2015). School communities can lead the way toward conservation by providing a supportive atmosphere for sustainable behaviors (Redman, 2013). Furthermore, conservation education should be infused into the core curriculum and require a new way of teaching, learning, and thinking about the content (Nolet & Wheeler, 2010).

To be able to explain how waste reduction relates to students' lives and values, teachers face a significant challenge in preparing young people to be conscientious citizens. Instilling environmentally friendly behaviors, attitudes, and practices from a young age cannot only have an immediate impact but long-term benefits to society by molding a generation who will be better stewards of natural resources. Incorporating a waste reduction theme as part of a science or reading curriculum engages students in their understanding of waste within the context of sustainable living (Griffiths, Richards, & Winters, 2007). Achieving changes in behavior will come from a shift in values and awareness (United Nations Educational, Scientific and Cultural Organization, 1997).

Teachers who incorporate conservation concepts into their classrooms can face obstacles such as lack of time to learn something new or the time to introduce an idea outside of the core curriculum (Church & Skelton, 2010). If teachers have the necessary resources to support integrated environmental learning opportunities, then students can develop the knowledge and understanding that prompts them to take action that promotes waste reduction. The Next Generation Science Standards supports teachers to express key aspects of environmental sustainability for future generations (Office of Superintendent of Public Instruction, 2015).

Partnership with Local Organizations

Conservation and sustainability can be difficult concepts to explain to elementary students. That is why organizations like Washington Green Schools, TerraCycle, Waste Management, and the Public Utility District's Education Team provide assistance to help educational settings reach environmental goals. To assist with the change educational settings need a researched-based program to provide a framework to help embed fundamental principles of implementing a waste reduction program.

Washington Green Schools is a nonprofit organization dedicated to challenging educational settings to create conservation practices through educational experiences that transform schools. The Washington Green Schools educators collaborate with the staff from schools to outline ways to incorporate sustainability concepts in educational settings. A partnership develops through ongoing conversations that teach and model environmental conservation. Best practices include moving beyond conservation knowledge while inspiring and strengthening concepts thinking toward the future (Shriberg & MacDonald, 2013). One in six people in Washington State spend their day in a K-12 setting (Washington Green Schools, 2015). For that reason, Washington Green Schools is a bridge to create a lasting educational experience in the school environments by educating students on ways to make conservation changes.

By partnering with the TerraCycle Company, students develop a lifestyle that minimizes waste. TerraCycle is an international upcycling and recycling company. Upcycling uses every aspect of waste as value (TerraCycle, 2015). TerraCycle offers a variety of more than 40 Brigade programs that range from collecting drink pouches to plastic containers to candy wrappers. Each Brigade program is designed to take difficult-to-recycle products and convert the materials into innovative products. For each approved waste item collected, the school is awarded two TerraCycle points redeemable for a charitable gift or a payment of \$0.01 per point to the school's account. After signing up and creating an account, TerraCycle sends heavy-duty boxes to the school along with pre-paid postage and a mailing label. The students put their empty waste products in the designated boxes. Once the box is full, it gets shipped to TerraCycle and points are credited to the school's account.

The Waste Management website provides free online educational resources, videos, and craft ideas to expand students' understanding of issues related to recycling and

natural resource recovery. The Waste Management's Public Education and Outreach team dedicates resources to the green school initiatives for recycling and composting. The Waste Management organization works to find the most efficient and forward-thinking approach to handling waste. Their goal is to reduce consumption, reuse products, and recycle waste materials that help to conserve natural resources (Waste Management, 2015). Solving conservation problems and generating sustainability opportunities requires active collaboration (Wiek, Withycombe, & Redman, 2011). A partnership develops with the Waste Management Education team through online communications making it possible to incorporate environmental ideas. Working together to reduce the depletions of natural resources, waste reduction systems can result in environmental benefits (Environmental Protection Agency, 2015).

