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HOW CAN EDUCATION IMPROVE THE RECYCLING BEHAVIORS AND
ATTITUDES OF MIDDLE SCHOOL STUDENTS

By

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A capstone submitted in partial fulfillment of the requirements for the
degree of Masters of Arts in Education: Natural Science and
Environmental Education

Hamline University

Saint Paul, Minnesota

2017

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To my fortune cookie,

“You are a lover of words, one day you will write a book.”

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CHAPTER ONE:

Introduction

Shortly after finishing my undergraduate degree in science education I became a middle school science teacher. What I like most about the middle school age is that the students have enough background knowledge that you can go deeper into the topics you cover and you can start to present them with challenges and controversies in the field of study. At the middle school age you can start to present students with big worldwide challenges. One challenge that has been at the front of many debates is that of climate change. Before my time in the Environmental Education program I never thought too much about what I was doing to impact climate change. After, it is easy to see that even small actions can start to have an impact on the world. During this program I was able to have experiences and was given certain tasks that led me to see that big changes start with smaller ones. Then I started thinking of my students. They are at an age where they can start to relate to world problems, but cannot see how they truly affect them. Therefore, I decided it was time to find a way to show my students that the little things they do can and do have larger implications. My question: "How can education improve the recycling behaviors and attitudes of middle school students? is aimed to help bring an awareness to middle school students of the connections between personal choices and global implications.

My Inspiration

For one of my classes in the Environmental Education program we were able to tour the Xcel Energy Center in Saint Paul Minnesota. The Xcel Energy Center hosts NHL

games, hockey tournaments, events on ice, concerts and many conventions. They received multiple awards for their sustainable practices and is one of the only complexes in the world to be awarded LEED, Green Globes, and APEX / ASTM environmental certifications (Xcel Energy Center, 2017). I think this tour was one of the most influential experiences in determining my choice of question. We got a tour of the facility from one of the managers and he was telling our group about how when they first started out, their recycling rate was around one percent, and that was only because they were able to recycle the grease and oils from the concession kitchens. They felt compelled to do more and decided to set out recycling bins. Suddenly their recycling rate jumped. Now they have installed multiple waste collectors that offer recyclables, trash, compostables, and mixed paper products. They are now able to recycle 61 percent of the waste that is produced in the three buildings. I think that having a very public example of these effective recycling practices is a great way to show the community, and everyone who travels to this location to attend events, that the environment does matter-even to large corporations and businesses. The Xcel Energy Center can show anyone who comes through the door that with a little extra time and effort, we can reduce the amount of waste that is sent to landfills, reduce the amount of trash that ends up in our local waters, and that we can use materials more than once by turning them into something else. One of their waste receptacles was even made from recycled plastic milk cartons.

I started looking at my own life and home and realized how much stuff I have that I do not need or use. I starting looking at downsizing my belongings, but there was still one big unanswered question: What do I do with all the things I no longer needed or wanted? Little did I realize at the time, but everyone is faced with this decision multiple

times a day. As a whole, the American society is one of high consumerism and convenience. Some statistics that are mind blowing. The one statistic I learned, which has had a lasting impact on me, is that the U.S. will use 60,000 plastic bags every 5 seconds (Jordan, 2007). Before knowing this fact, I would get a bag if I forgot mine or needed an extra one. Now I refuse bags and won't purchase more than I can carry. If I do end up using a plastic bag from a store I reuse it in some way, like as a trash liner, or bring it back to the store to be recycled. Even more disturbing fact is that these bags are made from nonrenewable resources, they put out pollution upon production, only five percent of these are recycled and they can take upwards of 500 years to break down (O'Connor, 2011). I am sure that when they were first introduced they seemed like a great idea: convenient, inexpensive, and lightweight-all great features. However, often products are produced without a thought for the implications to the environment or what will happen to them 3 – 5 years down the road let alone in 1000 years.

Through these learning experiences, at the age of 28, I was finally able to start to understand how my personal choices were adding to a global issue. To think that if I would have figured this out sooner, I could have had a larger impact. As it turns out, I feel like now I have a great opportunity, being a middle school teacher, to make an even larger impact. I have the opportunity to share with my students the knowledge I gained almost 15 years later. I want my students to be able to see how their choices contribute to their carbon footprint. Then I want to help them see how if everyone else is overusing resources in the world, how this could and has become a larger problem bigger than themselves, their community, and their country. Finally, I want my students to feel

empowered to make an impact by acting small and encouraging others to act small by recycling properly.

Why Recycling?

For years I have worked in a school that has recycling containers and middle school age students in the same room. I have also spent almost no time educating my students about what does and does not go into the recycling bin. I have taken some items out and put them into the trash because they were not recyclable, but in order to help people be more effective when they recycle, they need to have the knowledge of what is and is not recyclable. This comes with education.

In my classroom the recycling bin is a large blue bin that is near the trash can. Over the years I have watched kids use it as more of a large basketball hoop. The students do not know what does and does not belong in the recycling and trash bins. If you take a look in various bins around the school, they are all the same: miscellaneous dried liquids that have now encrusted gum wrappers to the side of the bin, wads of gum themselves, yarn from who knows where and what activity from some other classroom that got transferred into your classroom, and chip bags from the snack the student just couldn't finish in the lunch room. When I think back I sometimes encourage using the recycling bin as a basketball hoop. We will write things on paper and at the end of the class we will have a shooting contest of who can make it from the furthest place in the room. However, most of the items the students are disposing of on their own are things like pens and broken pencils. Also, because I am in a science room, we have paper towels to clean up spills. Students think that because they are paper that they belong in the recycle bin. It is clear that the student do not know what belongs in the recycle bin.

When talking with my custodian, I have asked if he recycles things or if a lot of it ends up in the trash. His response is that as he is emptying out the recycle bins, most of the contents is able to be recycled; but once he finds trash in the bin, he starts to put whatever is remaining in the trash. I started to think, “Well, this large bin is simply too inviting for middle school kids to use as a basketball hoop, regardless of what they are discarding. If only it had a top that had a slot for paper and a hole for cans and bottles. This would for sure be the answer to helping students stop throwing their garbage in the recycling bins.” We have some of these lidded bins in the hallways. Again I spoke with the custodian. He said most of the hallway bins are always trash instead of the recycling and he has had to start putting trash liners in the bins because the wrong materials are going in. Though these bins are intended for recyclable materials, it all goes in the trash.

Reducing the amount of garbage we produce is something that seems so easy, but when our society is centered on convenience, there are many items made for only one use such as; paper towels, plastic bags from stores and for food storage, tinfoil and plastic wrap that covers food, and many drink containers. There also is no added cost to these convenient items. In other countries, to get a plastic bag from a store, you must purchase one. When you buy a bottle of anything, there are deposits on the bottle and when you return the bottle you are able to get the deposit back. In these countries there are more incentives to help people develop good habits. Here, in the U.S., there are fewer monetary incentives, so there needs to be more of an intrinsic push. We can all reduce the amount of trash we produce by being more conscious about what we are buying. However, there are very few people who will be able to produce zero trash. In this case we have the opportunity to act responsibly about the choices we make to get rid of our

waste. Recycling is something that most people can do that will reduce the amount of true waste that each person makes in their lives.

Recycling is not only easy, but it is also encouraged in most places. Many cities contract with a company that provides recycling services to all residents, and many of these companies use a “single sort” system (also called single stream, or fully commingled). This presents a new challenge to residents. Before we had to sort the recyclables, now they can all be put into one bin and collected and brought back to a single location that will separate it. So where is the challenge? Well, many people are unaware of what is and is not recyclable. One challenge that can come with the single sort system is contamination. Contamination occurs when something that is not recyclable is disposed of with the recycling. Oftentimes the source of contamination comes from food item containers. If someone who is unaware of what is recyclable throws a food contaminated item into the recycling bin to be picked up, they can then also affect the other recyclables that all get collected in the truck. When this happens it can make some items not recyclable.

For example, paper, when it is recycled it is soaked in water and made into a pulp. If someone were to include a pizza box that had oils and grease from the pizza on it, this would introduce oil into the paper recycling process. When this happens the quality of the product that is made is reduced. A reduction in the quality of a product will also cause a reduction in the money made from the product.

Implications – The Bigger Picture

The issue of waste is something that seems small, but can start to have a large impact. It is one of the many factors that contributes to climate change. Climate change is

an issue that has so many layers and contributing factors to it that it can start to seem overwhelming. One of the factors that ties into our personal lives is the carbon footprint that we leave on this Earth. The good news is we have some control over how large our footprint will become. During my journey through the Environmental Education program, I found calculating my carbon footprint to be a great lesson of how my habits contribute to my carbon footprint. For the assignment, we needed to calculate our own footprint, have other people calculate their footprints, and lastly compare all the results. Through this activity, we could start to understand about what impact our daily lives have on our own carbon footprint. I found it interesting just how much material items, such as furniture, clothing, and household items had on everyone's footprint.

At first, jumping from recycling to climate change sounds like a large leap, but it is these little choices and actions that can start to snowball into having a much larger effect. When you buy a can of soda there is a certain amount of materials and energy consumed in producing both the can and the soda. The can, however, can be recycled and remade into another can that can then be refilled with more soda and sold again. This eliminates the need to gather more materials to make a new can, because we already have them. It will take a certain amount of energy to make the new can, but not nearly as much as the first original can. By this simple action of recycling one soda can, we are able to reduce the amount of natural resources for both the can and production and therefore reduce the amount of carbon dioxide emissions through the production process.

There are opinions out there that talk about how recycling is not cost effective and that some materials are not always able to be recycled into the same quality of product. While these are true, at some point it has got to be about something bigger: the Earth. At

some point it has got to be about more than just money, it should be about doing what is responsible and sustainable. We need to start being more proactive on the issue of dwindling resources and rising pollution. I came across a quote saying, “Until we are willing to make serious changes in how we live each day, recycling is the environmental equivalent of putting lipstick on a pig.” I partially agree with this quote. We do need to start making some serious changes to our daily lives. Many people will spend money on buying bottled water instead of buying one water bottle and reusing the bottle repeatedly. There is no motivation to recycle and there is no penalty for not recycling. However, I disagree partially with the quote. I don’t believe that recycling does so little that it changes nothing. If there are initiatives and incentives in place, it can become “the norm” and it could be a starting point for something much larger. According the EPA, in 2014 the United States had a recycling rate of 34.6%, which shows there is room for improvement (EPA, 2016).