To develop lifelong changes in young people, Snohomish County Public Utility District's Education Team has made a commitment maximizing resources and offering a school-to-world connection through free recycling assemblies and classroom workshops. For example, the Meet the Renewables assembly has "energy" characters igniting school-wide interest in recycling and waste reduction by immersing students on a fun and interactive adventure (Snohomish County Public Utility District, 2015). Students learn about the resources that generate renewable energy. Through audience participation, students are shown how simple actions can minimize their environmental impact to decrease garbage and waste. By the end of the performance, the characters help students realize that the best energy source is energy conservation (Snohomish County Public Utility District, 2015). Having opportunities to have ongoing dialogue about conservation education enhances waste reduction programs.

Journey to Becoming Certified

During the beginning stages of initiating change in school, the students learn that composting organics is one way to reduce methane emissions and decrease their carbon footprint (Hertwich & Peters, 2009). Since composting is nature's way of recycling, compostable organic materials transform organic soil returning the nutrients to the earth which conserves natural resources. The decomposed organic materials produce bacteria in the soil breaking down waste to make organic fertilizer (Environmental Protection Agency, 2015). Furthermore, composting is endorsed by the Environmental Protection Agency as a preferred waste management solution with the potential to reduce greenhouse gas emissions by diverting organic materials from landfills (Hasling, 2012).

Becoming a green school means taking actions by introducing and reinforcing conservation concepts that create a healthy learning environment. Providing students with a supportive environmental infrastructure for taking action is vital to maintaining change in the future (Redman, 2013). The school staff must believe that knowledge is power when making lasting changes. This commitment is a way to establish long-term effects on the environment through increasing recycling, reusing products, and composting materials. Conservation educating requires that students develop the knowledge, skills, and disposition that engage multiple strategies for understanding. Additionally, conservation concepts can provide notable contexts for developing the skills of critical thinking, collaboration, and communication (Church & Skelton, 2010).

Stakeholders view school settings as centers for change which can lead to a revolution in maintaining the environment for future generations. It is important to have teachers and staff as role models to motivate students about environmental conservation (Higgs & McMillan, 2006). By getting the school leaders to model conservation behaviors and positively reinforce those behaviors in others, there is greater potential for utilizing social knowledge as a motivation tool rather than a barrier (Redman, 2013). Collaboration is

critical for understanding and exploring future alternatives in ways that are conducive for action (Wiek, Withycombe, & Redman, 2011). When educational leaders reuse items for different purposes and reduce waste, they are modeling how to take care of the environment while cutting school costs.

How can elementary students make a difference? Students do their part by rethinking how to reduce waste. They select specific strategies for changing their food and waste behaviors while considering any personal constraints to change. As a result, when seeing the actions of others the students become better prepared to lead more sustainable lifestyles while making a difference in their school culture (Higgs & McMillan, 2006). A greener school empowers students to make a change that will stay with them for life (Green Schools Initiative, 2014). Thus, the journey begins by identifying the kinds of actions that can be implemented to make the biggest improvements in becoming more conscious of using resources at school.

Students Initiate an Environmental Movement

The environmental movement began immediately following the Meet the Renewables waste reduction assembly. As a follow-up exercise, a group of fourth graders had a discussion with their teacher about conserving energy while recognizing the environmental benefits of recycling materials. One student asked, "How can we help to make the environment better for our future?" Through the class discussion, the students stated they wanted their school to become more eco-friendly and by working together they could make a difference. Thus, the fourth-grade students were determined to take actions to make lasting change in their school community. That was the day that the student initiative began.

Since students learned how they could conserve at school, they wanted to lead by example and advocated for the inclusion of renewable resources. The educational waste reduction assembly increased awareness and brought environmentally friendly ideas to life by showing concrete solutions and strategies to recycle and compost natural resources (Snohomish County Public Utility District, 2015).