Goals

By completing an investigation on how can education improve the recycling behaviors and attitudes of middle school students, I am hoping to determine how to best influence and improve the recycling practices of middle school students. They are at an age where they can start to take action to make significant changes. I want to know how to best change the practices in our school to help increase awareness for not only what waste is created, but also other options than just throwing objects in the garbage.

I am also hoping that through this investigation, students will gain a deeper insight as to where so many of the materials they discard everyday come from. My middle school students seem to have a very low appreciation for material items. They

cannot be fully at blame here. Society and companies are constantly telling them that when the newest version of something comes out, the old one they are using is no longer valuable. Most middle schoolers are still too young to hold jobs, so still have things bought for them by parents or guardians. In my school in particular, many of the students' supplies are donated in order to help families obtain the essential materials that students need for school. In most recent years, we have seen a lack of respect for the items provided for them. Students tend to leave their things wherever they please or break pencils to throw at their friends in class and expect that someone will just get them a new one. There is no sense of responsibility with material items.

Hopefully, by this investigation they gain more knowledge as to where items they use everyday come from, and how much materials and energy are needed to make these common items they discard. They can then start to see the importance of taking care of items and when the items are no longer of use, know the importance of needing to make sure the resources that went into making the product are not further wasted.

Summary

I want my students to see how their actions and decisions can influence something much larger. To do this, I will introduce them to their carbon footprint. We will dissect what makes the footprints larger or smaller, extrapolate the global implications of our carbon footprints and our current population, and evaluate and develop changes they can make to lessen their footprints. By educating students on where the things in our daily lives come from, what goes into making them, what happens when we throw them away, and how these small pieces of knowledge and choices affect our carbon footprints, students can start to extrapolate how around the world people have a great power to

influence larger outcomes. With all of this being said, change starts small. Recycling is something that almost everyone is able to do, and when done correctly, it can start to be the small change that will make the big difference.

In the following section I will be highlighting some educational strategies that have been used to influence changes in actions through a review of literature from other publications. There will also be current practices in schools that are showing success. Chapter three will discuss the strategies I have chosen to implement and the methods in which I did so. Next, will be my results and findings, followed by conclusions that I was able to draw from the data I collected.

CHAPTER TWO:

Literature Review

Chapter one focused on my personal reasons and experiences for wanting an answer to my question: How can education improve the recycling behaviors and attitudes of middle school students? The main goal of this research is to show my students where the items they buy come from and the possible end locations for those items once they are no longer wanted or needed. Once students can understand the normal chain of events, we can start to look at what else can be done in order to reduce the amount of waste that is produced.

This chapter will review the relevant information that will help focus my curriculum during my data collection. The first area of focus will be recycling and waste management. In order to inform students on why recycling is important, they must first see the impacts of waste on the environment, they will need to find out about the current practices are and trends with waste. There will also need to be some discussion on the how recycling can limit the waste impact to our earth.

Next I will address attitudes and behaviors of recycling. There are many different things that affect and influence our attitudes and behaviors and I will look at relevant research that has been done on this topic.

Finally I will compare and contrast curriculum that has been developed to help teach students about recycling. This comparison will help me to better focus my choice in lessons that I will later implement in the classroom.

Waste Management – Recycling

Brief History. Recycling is one practice that takes items that would be classified as garbage, and collects and reprocesses them to be made into something new that can be used again. Taking something that is unwanted and unusable and turning it into something new is not a new concept to most people. The idea of reusing and repurposing materials has been around since before the industrial age. In Europe they would reuse metals by melting them down and reforming them for a new purpose. Japan was one of the first places on record to sell repulped paper in 1031. In Britain, people would collect the ash from fires and use it as a material in making bricks (Bradbury, 2014). These actions of reusing and repurposing allowed materials to be obtained easier and sometimes at a cheaper price.

During times of war many civilians found that there was not a lot of resources allocated to them, instead they were being allocated to the military and war efforts. This created a need for recycling and reusing materials. Throughout history recycling became a means of income for families who would trade in scrap materials. (Economist, 2007).

Companies started to see the need for using less materials in the mid 1970's and switched from glass bottles to thin plastic bottles. It took less energy to produce the bottles and six plastic bottles weighed less than one glass bottle. Recycling allowed the bottles to be used over again, (Kennedy, 2014).

Throughout time, recycling has been linked to economics. At times, where people needed to save money, they would look to recycling to help get money back. When prices on materials dropped, the need for recycling also seemed to drop. In the 1980's, landfill space was inexpensive and seemed to some like a better option. Toward the end of the

decade, the problems with landfills became apparent. Landfills that were unlined led to groundwater contamination. In recent years the cost of oil has fluctuated causing the ideals around plastic to fluctuate as well. When it is cheaper to make a new bottle than to recycle, one there is less motivation to recycle.

Current Trends in Recycling. According to the latest report by the EPA in 2012 on average Americans generate 4.38 pounds of waste, per person per day. This figure is the lowest waste generation since the 1980's. This is because in the 1980's Americans had a recycling rate of less than 10 percent. Now Americans generate 4.38 pounds of waste but they are recycling or composting 1.51 pounds for a rate of 34.5 percent, (EPA, 2012). Overall landfill waste has decreased as well. In 1980, 89 percent of the waste produced went into a landfill, now only 54 percent is going into a landfill. Overall, 87 million of the 251 million tons of waste throughout the nation was recycled or composted. This gives us a benefit of reducing 168 million metric tons of carbon dioxide emissions, or taking the equivalent of about 33 million passenger vehicles off the road (EPA, 2012).

Recycling in Schools. In 1980, the Minnesota legislature passed the *Waste Management Act*. This act aimed to push public schools and other public entities to recycle at least three different recyclable materials (Countryman & Worner, 2007). The Minnesota Pollution Control Agency did a study in 2010, of the waste habits of six schools in Minnesota. It was noted that all the schools in the study had recycling and organics composting programs in place. Cioci and Farnan found that 78% of school waste materials could be discarded in either the organics composting or recycling. It was found that overall the recycling rate of the schools was 41.15% (Cioci & Farnan, 2010). They

found that schools were about to divert 65.65% recyclables but only 27.27% of compostables. The most abundant material of all waste was food related waste (Cioci & Farnan, 2010). Increasing our recycling rates has benefits for the environment as well as our financials.

Benefits of Recycling. Many people are in agreement that recycling has multiple benefits. One benefit that people seem to all agree on is that overall the amount of greenhouse gases and carbon emissions decrease due to the process of recycling, (EPA, 2012; Rappaport & Creighton, 2007; Smith et al, 2001; UNEP, 2010) Along with carbon emission reductions, there are also energy savings. It takes more energy to obtain and process virgin material from Earth than it does to take material that is already out of the ground and reprocess and repurpose it into something new (EPA, 2005). Not only are there energy savings, but there are also many financial and economic reasons why recycling should be considered.

Energy Savings. Recycling different materials has different benefits. Not all products can be 100 percent recovered and made into new products. However, some materials are much better for recycling than others. Aluminum, for instance, is made from the mineral bauxite. It takes 96 percent less energy to make a can from recycled material than from virgin bauxite. Plastic is next, requiring 76 percent less energy to repurpose than to create new plastic and newspaper requires 45 percent less energy to make from recycled newspaper. Glass is a different story. As mentioned before not all products can be 100 percent recovered. Making something from recycled glass only reduces the energy needed by 21 percent (Popular Mechanics). Whether it be glass or aluminum, there are energy savings by making products from recycled materials.

Financial savings. Other benefits of recycling are on the economical end. Having recycling programs in cities creates a need for collection and delivery of the recyclable materials, which creates more jobs. In 2005, in the U.S., there were almost one million jobs related to recycling and remanufacturing of materials. These jobs range from truck drivers, sorters and dispatchers to chemists, engineers and sales representatives (EPA, 2005).

Businesses. In a study done by New Jersey WasteWise Business Network it was found that recycling and composting on a large business scale proved to have financial savings. It is pointed out that the savings are mostly realized when the cost of waste disposal is less because there are less services needed. For example, The Federal Correctional Institution at Fairton recycled food waste through a composting system that they then used on landscape projects on the grounds. This composting saved almost \$11,000 in one year. There was an accounting firm that took a paperless initiative and was able to save over \$71,000 between printing, storing, and shredding costs along with the less need for paper.

One of the other considerations for money savings was the potential sale of materials. Campbell's Soup Company saved over \$219,000 in waste related costs and generated over three million dollars through the sale of used equipment that needed to be replaced. Anheuser-Busch Newark Brewery generated over one million dollars from recycling and avoided almost 5.5 million dollars in disposal fees. (New Jersey 2015)

Schools. Many businesses and schools are able to see the financial savings as a lower cost for trash disposal. In the state of Minnesota, waste haulers are required to add taxes or other charges to waste bills (Countryman & Worner, 2007). These taxes and

charges are not required on recycling and composting. Therefore, these disposal methods often end up costing less. From the researchers observations there are also programs in local school districts that aim to collect recyclable from the community that then earn money for the school district.

Influences on Behavior

According to Merriam-Webster a behavior is an action that a person does as a response to the environment in which they live (Merriam-Webster, 2017). There are many different factors that influence a person's behavior. Hook and Lucier found that a change in attitude can lead to a speedy behavior change (Hook, Lucier, 1995). Social norms and values play a large role in our development of behaviors from a very early age (Clément, Dukes, 2013).

Attitudes. There are many things that contribute to the way that each of us think and act. Both attitudes and behaviors are often closely related and can influence one another. McLeod talks about the strength of an attitude and how it oftentimes becomes a predictor of actions and behaviors. The overall idea is that the stronger the attitude is, the more likely that a supporting behavior would follow. Stronger attitudes can be developed though personal beliefs and knowledge (McLeod, 2014). If someone holds a certain belief to be important or of great value, this will lead to actions to support that belief. For example, if a person believes that voting is a great civic duty and the political process is extremely important to them, it is more likely that they will vote at many different levels of elections, encourage others to vote and possibly volunteer to help others with the voting process. Since this person is interested in the political systems they will want to gain more knowledge on their own. Knowledge can also influence our behaviors; people

tend to want to gain more knowledge on topics they are interested in and will then have stronger attitudes (McLeod, 2014). One of the influential pieces on behavior change is the interest to act. Boyes and Stanisstreet did a study with middle school age students and looked at the willingness to act and the students' perceived effectiveness of the action to reduce global warming for multiple habits. They found that if a student believes an action to be more helpful to the environment then they will be more likely to act on it. There were some actions that were found where this did not hold true, it appeared as though this was due to the students being in an age group that is not able to have a large amount of influence on the action. Students said that the need for smaller cars and an increased use for public transportation was a good thing and would be willing to do these things. Unfortunately, middle schoolers are not able to drive a car or may not be able to take public transportation based on the family structure and rules (Boyes & Stanisstreet, 2012).