Methods

The intent of this study was to determine if the 770 students (374 girls and 396 boys) and 72 staff members could reduce waste at school. This Title I elementary school had 77% of the students receiving free or reduced-priced meals and 36% of the students were transitional bilingual.

A classroom teacher, custodian, and three students conducted a Waste and Recycling Assessment and Characterization Audit. The materials used for this audit were a digital scale, the assessment sheet, and bins that contained each waste product. The assessment provided specific guidelines for the Green Team to follow. There was a random selection of garbage bins collected in the school cafeteria, classrooms, and main office. Each bin was weighed by the students and recorded on the assessment sheet. The pre-assessment identified the percentage of specific waste products from the three areas within the school.

Staff and students were trained to reduce, reuse, recycle, and compost waste products. Then students from the Green Team created signage for each new waste bin in the cafeteria. The bins were donated by Waste Management and Washington Green Schools. At the end of each month, a post-assessment examined the waste from the bins. There was a comparison between the pre-assessment and the post-assessments from the cafeteria. The data revealed a notable decrease in waste and an increase in recycling and composting.

Forming a Green Team: Supportive Action

The Washington Green Schools program provides educational resources to public and private K-12 schools. This program outlines ways to inform teachers and school leaders about the process to create lasting change reducing schools' environmental footprint. The Washington Green Schools certification program promotes and acknowledges long-term action for lasting changes in six environmental categories.

The first requirement for becoming certified as a waste reduction school through Washington Green Schools was to create a school Green Team. A classroom teacher became the facilitator for the Green Team along with five certificated staff, two classified staff, the principal, and nine fourth-grade students. After forming the Green Team, the group organized efforts associated with environmental responsibility. Then, a discussion began to initiate the process of establishing a school-wide goal to implement lasting change. During the beginning stage of this movement, the Green Team members created a sense of teamwork and the Green Team students became leaders.

Table 1. *Demographics of the student green team members*

Gender	
Girls	7
Boys	2
Age	
Eight years old	1
Nine years old	5
Ten years old	3
Ethnicity	
Hispanic	6
Caucasian	2
Asian	1

The Green Team met every two weeks. They encouraged one another to think of creative ideas to reduce waste that would benefit the environment. Their school-wide goal was to make lasting change by decreasing the amount organic waste and recyclables getting placed in landfills while increasing composting and recycling. However, the achievement of such goals within the school environment needed participation, support, planning, and fortitude from all stakeholders (Colliver, Bishop, & Caristo, 1999).

A fourth-grade student created the Green Team pledge to be responsible leaders of the school. All the Green Team students signed the pledge stating they promised to follow rules, keep the environment clean, tell other students about recycling, and be positive leaders at school (see Figure 1). After making this pledge, the student leaders received a Go Green t-shirt.

Building a Green Team demonstrated that teamwork increased students' awareness of environmental issues empowering them to be leaders while working together to decrease waste (Green Schools Initiative, 2014). The overall message from the team was to create lasting changes within an environmentally friendly school community.

Green Team Students' Pledge

I will promise to follow these rules.

I will sort the recycling from the garbage and the compost.

I will also help the environment by nicely telling other kids about recycling and composting.

I will pick up garbage and recycled stuff and put it in the correct bin.

I will be a positive Green Team leader at school.

I also know how to keep the environment clean and will follow these rules.

Date

Sign your name in cursive

Figure 1. *Student Pledge.*

Waste and Recycling Assessment and Characterization Audit

Step two of the Washington Green Schools certification program was to select one of six environmental categories to assess in the school setting. The Green Team chose the Waste and Recycling Assessment and Characterization Audit. This category gave an overview of the status of the school's waste, recycling, and composting practices in the cafeteria, classrooms, and office area. Some questions from the guide were:

- 1) Does your school recycle currently?
- 2) Are there easy-to-read informational signs on or above your garbage, recycling, and compost bins?
- 3) How many garbage dumpsters and containers does your school have?
- 4) How much waste does your school dispose of in one month?
- 5) After sorting your waste, what percent of garbage could have been recycled or composted?
- 6) What does your school pay for recycling services?

Results

A random selection of three garbage bins were collected from the cafeteria, main office, and classrooms. The Waste and Recycling Assessment and Characterization Audit provided a snapshot of how much and what types of waste products were at the school. After recording the weight of the waste materials, each item was sorted into recyclables, compostable, and garbage. The sorted contents were weighed again with common items documented. This information helped the Green Team members look for opportunities to reduce or prevent waste.

The Green Team established a baseline of waste generated at school. This measurement revealed that each month the school disposed of 40 yards of garbage, 20 yards of recyclables, and 3 yards of compost materials. Waste Management collected the garbage and recycling. Waste Management is the largest provider of integrated environmental solutions (Waste Management, 2015). Cedar Grove collected compostable materials to help decrease and divert the amount of organic waste that goes into landfills. Cedar Grove is an environmental solution company that harnesses the energy of organic waste through composting (Cedar Grove, 2015).

There was one key finding from the cafeteria that stood out to the Green Team members. After sorting and weighing the waste product from the three random garbage bins, there was 45 lbs of compostable materials, 111 lbs of recyclable materials, and 12 lbs of garbage collected. Thus, the data assessment showed 93% of the products in the garbage

were recyclable or compostable. From the waste products collected, 66% was recyclable, 27% was compostable, and only 7% was garbage. There were fifteen 44-gallon bins of garbage a day in the cafeteria. Examples of items put in the trash versus recycled or composted consisted of milk containers, juice containers, fruit, bread, napkins, juice pouches, and soda cans.

The information gathered for step two revealed the current waste and recycling practices. Through the baseline assessment, the Green Team tracked changes, determined potential improvements, and prioritized goals. After the analysis, it was clear that waste products in the cafeteria were not being disposed of correctly. For that reason, it was decided that reducing waste in the cafeteria would be the first place to make an effective, lasting change. Therefore, a goal was set to reduce the waste 50% at school in two months.

Implementation of the Action Plan: Focus in the Cafeteria

Assessing the information collected from the Waste and Recycling Assessment and Characterization Audit, the Green Team made changes in the cafeteria. To obtain a better understanding of barriers to recycling and composting, the Green Team completed the Washington Green Schools program criteria. To begin the Green Team members identified current recycling behaviors and tracked successes over time. After reviewing the assessment results, an action plan created and set realistic targets to improve environmental practices. This led to the third step of taking action that resulted in implementing lasting change in the focus category.

What kinds of actions were implemented to make the greatest impact on student engagement that promoted waste reduction in the school community? First, the facilitator of the Green Team educated and trained the Green Team students to recognize which waste products went into each waste bin. Modeling allowed students to emulate conservation concepts through continual direct observations that reinforced sustainable practices (Higgs & McMillan, 2006). The students had multiple resources for understanding the recycling process which made it easy to adapt to change. After that, the students created signage to identify what products should go into each bin. Fourth-grade students volunteered to be environmental ambassadors. These students assisted other students with sorting materials as well as emptying recycle bins into a centrally located container. Diminishing confusion about what could be recycled and composted enhanced behavioral changes.

Through the guidance of the school staff, the student body learned the proper procedures to dispose of waste in the cafeteria; for example, recycling milk and juice cartons after emptying the liquid into a bucket. Paper containers, cardboard, and plastic containers were placed in the recycle bin. Excess food products were composted along with napkins, paper bags, and other identified items. Leftover waste items were sorted into separate bins and reusable food trays were stacked. Products brought from home were placed into thermoses and reusable containers.