They also found some actions where there was a high willingness to act may be more influenced by things like ease of action and direction from adults. For instance, turning off lights when not in use, the action itself lacks difficulty and is convenient and many times students are reminded by adults at home telling them to turn off lights. This action is then driven by financial reasons of the adults instead of a desire from the student to help save energy and reduce the energy consumption of their home (Boyes & Stanisstreet, 2012).

Boyes and Stanisstreet looked at the willingness to act and the perceived benefit of actions and correlated those actions to the potential that education could influence actions on the actions. They found that for some actions like turning on and off light

switches and long distance travel choices education would not heavily influence a student's actions. In the case of light switches, Boyes and Stanisstreet found there was already a high willingness to act, and the lifestyle changes, in the case of long distance travel choices, were not worth the action and potential inconvenience. In this case, the potential for inconvenience served as a disincentive to change behavior.

It was found that education would be effective for behaviors such as recycling, planting trees, and using energy-efficient products in the home because for these behaviors students have more influence in the decision making and had more control over whether or not the action was taken (Boyes & Stanisstreet, 2012). It appears through research that middle school students would be most receptive to the teaching of environmental issues and solutions than younger students (Boyes & Stanisstreet, 2012; Smith, Rechenberg, Cruey, 1997). However, not all students will have the same response to education of the same topics (Boyes & Stanisstreet, 2012).

During a study of a college campus it was found that attitudes are the first indicator for recycling behaviors in the dorms (Schwab 2012). It was also found that these recycling behaviors become more like others around us when we live close to one another. Early on in the school year it was a student's attitude toward recycling that determined if they were going to recycle. Toward the end of the study, Schwab found that recycling behaviors were better predicted by not only attitudes, but the behaviors of those around people, or normative behaviors.

Normative Behavior. Normative behavior, or norms, are things that are expected or usual (Merriam-Webster, 2017). Sometimes they are classified as acceptable or expected or normal behaviors. Our attitudes and behaviors are influenced by what the

norms are. These norms are also fluid and changing with each situation, social group and place we visit. Awareness of norms directly affects behaviors (Barr 2007). As previously mentioned through a study at a college dormitory, as students saw neighbors recycling throughout the year, others started to recycle more as they saw it to be a normative behavior of their environment, (Schwab, 2012).

Barr found that recycling is a normative behavior. Through a study, he found that although concern played a role in a persons' intentions to recycle, the norm of recycling and in turn the awareness of the norm was a better indication of whether or not a person would participate in recycling behaviors. He found people were more willing to say that they would recycle more if others did, but actually seeing other people going through the action of recycling had a larger impact on the acceptance of a recycling norm (Barr, 2007).

Norms, along with attitudes, affect a person's intentions to recycle (Chen and Tung, 2010). Chen and Tung found that people who had a more positive attitude, more norms around recycling, and more perceived consequences when not recycling, ended up having more intentions to recycle than others.

As found by the EPA, the current rate of recycling for the United States is 34.3 percent (EPA, 2015). Nolan mentions concludes that this is due to the lack of normative pressure on the people who are partial recyclers. These people will recycle some things but not all. In the study, it was found that people will tolerate those who consider themselves partial recyclers and therefore will not pressure them into increasing their recycling efforts and habits (Nolan, 2015).

Roles. Nolan (2014) looked at recycling behaviors in adults both college level and recycling experts. The range of people studied ranged from non recyclers, people who would not separate their waste; partial recyclers, people who would recycle as long as there were no extra steps like rinsing out a container to make it recyclable; full recyclers, people who would go the extra step to make the item recyclable; and pro-recyclers, people who would be full recyclers and would separate others' trash if they noticed it was done incorrect. She also looked into the tolerance level of the different types of recyclers between the different groups. Interestingly she found that among the different groups pro recyclers were approved of less than the full recyclers. However, partial recyclers were more tolerated by the college group, but were less likely to be corrected by all groups. From this, Nolan made the conclusion that partial recyclers are able to escape the pressures of normative behavior. It was found that if you recycle some things and not others, you are less likely to be corrected by your peers and feel no pressure to change your ways, which is reflected by the U.S.'s recycling habits (Nolan, 2014).

Facilities. Chen and Tung found that the availability of recycling receptacles and facilities affects our intentions to recycle. If there were fewer receptacles and facilities it becomes harder to recycle. Even for the people who have positive attitudes towards recycling and know that they have the choice on how to discard of their item, if there are not facilities they will be more likely to trash the item instead (Chen & Tung, 2010; Barr, 2007).

Austin, Hatfield, Grindle and Bailey also found this to be true. They ran a study in an office like setting of a university and obtained baseline data for two different areas. One area had a recycling and trash bin next to one another, the other one had both but

they were about 4 meters apart. The data showed that recyclable items were placed in both the trash and recycle containers in both areas at the start of the research.

Informational signs were put above the receptacles explaining what type of items went in each. When they did this, one of the areas had much more success in recycling. This area had both receptacles next to one another. It appears through their data that the perceived lack of facilities was preventing people from recycling. Once the trash and recycling bins were placed next to one another in the second location, they saw an increase in the amount of recyclables ending up in the correct location (Austin, Hatfield, Grindle, Bailey, 1993).

Recycling Curriculum Examples

As previously mentioned, our knowledge on a subject influences our actions (McLeod, 2014). One can gain knowledge through personal experience and education. Education can raise awareness of the waste of resources and the damage that can come to the environment through not recycling and reusing materials we already have (Asmatulu, Asmatulu, 2011). For the purpose of identifying the best curriculum to use in my study, I will take a detailed look at different curriculum units and analyze each one. This will help me decide which curriculum will work best for my students.

Waste Away. Waste Away is a curriculum that was developed in Vermont that seeks to help students learn about recycling and waste. In the curriculum students figure out where waste comes from, what types of waste we create and find around us, and introduces students to actions they can take to help with the issue of waste that they are facing, (Ross, 1989). This curriculum is broken up into four different sessions. It is worth

noting that the author has said that this curriculum has been developed for upper elementary and junior high students.

Session One. First, students are introduced to the concept of waste and what types of things are categorized as waste. Students use their science knowledge to help recognize that certain types of waste are biodegradable or chemically degradable and that Earth's natural processes will one day be able to breakdown the materials. Activities have students classify materials as trash.

Then they are introduced to some of the problems that waste creates in our environment. Students are presented with the problem of waste production and how it is related to the population growth in the United States. They compare the waste generation of an individual, and company, and then it is brought to a more global scale where students learn about how other nations would be grateful for things that we consider waste (Ross, 1989).

Lastly, in this session, students start to learn about the effects of waste on the environment. Students learn about how there is limited landfill space, about the financial cost of collecting and disposing of waste, and about the pollution that comes from the disposal of materials. They also learn about how animals and wildlife are affected by our decisions to discard or pollute.

Session Two. In session two the issue of packaging and plastics comes into focus. Students learn about why packaging started, how much of packing becomes waste and how does that packing affect the cost of the items we buy. The focus then shifts to plastics. Issues over the growing demand for plastics come into play, along with the environmental effects on animals that mistake the plastic for food and can become sick

and die. The production of plastics is presented to students, including the natural and nonrenewable resources that go into making some of the plastic and packaging that we use. The fact of plastics and packaging that are biodegradable is presented to the students (Ross, 1989).

Notably, Ross talks about other problems with plastics and Styrofoam production that uses chlorofluorocarbons (CFCs) and how it impacts the environment. Since the Montreal Protocol in 1987, CFCs and other ozone-depleting chemicals (ODCs) have been more heavily regulated and phased out in many different countries, (Britannica,)

Students then focus more on the natural ways that waste can be disposed of and how the problem of waste has started to grow to extremes. How nature naturally recycles is looked at closely; students learn about the key organisms, fungi, and bacteria that are involved with the process. A large part of this unit is focused on waste as a growing issue. There is mention of other cultures in the U.S. like the early Native American population and how they used and treated the environment and resources around them.

Energy usage and resources is brought in to compare the amount of energy and resources that the U.S. uses in contrast to the world population. The shift in accessibility of energy and resources is presented to show how modern technology and society has shifted the perception of how difficult the materials are to obtain. Renewable versus nonrenewable resources is a large part of understanding where our materials come from. Nonrenewable resources are harder to obtain. This is important for students to understand along with the knowledge of how long these resources take to form.

Students then learn about how the population plays an important part in the generation of waste in our country. They learn how the lifestyle changes that have come

about in recent years has accelerated our waste production. Ross presents an activity where students get to see how items were made in the past versus now. Students get the chance to compare the material quality and item quantity to see the differences in products available today versus past generations.

Session Three. The third session focuses more on actions that are taken to help manage the waste. To first get an idea of the type of things that can end up as waste around them, students are sent on a trash clean up around the school. When they return with litter, they are asked to review which items are biodegradable and recyclable and which items are trash. When the students have deemed an item trash they need to understand what it means for the item. Landfills are introduced and the understanding that what we put in the trash each week ends up in a landfill. The rate of decomposition in a landfill can be variable (Ross, 1989). After examining the trash the students have found, they decide how long it would take to decompose.

Building on the background of the population increase, students learn how much garbage is generated by each person living in the U.S. and compares this to other countries. Students then start to learn about the different ways in which we are able to manage the waste. Pros and cons of each are looked discussed.

Landfills bury garbage, but in the past they have leaked and contaminated groundwater. Not many people want to live near a landfill, so finding places for them becomes increasingly difficult (Ross, 1989).

Incinerating reduces the volume of garbage and leaves more room in landfills (Ross, 1989). The heat of the incinerating process can be converted into thermal energy to heat a building or it can be turned into electrical energy to power a building. Some

chemicals that would stick around for a long time are destroyed during the incineration process. However, chemicals that are not destroyed are then introduced into the atmosphere and can have adverse health affects for humans (Ross, 1989). When burning becomes an option, there is little incentive to reduce waste.