Green Team Makes an Impact: Verification

When implementing a waste reduction program, it is essential to monitor areas that evolve over time. Thus, the fourth step to becoming certified through Washington Green Schools was verifying the focus area for lasting changes. The study revealed notable results in the first week of implementing changes. The first thing that was evident in the school cafeteria was how students altered the way they disposed of their waste products. Even though this was a work in progress, there was a noticeable difference in the cafeteria between the trash produced during the assessment period as the garbage declined and the recycling increased.

The goal to reduce waste at the school by 50% evolved over two months. The 770 students and 72 staff members were able to reduce the garbage each month. Factors that made a positive change were educating the student body on correct recycling and composting practices, prompting students to take ownership in the program, and using appropriate containers to dispose of the materials properly. Best practice in recycling, reducing, reusing, and composting became an integral part of the school and cafeteria. The integration of two green compost bins, two blue recycling bins, and two red garbage bins made it easy to identify where to deposit waste materials. Also, there was a change to durable trays versus disposable Styrofoam trays as well as using bulk dispensers for condiments and other food products.

Analysis of Data: Findings

A recycling program was an essential piece of conservation when it was modeled and incorporated into the school setting. The Green Team implemented the recycling program by clarifying what waste products were recyclable, determining what was considered actual garbage, and shipping drink pouches and Lunchable containers to TerraCycle. In just one month, there were 12 lbs of drink pouches and 6 lbs of Lunchable plastic containers collected in the cafeteria. As the awareness increased, students worked toward keeping their promise to make a difference in the environment.

In one month, the garbage for the school decreased by 25% from 40 cubic yards of waste to 30 cubic yards. The monthly Waste Management bill decreased by 17% from \$980 to \$813 saving \$167 the first month of implementing waste reductions. Because of the determination of the student body to make a difference in the environment and reduce their carbon footprint, the school reduced the size of its garbage dumpster from a 6-yard dumpster to a 4-yard dumpster.

The findings revealed in Figure 2 show the monthly amount of cubic yards of waste recycled, composted, or disposed of as garbage. Using the Waste and Recycling Assessment and Characterization Audit as a pre-assessment baseline, the garbage decreased 60% in two months from 40-cubic yards of waste to 16-cubic yards and after three months further decreased to 62% resulting in 15-cubic yards of waste. At the same time, recycling increased 20% in two months from 20-cubic yards to 24-cubic yards and after three months increased 25% resulting in 25-cubic yards of recyclable materials. After two months, composting increased 33% from 3-cubic yards of materials to 4-cubic yards and after three months increased 66% resulting in 5-cubic yards of compostable materials.

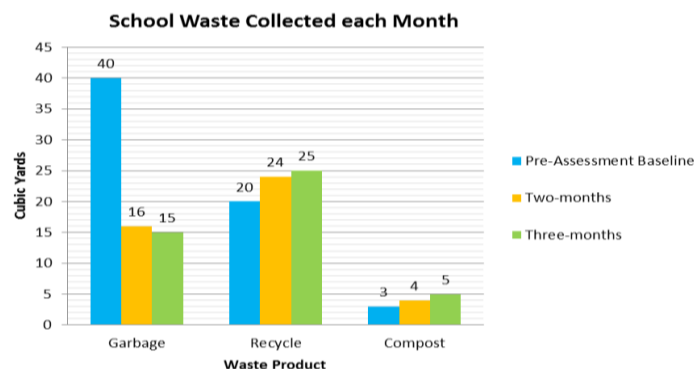


Figure 2. School waste products.

In Figure 3, data from the Waste and Recycling Assessment and Characterization Audit identified the number of bins in the cafeteria full of waste products each day. By the end of

the second and third months, there was an extreme reduction in waste from fifteen 44-gallon bins of garbage a day down to one 44-gallon bin a day. There was a significant increase in daily recycling in the cafeteria. The results revealed at the end of the second month; recycling increased 400% and by the end of the third month increased 500% since the pre-assessment baseline.