Toward the end of the session recycling as a means of managing waste becomes the focus. Students learn the common types of materials that are able to be recycled and some of the benefits of recycling overall. As mentioned before, some of the benefits are reducing the amount of waste in landfills, saving natural resources, and reducing the pollution generated from obtaining virgin resources (Ross, 1989).

Session Four. The last session focuses on solutions and how students themselves can help. In this session the students investigate what Ross refers to as roadblocks, or things that prevent actions of recycling, reusing, or reducing. Things like industry that is creating use and throw away products; technology that is changing and going out of date; market demand for products that do not reflect an environmentally friendly mindset are all things that can prevent people from acting environmentally responsible.

Education can help break down and overcome some of these roadblocks (Ross, 1989). It can make people aware of the their daily choices that impact the environment. It can also inform people of the little things they can do to reduce their waste, reuse things they have that would otherwise become garbage, and recycle things properly to make the most out of the material that is already in use.

Lastly, students are encouraged to make a pledge on how they will be able to use the new knowledge they have gained. They are also asked to follow up with posters promoting positive environmental behaviors. Students can also make signs for

classrooms, offices and cafeterias to help inform others about how to separate their waste responsibly.

It should be addressed that this curriculum was created in the late 1980's. Many of the statistics, facts and figures, and methods of disposal are out of date. It does appear to have a solid framework and ideals; Data is always changing and students should be presented with the most recent and accurate data.

The Quest for Less. The Quest for Less was developed by the Environmental Protection Agency (EPA) as a resource for teachers of elementary to middle school. This curriculum is designed to accompany existing classroom activities or as a more intensive week long unit (EPA, 2005). It summarizes how natural resources are used to create new products, the quantity and types of waste that are created from these products and explains the different methods used to manage waste. The Quest for Less curriculum has three units, each of which is divided into different chapters. The first unit has three chapters on natural resources, products and waste. The second unit has four chapters on source reduction, recycling, composting, and landfills and combustion. The third and final unit only has one chapter where all the information in the previous chapters is put together.

Unit 1 – Chapter 1 – Natural Resources. This unit focuses on natural resources. It explains and gives examples of raw materials and why natural resources are important to not only humans, but also to plants, animals and other organisms. The difference of virgin versus recovered resources is an important distinction to make. Recovered resources conserve natural resources as it uses materials that are already out of Earth and lessens the need to extract more (EPA, 2005). This unit highlights common products that

are made from the natural resources and compares renewable and nonrenewable resources.

The focus shifts to the benefits and challenges of using natural resources. The use of renewable resources does not deplete any source, it allows for self reliance, and allows for continued use even after disasters (EPA, 2005). Pollution of the atmosphere is created when getting and using natural resources can cause problems. Greenhouse gasses are believed to cause climate change and can intensify disasters like droughts, flooding and other storms (EPA, 2005). Damage to the ecosystem can also occur when extracting natural resources. In harvesting wood for example, trees are cut down, which may be home to hundreds of organisms. If these organisms have to leave, it can further change the balance of populations within the ecosystem. With larger trees being cut down, this gives opportunity for other trees to take its place, which could be an issue if they are non-native species.

Unit 1 – Chapter 2 – Products. This chapter focuses on products, including how they are made and how they are disposed of. It presents the life cycle of products: design, exploration, extraction, processing of raw materials, manufacturing, distribution, use, and retirement. By using recovered resources instead of virgin resources, energy, resources, and pollution are lessened. Recycling, composting, or reusing changes the life cycle of the product and can save resources, energy, and prevent more waste.

Some of the activities in this chapter include things like figuring out where products come from. In trash bingo students are given a product and on their bingo sheet they have to cover what type of resource it came from. Building on trash bingo, students find products, figure out the materials they are made from and finally figure out the

resources those materials came from. Another activity guides students to find products that are packaged or made from recycled materials.

Unit 1 – Chapter 3 – Waste. Once the students understand the life cycle of a product, they know that at one point a product will become waste. This chapter covers what waste is, and how much waste the average American produces. It also addresses that, as the population grows, the amount of waste will continue to grow. Managing solid waste becomes the focus, and it becomes apparent that not just one method can manage all of the waste. Therefore, there is a need for different methods. The idea of source reduction is presented to students as a method of waste prevention. If we do not have the material, it cannot become waste. Recycling, composting, combustion, and landfills are all presented as destinations for waste, but will be covered in more detail in the next unit.

Benefits and challenges with waste management are covered. It starts with the past and how people used to dump waste out of windows (EPA, 2005). As the population grew, this started to create health problems for both people and the environment. This caused the government to set up regulations about how things need to be disposed (EPA, 2005). One challenge that is still being faced is that no one wants to live by a landfill or dump site. This makes it increasingly difficult to find locations for new facilities. One trend that is starting is called “Pay-As-You-Throw.” Residents pay for their garbage in the same way they pay for other utilities, they are charged for how much they use or in this case throw away (EPA, 2005). There is mention of hazardous waste and how products we live around when disposed of need to be properly managed.

Some of the activities include things like trash murals where students bring some garbage from home to make a mural of items that are commonly thrown away. Students

also do a trash sort where they take trash and sort it all out and determine which waste category it belongs in. They also determine if there is a better way to dispose of the waste. Another activity has students research different eras of waste management to give students an idea of how it has changed. Lastly, it has students find out how contamination of ground water occurs through waste disposal.

Unit 2 – Chapter 1 – Source reduction. Convenience is one of the causes of the large amounts of waste that Americans find themselves facing. Source reduction is one action that can limit the amount of waste that is produced. Source reduction is when a product life cycle includes more previously used materials and limits the amounts of packaging that will become waste. Its main goal is preventing waste before it is created (EPA, 2005). One other important part of source reduction is reducing the amount of materials that will become toxic or hazardous, as well as keeping these hazardous chemicals out of the production process.

Benefits of source reduction include lower manufacturing costs for companies because they are using less materials. Using less materials means saving energy and resources. Schools often buy items in bulk saving on packaging and costs. Challenges are always there with source reduction. One challenge is dedication. Changing your routine to help limit waste means instead of disposable lunch containers and utensils, you now need to bring your own container and wash them after using them. For some people the convenience to them out ways the cost to the environment. Some companies are practicing source reduction by taking back broken or unusable products and making them into new ones. Ink cartridges are presented as an example. Before you had to discard them, now you can get them refilled.

Some of the activities for this chapter involve presenting students with trash and having them make something useful, like turning a milk jug into a bird feeder. Two activities involve lunches. One has students packing a source reduction picnic, showing kids you can bring reusable plates and silverware. Another activity explores the weight of lunch. Students measure the weight of each component of their lunch, then they measure the weight of the waste from the item and decide what is the best end location for the item's waste.

Unit 2 – Chapter 2 – Recycling. Recycling is where materials that would be considered waste are turned back into raw materials and reprocessed to into new products (EPA, 2005). Recycling can also include actions like composting organic material, which is covered in the next chapter. Recyclable materials can be collected at a residence, drop-off center, a buy-back center or through deposit refund programs. Once collected they are processed by making sure the non-recyclables are removed and all are sorted properly. After sorting they are sold to a materials recovery facility to be later sold to a manufacturing facility that will turn the material into a new product.

Preventing more waste by recycling helps the economy and the environment (EPA, 2005). It prevents useful materials from being thrown away or incinerated, as well as prevents the need for more virgin raw materials to be removed from the Earth; causing more pollution and using more energy. Recycling also produces a need for jobs, which benefits the economy. Challenges also exist with recycling. Some plastics for instance can be easily recycled, but others cannot. Many of the packing items, like the plastic wrapping and packing peanut material, is not easily recycled and still needs to be discarded. Economically there is a higher cost to recycling versus landfills and

combustion. Facilities for recycling are often times sources of pollution and can be as undesirable to live by as a landfill (EPA, 2005).

Some of the activities in the chapter include things like making recycling awareness materials for both schools and homes. Also, students are brought through the whole process of recycling one item and can see how one item, like a plastic bottle, can be broken down and used to make many different products. Another activity shows students how recycling in a plant setting works and how the different materials are sorted. For the upper grade levels, there are activities around e-cycling which involves recycling electronic devices.

Unit 2 – Chapter 3 – Composting. Composting is where organic material is decomposed by various organisms. Homes and cities are typical participants of composting. At home composting usually contains food scraps, yard waste, ashes, and paper shreds. Oftentimes microscopic organisms are the decomposers at work, sometimes earthworms also play a role in the decomposing process. City municipal cites work mostly by heat. These high temperatures cause the material to degrade. In both places the compost that is created is a soil-like material that can be used in a variety of ways.

Materials that are compostable are oftentimes not suitable for combustion because they do not produce enough fuel (EPA, 2005). Compost does make a desired soil additive for gardens and landscapes. Many communities that sponsor a yard waste compost program often will allow community members to come and collect compost to use in their own yards. There are economic benefits of keeping waste that can be useful out of the waste system. There are challenges with composting as well; it is a difficult process. Not all food scraps can be composted; animal and oil products take longer to decomposed

and should not be used. If not left to mature, compost could harm plants. Creating quality compost does take a lot of work and needs attention. The odor of the decomposing process is another undesirable consequence.

Composting allows for many hands-on activities for students. For example, composting bins can be made for school. Making smaller bins in the classroom allows for observation of the process. Students can also see how compost is able to benefit plants by setting up an experiment to observe the difference in growth of plants using soil versus soil with compost.

Unit 2 – Chapter 4 – Landfills and Combustion. A landfill is an area that has been excavated and is designed to be filled with waste (EPA, 2005). Landfills receive the trash that we throw out at home-some even accept hazardous waste. Open dumps, common in the past, were uncovered and unlined. Leachate, a liquid that is made by decomposing waste, could leak into the ground and cause the groundwater to become contaminated (EPA, 2005). Open dumps have an array of other undesirable consequences, including rodents, smell and fires. Although there are now fewer landfills, they have increase in size, a necessity from the increase in waste production. Landfills are in need of constant attention as byproducts of the landfill process need to be monitored. If left without supervision, chemicals and contaminates can build up and be released into the air or water in the area.