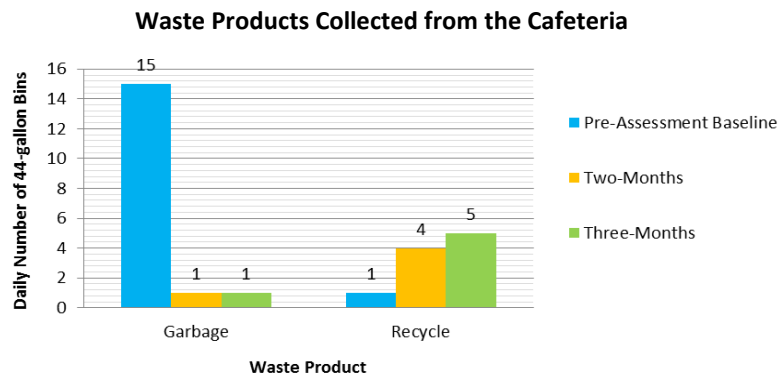


Figure 3. Cafeteria waste products per day.

Discussion

Based on the findings, the biggest factor that influenced the decline in the garbage consumption was recycling milk and juice cartons in the cafeteria as well as eliminating Styrofoam trays. In addition, each bin in the cafeteria was color coded and marked clearly, so students knew where to put each waste product. To reduce items being accidentally deposited in the incorrect waste bin, the Green Team students were available in the cafeteria daily to help other students with proper placement of waste products.

Significance of Decreasing Waste: Sharing the Results

The fifth step in completing the certification was to share the journey and results with stakeholders as well as the community to inspire others to make a difference. Therefore, a school-wide assembly was organized inviting students, staff, parents, the media, and community members to attend the celebration of accomplishments. Students shared what they learned through artwork, poems, and their student written and performed skits. Real-world learning enabled students to apply theory to practice and built interpersonal skills critical for sustainability (Redman, 2013).

The final step in becoming certified was to review the Washington Green Schools report card, which was a summary page that tracked the progress in each category. After meeting the requirements and the lasting change verified, the application was submitted to Washington Green Schools for approval. Once successful, the school became certified through Washington Green Schools (Washington Green Schools, 2015).

The significance of the study identified barriers and improvements that resulted in the recycling and composting of waste at an educational setting. The improved conservation practice reduced depletion of natural resources making it possible for ongoing changes. Stakeholders had an opportunity learn how to identify and reduce waste while at the same time preserving the environment.

There are benefits to an eco-friendly school setting. Schools can conserve valuable resources, reduce environmental impact, save money, and cut down the amount of waste

generated by recycling and composting (Colliver, Bishop, & Caristo, 1999). Teachers in Washington State have the necessary resources to support integrated environmental and conservation education learning opportunities for each student.

Through teaching, training, and working together to support environmental issues, steps were taken to reduce waste at school. Students made a lasting change by participating in a school-wide recycling and composting program. There were resources available for stakeholders to implement throughout a school setting. This lasting change allowed students to discover practical solutions to reduce waste. Therefore, the goal was met by increasing recycling and composting while decreasing garbage. The next area for improvement includes implementing lasting change throughout the entire school setting and surrounding grounds.

Conclusions

It takes a team to develop and implement change within the school community. The school's Green Team introduced something important which united the students and staff. Stakeholders took action resulting in behavioral changes that taught, modeled, and practiced waste reduction. Educating students on ways to take care of the environment started with making small changes. Students developed and applied the knowledge and skills needed to make decisions while promoting green solutions.

The outcome of this study provided insight and information on how elementary students reduced waste within a brief time. Based on the results, a lasting change program can improve the way a school manages waste products. This short-term milestone aided in taking the first step to making a difference at a Title I elementary school. Best practices in the community will also continue to evolve and allow for effective outcomes that translate into successes in education (Shriberg & MacDonald, 2013). In the future, recycling programs may help school communities to meet conservation needs and show greater improvements in becoming eco-friendly while reducing the depletion of natural resources.



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