Combustion is a process where waste is burned in an incinerator. This process greatly reduces the volume of waste and reduces the amount of waste going into the landfills. Before regulation by the government, people would burn their own garbage, which would cause pollutants to enter the air. Now cities are able to burn garbage, but

have ways to control the amount of pollutants that enter the air. These combustors are burning waste which is able to generate electricity. Sometimes this form of electricity is cleaner than producing energy from oil or coal (EPA, 2005).

These methods of waste disposal allow students to have hands on models to study the concepts taught; they allow for debate over which method is best or other controversial issues around waste, and they help reinforce the renewable versus nonrenewable resources for energy generation

Unit 3 – Putting it all Together. This unit of the curriculum is designed to have students use the knowledge they have gained in the previous units to show decision making and analytical skills. These activities help students review what types of materials are recyclable, compostable, and garbage. It offers a role in school to act responsibly and to help others act responsibly by being a member of a group of students who are willing to monitor waste at school. By making their own posters and announcements, students can help others learn the proper way to dispose of materials.

Summary

Based on the work and findings of others, it seems as though an education on recycling could help students make a better and deeper connection to the world around them along with helping them to become better citizens. Recycling is an action that many students of middle school age are responsible for and have control over, therefore students are more likely to benefit from education on the subject as Boyes & Stanisstreet (2012) found.

From the comparison of the curriculum, both focus on where our products come from and where they end up. Because some of the activities in *Waste Away*, (Ross, 1989)

are out of date and need to be updated, some original materials that are updated and relevant will need to be included. Also in *The Quest For Less*, (EPA, 2005) some activities are not suitable for the middle school age group and will have to be left out or modified in order for students to truly engage with the material being taught.

CHAPTER THREE

Methods

Chapter two presented some information that explained what recycling is and how it came to be. It also looked at the bigger issue of waste in general, and ways in which to dispose of waste and their benefits. Part of chapter two helped explain how we get behaviors and some of the factors that influence them. There were some studies synthesized that focused just on the behaviors of recycling. The last part of chapter two was dedicated to the different curricula that I found through my research. This part was particularly helpful in deciding how I wanted to structure my action research in the classroom. In this section, I will focus on the methods that I will be using to find out how can education improve the recycling behaviors and attitudes of middle school students.

Overview

For this research project, it was decided to teach a waste and recycling unit to a class of seventh grade students. The goal was to determine how can education improve the recycling behaviors and attitudes of middle school students. In order to do this, I needed to get some base line data so students took a pre-survey that assessed their knowledge on recycling, what their current recycling habits were, and their willingness to act in certain situations. The survey, that can be found in Appendix A, was adapted from previous research done by Knussen and Yule (2008), Barr (2007), and Boyes and Stanisstreet (2012). After the survey students participated in the curriculum to learn about where our products come from, possible end locations, and why making more responsible choices is important. Following the curriculum students made a campaign to help inform

others to hopefully inspire change in their actions. At the end, students took a post survey where the results were compared to the presurvey to determine if there was a change to their behaviors and attitudes. Students also participated in focus groups where they had the ability to voice their own opinions and talk about experiences they learned from.

Before I was able to collect data, I had to decide what I was going to use to teach the class. In the previous chapter I analyzed two different curricula to figure out some common topics and sensible progression of material. After reviewing both of the curricula found, I determined that it would be necessary to borrow some lessons from *Waste Away* (Ross, 1989) and *The Quest for Less* (EPA, 2005) and supplement with additional materials I would find through school curriculum and some that I would create on my own. An overview of the activities used during the curriculum can be found in Appendix E.

The remainder of the chapter will be broken up into four different sections. The first section will detail my research setting and the students who I will be doing my action research with. Secondly, I will focus on the relevance and rationale to my topic. The third section will talk about the research design and will focus on the different types of data that will be collected. Approval for this research will be the last section.

Rationale and Relevance

Based on the research and information presented in chapter two, there is a need to educate the youth on how things are disposed of and some alternatives for these items other than landfills. As natural resources become more and more difficult to obtain, it is likely there will be a greater push to reuse the materials we have already taken out of the earth. If younger generations are aware of solutions to some of these problems from an

early age there is a chance that they will be more likely to act and to maybe one day find ways to improve the processes to recover more material, or use less energy to recover the material.

As mentioned by Boyes and Stanstreet (2012), students have a high willingness to act for certain actions that they feel will help the environment and are useful, but they are not always able to do those things. Recycling is one action that middle school aged students are able to participate in and is useful to the environment. Education can help students become better and more effective recyclers (Boyes & Stanstreet, 2012).

This content is relevant to the researcher as personal observations, previously talked about in chapter one, have been made on students' knowledge, misconceptions, and lack of understanding related to recycling. One could argue that this content will always be relevant until a zero waste situation is met, and even then knowledge must be obtained to participate responsibly in a waste program. Americans are producing waste at a rate of over four pounds per person per day (EPA, 2005). To act more responsibly we must understand the problems this can cause and solutions already available to help.

Research Design

This research took place in a middle school located in a first ring suburb. The school has around 700 students in grades six through eight. Of these students, 46% are white, 21% are Asian, 16% are African American, 15% are Hispanic, and 2% are American Indian. In this school, 58% of students qualify for free or reduced priced lunch, 14% are special education students, 9% of students are considered English learners, and 2% of students are homeless. For this study, students in a first hour life science class were targeted participants of the curriculum. These students were asked to participate because

the curriculum fit into the content area of the class. The class was around 20 students with consent from guardians, there were 16 participants. Students from the researcher's advisory class, which did not participate in the curriculum, were targeted for a control group with consent from guardians. This class was asked to participate because they spend a small amount of time daily with the researcher.

This research used a mixed method approach. A mixed method approach is when multiple sources are used to gather data, and it is often referred to as triangulation. (Mills 2014,). According to Mills (2014), researchers should not rely on only one type of source whether qualitative or quantitative, instead a combination of both is best. In order to collect the data needed to answer the question; how can education improve the recycling behaviors and attitudes of middle school students, there first must be education presented to the students.

Curriculum. In chapter two, two different curricula were analyzed. It was this analysis that led to the decision to use a combination of the activities and lessons from both *Waste Away* (Ross, 1989) and *The Quest for Less* (EPA, 2005). The series of topics and activities can be found in Appendix E. In order to implement the curriculum, a class was needed. As previously mentioned, a seventh grade life science class was targeted as participants. The researcher led the class through instruction for a three-week period. During this time, students participated in the various activities including trash audits, learning about resources and waste, learning about how humans can impact the world including possible solutions, and making informational campaign materials.

These campaign materials were used in the classrooms and the offices, to help inform others on how to make better choices with their waste. Since this campaign was

schoolwide, data was collected from a group of students who did not participate in the class to determine the impact of the campaign on the attitudes and behaviors of others.

Data Collection

Quantitative Data. During the research, different types of quantitative data were collected. Trash audits were one of the ways data was collected to see the impact of the campaign on students' behaviors. This required students to separate trash from classrooms and determine the amount of items that were discarded correctly and the amount of items that were not discarded correctly. Trash audits are done to determine current waste habits and that data can be used to lower waste costs and even make some money in return. In chapter two, a study done by New Jersey WasteWise Business Network (2005) mentioned how different companies were able to save money or even make money by not having the garbage picked up as often, or selling valuable materials like metals. These are decisions made after a trash audit, if a company is throwing out metals they could be selling they are spending more to get rid of the metal and missing the opportunity to generate money off their waste.

Trash audits were done at different times throughout the study, and can be found in Appendix C. The first time was to get a baseline of the habits schoolwide. To audit all of the trash bins in the school would have been too long of a process to complete in a 54 minute class period. It was decided that ten classrooms from the seventh and eighth grade level would be selected and analyzed to help give us a schoolwide view. The students in both groups were part of the eighth and seventh grade class. Therefore, sixth grade classrooms were left out of the audits because students in the study would not be likely to use them.

At the start of the class, students in both groups were given a survey. In this survey there was questions to help determine the knowledge and misconceptions that students possessed at the start of the study. This survey was again given to the group of students taking the class at the end of the curriculum unit to determine how the curriculum unit addressed and helped students' misconceptions and if it furthered their knowledge base. Copies of both surveys can be found in Appendix A and B. After the campaign went out schoolwide, students in the advisory group were asked to take the survey again to see the effects of the campaign on the knowledge of those students who were not in the class, but instead only saw promotional materials.

Students in the class were asked to keep a journal to record instances and items that they had seen where people are discarding incorrectly at school to better help them later. This information helped the students to make relevant campaign materials to better inform their peers on how to properly discard waste.

Qualitative Data. This research required qualitative data to be collected as well. The survey mentioned in the section above also included questions related to attitudes and behaviors of recycling, waste, and the environment. This survey was given to both groups of students at the start and again at the end of the study. The researcher kept a journal of daily happenings and new knowledge during the curriculum implementation. This data helped to identify some misunderstandings and helped guide further instruction.

Approval

Approval for this research was granted by the school administrator, the school district, and Hamline University School of Education. The Hamline Human Subject Committee also granted approval for this research. Informed consent from guardians was

received in order for minors to participate in the study, fill out surveys, and be interviewed. Anonymity and confidentiality was assured through the permission letter.

Summary

The action research done took a mixed method approach and used different sources of data, both qualitative and quantitative, to help better understand how can education improve the recycling behaviors and attitudes of middle school students. Student participants were from two groups, one who participated in the curriculum unit, and school recycling campaign, and other who were not in the class but saw the campaign materials around the school. Surveys were handed out in the beginning and end to both groups to get data of the knowledge of recycling and waste along with some attitudes toward recycling, waste, and the environment. Journals were kept by both the researcher and students on actions of others recycling habits and actions. The researcher kept a journal of happenings through the curriculum class. In the next chapter the findings of this research will be discussed.

CHAPTER FOUR

Results

In this chapter the qualitative and quantitative data that was collected will be analyzed. Students who were in a seventh grade life science class participated in the curriculum; students who were in the researcher's eighth grade advisory period class did not participate, so they were used as the control group. The students in both classes answered survey questions at the beginning and the end of the unit, which can be found in Appendix A and B.

Overview

As mentioned in chapter two, Boyes and Stanisstreet (2012) found that some actions would not benefit from education because there was already a high willingness to act or there was an inability to act. Attitudes, norms, and facilities are all contributing factors to how people discard their waste. In order to answer the question how can education improve the recycling behavior and attitudes of middle school students, two things were needed, first a curriculum and second, the already formed attitudes and behaviors needed to be assessed.

The curriculum was adapted from both *The Quest For Less* (EPA, 2005) and *Waste Away* (1989). Supplemental materials and activities were added in from current curriculum, other materials created by the researcher and other various environmental resources. Once a curriculum was created the pre-survey, which can be found in Appendix A, was administered and the curriculum unit started. While going through the curriculum unit with the students' assignments were collected that provided data, such as

the trash audits, which can be found in Appendix D. Toward the end of the unit students were asked to create campaign materials based on the information learned in class. At the end, the students participated in a post-survey, found in Appendix B, and focus groups. Questions from the focus groups can be found in Appendix C and an overview of activities and sequence of the curriculum can be found in Appendix E.

This next section will discuss the data that was collected through the study. Students took a pre-survey before the curriculum, did trash audits as part of the in-class activities, took a post-survey at the conclusion of the unit and participated in focus groups where they were able to offer answers to open-ended questions and add more information and clarifying details. The researcher also kept a journal with happenings from class, such as quotes or common concerns or findings from students.

Survey Results

The following section will focus on the results from the survey which can be found in Appendix A and B. The survey results from each group will be presented. Analysis will include comparisons between the groups from the pre-survey, post-survey, and finally a comparison of the answers from the life science group pre-survey versus post-survey. Some of the questions that have a similar theme were broken up into multiple sections to encourage students to take their time and not simply answer the same response all the way through the survey.

Analysis of Attitudes

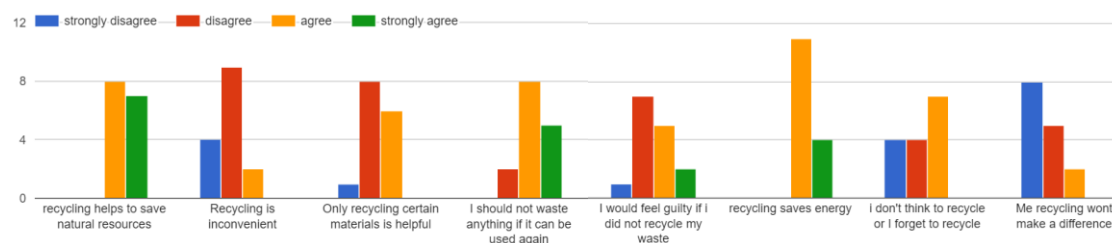


Figure 1.1 – Attitudes – Pre-survey – Life Science

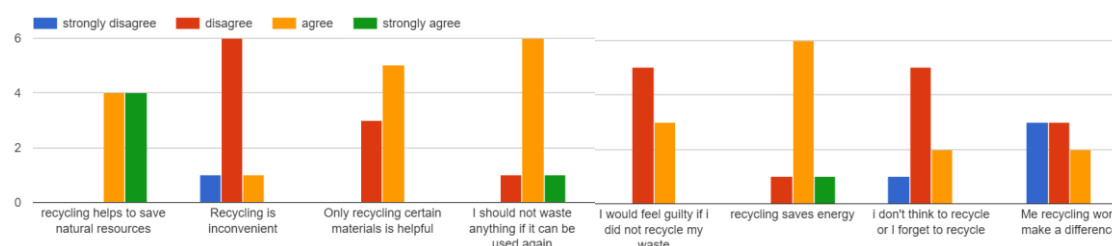


Figure 1.2 – Attitudes – Pre-survey – Advisory

Pre-survey Analysis. Looking at the responses from the survey given before the curriculum was taught, both classes look to be very similar in attitudes. Both groups agreed that recycling can save natural resources, showing that they have some knowledge of where products come from. In both groups, a strong majority believed they should not waste items if they can be reused, and many of them know that recycling saves energy.

One thing that was interesting: more students in the advisory group disagreed with the statement that they forget or don't think to recycle, this could be because this group of students were older and have learned or experienced more about recycling. It could also just be from the norms established in the home. There was one student in the seventh grade life science group that told me a story about how her mom was throwing out glass jars and aluminum cans because she didn't know that you were supposed to recycle them. Another student in this same group talked about how she feels like she recycles a lot at

home and how they have different bins for the different materials. Clearly the different norms in the home come into play as Schwab (2014) found as stated in chapter two.

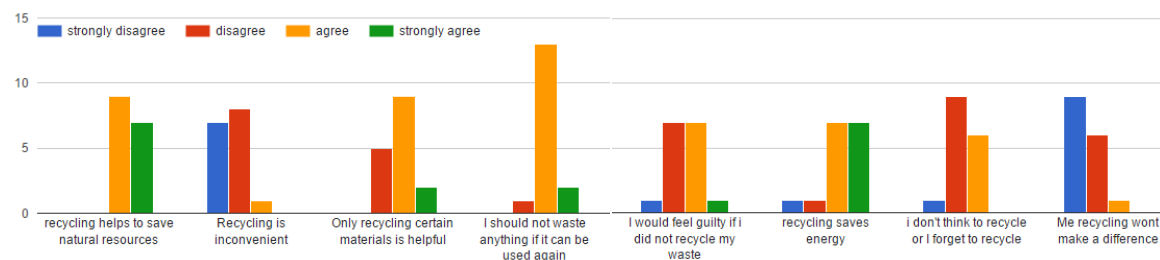


Figure 1.3 – Attitudes – Post-survey – Life Science

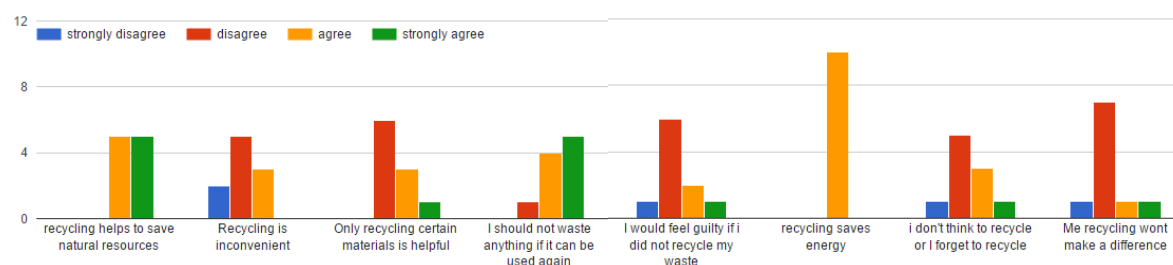


Figure 1.4 – Attitudes – Post-survey – Advisory

Post-survey Analysis. Some interesting results from the post survey was first with the statement ‘Me recycling won’t make a difference’. Many more people in the life science group strongly disagreed with the statement. From a comparison of the statement ‘Only recycling certain materials is helpful’. These results show the life science group had more people agreeing with this statement than the students who did not go through the curriculum.

One possible explanation for this is that during the curriculum, one of the lessons was almost a full class period of watching news clips and videos with discussion about how particular items are discarded. Throughout the previous lessons students were interested in finding out how recycling certain products was actually done. Through these clips, it became apparent that the way that certain items were discarded can affect the

processing of all the other items. For instance, one clip came from a recycling facility in Vancouver, that showed the different steps of the recycling process. This clip showed what happens when certain materials make their way to a step-in processing where they don't belong. Students seemed to understand and feel bad that when plastic bags got through to certain areas, that they would clog up the machines. In the focus groups and while making campaign materials, it was clear that this was a big takeaway fact for many of the students. In the video, the manager of the facility talked about how every two to three hours they would have to send in people into the machines, harnessed for safety, to cut out all the plastic bags and plastic wrappings that made it through. For this reason, it almost makes the statement 'Only recycling certain materials is helpful' true.

The data also shows that many more people from the life science group disagreed with the statement 'recycling is inconvenient'. Perhaps after they were more educated about how to recycle, they found it easier. For the statement 'I would feel guilty if I did not recycle my waste', there are quite a few more students in the life science group that agreed with this in the post survey. One of the clips that we saw showed that the waste that ends up in the oceans ends up hurting animals because the animals think it is food and they try to feed it to their young. Many students during the focus groups and in-class activities made reference to the clip showing that it did have a larger impact. The advisory group answered more strongly agree to the statement 'I should not waste anything if it can be used again', overall the number in the agrees are the same but the older group feels more strongly about this statement.

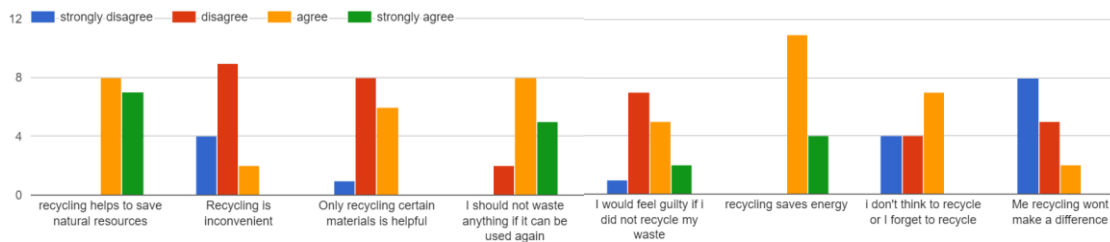


Figure 1.1 – Attitudes – Pre-survey – Life Science

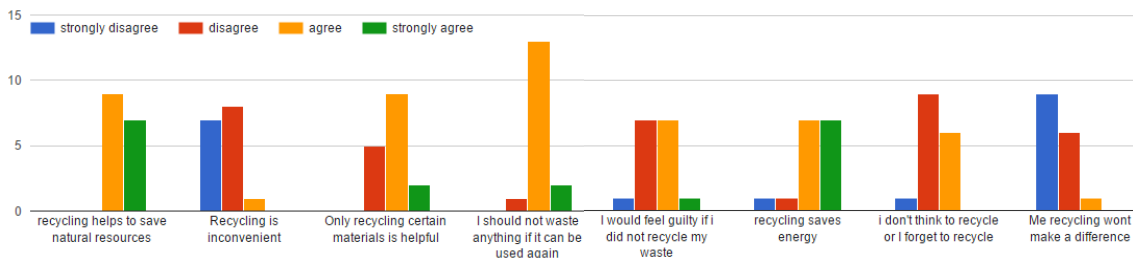


Figure 1.3 – Attitudes – Post-survey – Life Science

Life Science Group Analysis. From the data above there are some differences in the responses from start to finish. In the post-survey more students answered that they strongly disagreed with ‘recycling is inconvenient’. This can suggest that after understanding how to recycle it seems like a less intrusive task. There were more students who agreed with ‘only recycling certain materials is helpful’, again I think this goes back to the day where students saw a clip from a recycling center and found that materials that do not belong there can clog up the system, removal of these materials can take a long time and be potentially dangerous. Some students disagreed with the statement ‘recycling saves energy’, the only explanation I can come up with is that we spent limited time on this topic in class where we could have focused a bit more on it to make more of an impact.

Analysis of Recycling Behaviors

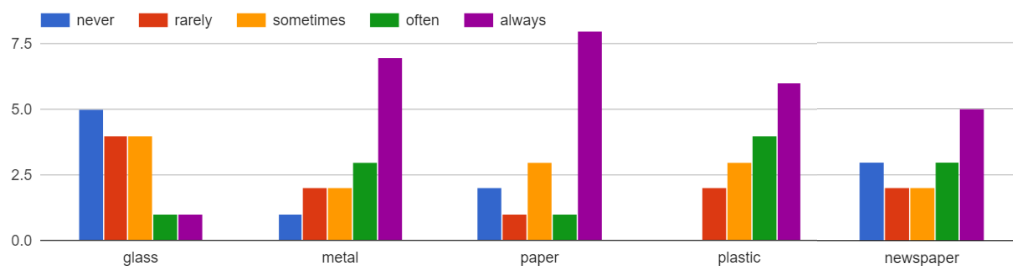


Figure 2.1 – Behaviors – Pre-survey – Life Science

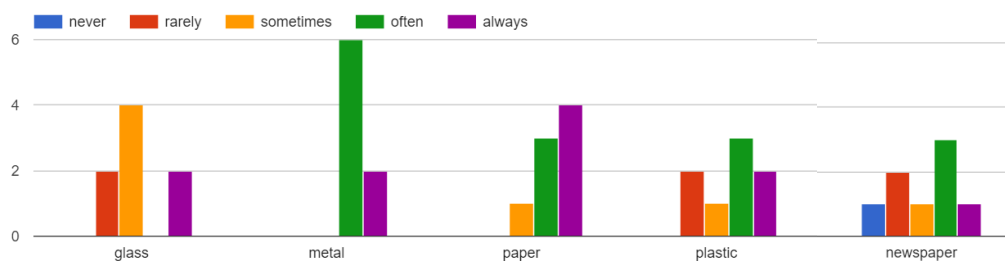


Figure 2.2 – Behaviors – Pre-survey – Advisory

Pre-survey Analysis. Metals and paper appear to be two categories where students have good behaviors on recycling. For both groups, glass seems to be an area where there could be improvements. This could be due to the fact that there are not a lot of containers used at this age range that are glass. Many of the beverages that this age group drinks are either in plastic or aluminum containers. Many containers for food may not be glass, but plastic instead.

For both groups, newspaper and plastic are areas that lack a bit of consistency across the board. Like glass, newspaper is a category that may not be as available to this age group. News is now available online and on smart devices; it could be that paper copies are not as popular as they used to be because there are more sources to get the news. Plastic seems to have a bit more responses towards the “always recycle” end. Plastic could have more variation because of a lack of knowledge. There are many

different kinds of plastics and even some residential waste disposal companies, have certain types of plastics that they cannot take. When a person sees the recycling symbol on an item, they assume they can put it in their recycling bin at home. However, plastic film around paper towel rolls, bundles of toilet paper, packaging around bottles of water or other beverages, and plastic shopping bags, most of the time, cannot go into the recycling bins that are picked up at the curb. Many people who see this information on a recycling guide will then choose to throw the item away instead of finding out where else it could be discarded.

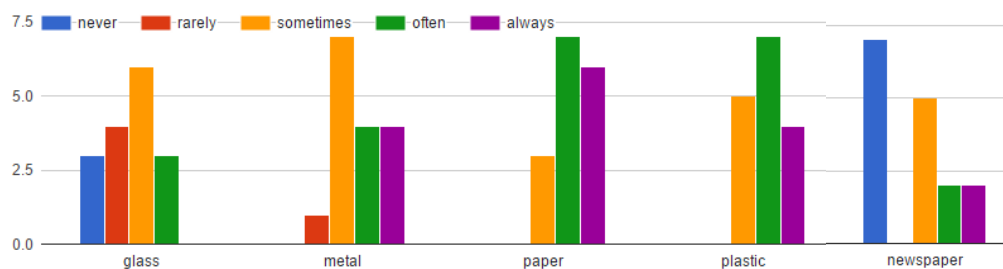


Figure 2.3 – Behaviors – Post-survey – Life Science

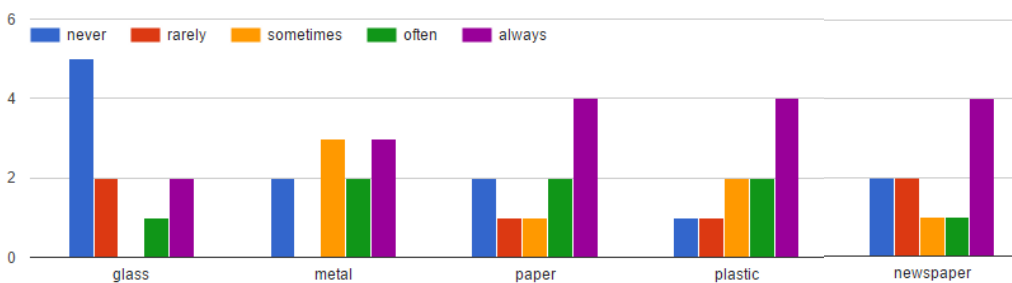


Figure 2.4 – Behaviors – Post-survey – Advisory

Post-survey Analysis. There are a few notable differences from the data above. Paper and plastic appear to be two materials that the life science group at the end of the study was better at recycling more often. There were no responses in the “rarely” or “never” categories. Between the glass and newspaper categories, there does not appear to be a large difference in the answers given.

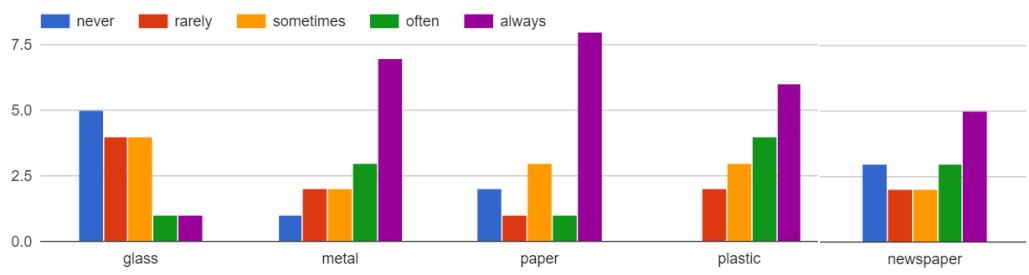


Figure 2.1 – Behaviors – Pre-survey – Life Science

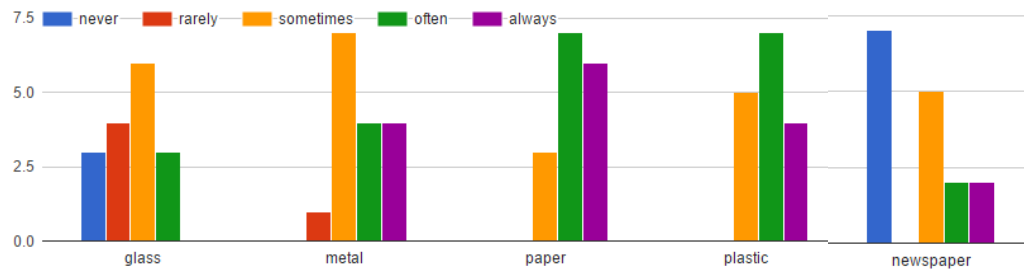


Figure 2.3 – Behaviors – Post-survey – Life Science

Life Science Group Analysis. For almost all categories, except newspapers, students showed an increase in the how often they recycle the different materials. Again, newspapers are not often used by this age range, which may help to explain the high numbers in the “rarely” and “never” categories.

Willingness to Act Part 1 Analysis



Figure 3.1 – Actions Part 1 – Pre-survey – Life Science

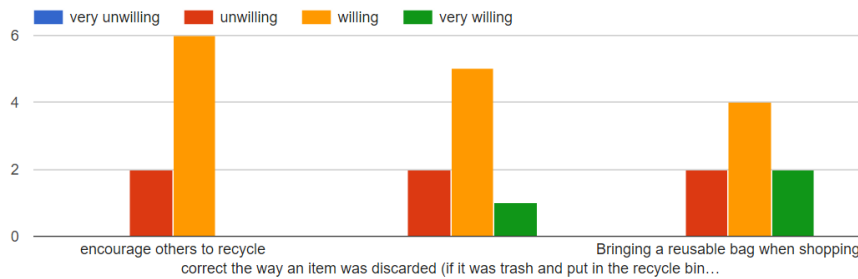


Figure 3.2 – Actions Part 1 – Pre-survey – Advisory

Pre-survey Analysis. One thing from this set of data that is very interesting was the large numbers of “unwilling” and “very unwilling” to bring a reusable bag when shopping. Again, this study took place in a first ring suburb of Saint Paul, MN. Across the country, there is legislation, that is in the works or has been passed, to ban plastic shopping bags at stores. Once passed, people are required to bring in their own bag or will need to pay for an environmentally friendly bag. It seems odd that in an area where this is a real possibility, that many of the students would be unwilling to bring their own bag.

Another interesting thing was the number of students who indicated that they would be willing to correct the way an item was discarded. Through the personal experience of the researcher and observations made during the trash audits, this seems inaccurate. When actually going through the trash, many of the students were highly resistant to doing so, even with protective clothing.



Figure 3.3 – Actions Part 1 – Post-survey – Life Science

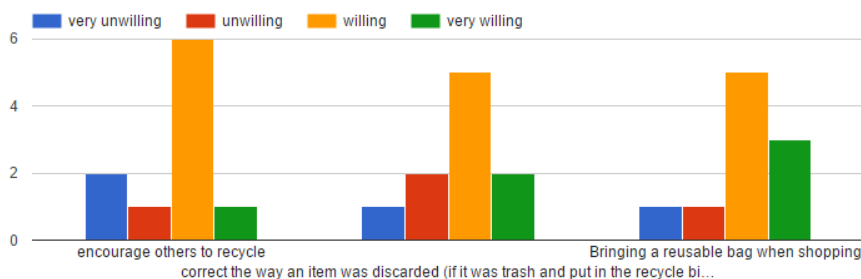


Figure 3.4 – Actions Part 1 – Post-survey – Advisory

Post-survey Analysis. An area that has noticeable growth is “encouraging others to recycle”. The life science group all answered that they were “willing” or “very willing” to do so. It is also interesting to see that there were more people from the advisory group, who did not go through the curriculum, that answered “always” to correcting the way an item was discarded and bringing a reusable bag.

Many students from the life science group expressed concern over the removal of plastic bags from the recycling system during the curriculum and during the focus groups. Based on that data, it is odd to see that so many of them still answered that they were unwilling to bring a reusable bag.



Figure 3.1 – Actions Part 1 – Pre-survey – Life Science

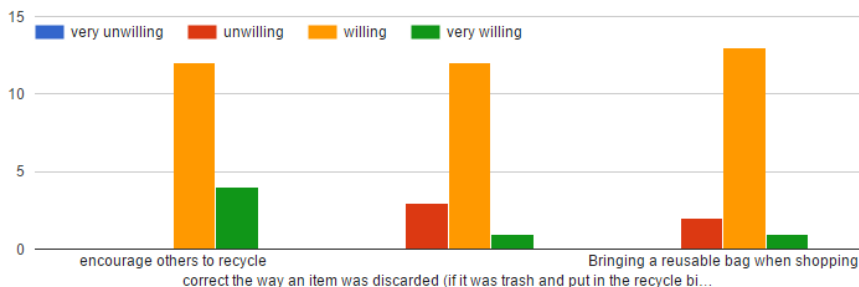


Figure 3.3 – Actions Part 1 – Post-survey – Life Science

Life Science Group Analysis. Again, noticeable growth occurred in the ‘encourage others to recycle’, with no responses in the “unwilling” and more in the “very willing”. Growth also happened in ‘bringing a reusable bag when shopping’. Perhaps this is due to the video students saw where plastic bag get stuck and clog the recycling facility machines.

Willingness to Act Part 2 Analysis

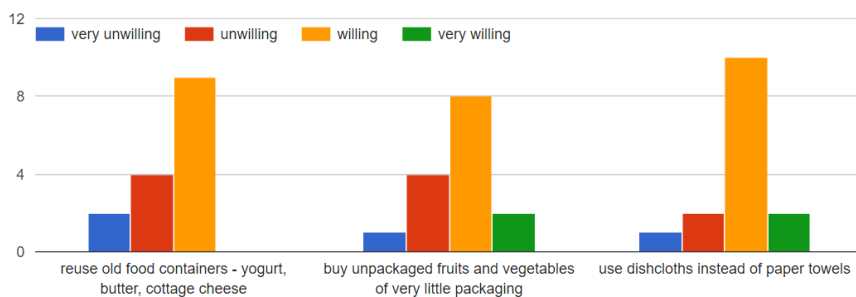


Figure 4.1 – Actions Part 2 – Pre-survey – Life Science

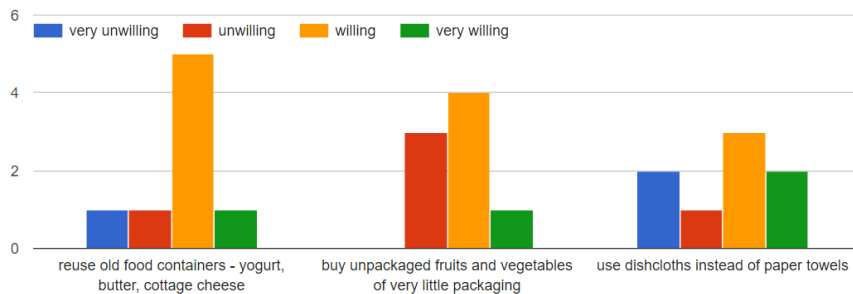


Figure 4.2 – Actions Part 2 – Pre-survey – Advisory

Pre-survey Analysis. Between both groups, the distribution of responses seems to be about the same. The one area where there is a noticeable difference was the use of paper towels versus dishcloths. Many more students in the life science group were “willing” or “very willing” to use a dishcloth instead of a paper towel. There were only a few students in each group that were unwilling to reuse containers or buy foods with less packaging, but this does not mean that they would not dispose of the containers in a responsible manner.

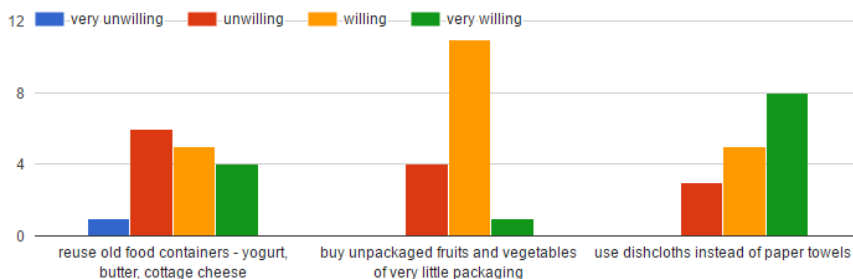


Figure 4.3 – Actions Part 2 – Post-survey – Life Science

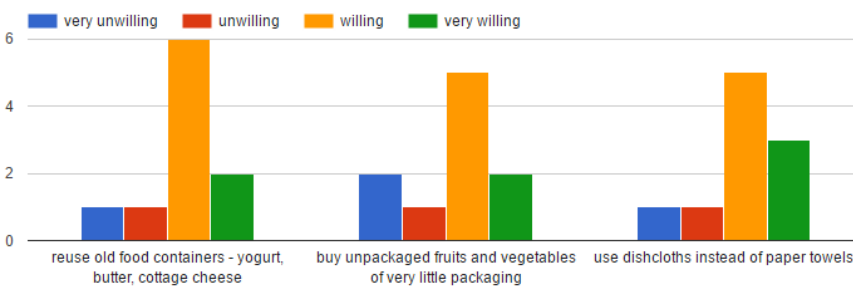


Figure 4.4 – Actions Part 2 – Post-survey – Advisory

Post-survey Analysis. The advisory group is more willing to reuse old food containers, while they are less willing to use dishcloths and buy unpackaged foods. Thinking about most foods that are in grocery stores, it is unclear if many students have ever experienced many unpackaged foods in their lives. Most food sold in stores is in some form of package. Even meat at large grocery chains is packaged so it can stay out and visible for customers to see and buy it, as opposed to being in the case and wrapped in paper when bought like in many meat markets.

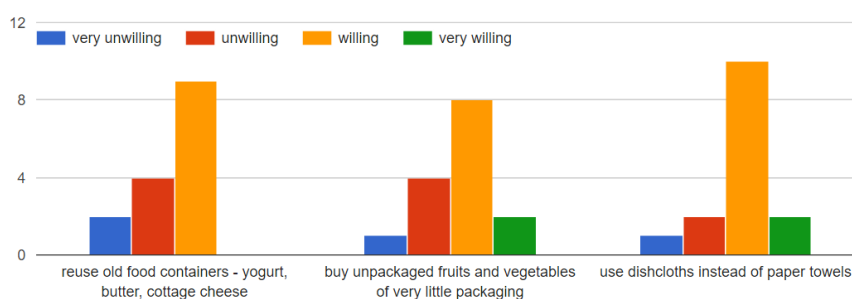


Figure 4.1 – Actions Part 2 – Pre-survey – Life Science

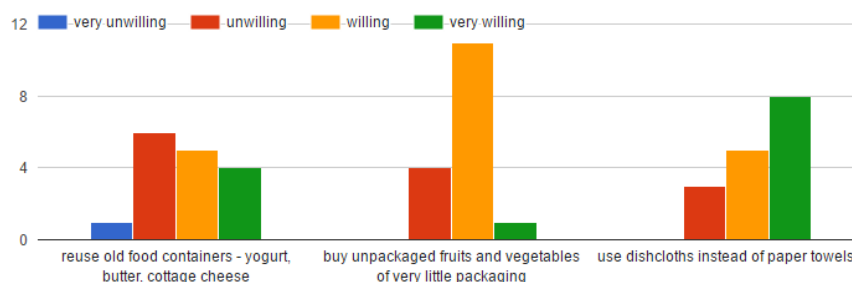


Figure 4.3 – Actions Part 2 – Post-survey – Life Science

Life Science Group Analysis. Based on the graphs above, there was movement in all categories towards the more willing end of the spectrum. This indicates that the curriculum and activities did have a positive impact on the students' willingness to act which mirrors the findings of Boyes and Stanisstreet (2012).

Willingness to Act Part 3 Analysis



Figure 5.1 – Actions Part 3 – Pre-survey – Life Science

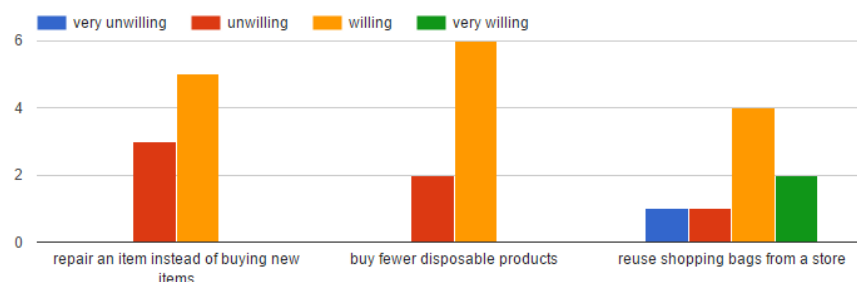


Figure 5.2 – Actions Part 3 – Pre-survey – Advisory

Pre-survey Analysis. The majority of the students from both groups were willing to repair items that were broken instead of discarding them. One thing that was interesting was the life science group was less likely to buy fewer disposable products, but in the previous data set they were more likely to use dishcloths instead of paper towels-which are disposable products. This is not to say that there are not many disposable products in our society other than paper towels that they may decide not to buy. Both groups also appear to have similar attitudes toward reusing shopping bags from the store. In a previous data set, those students who indicated that they were unwilling to bring reusable bags with them to the store, were very similar numbers to the ones who were unwilling to reuse shopping bags.

It appears that the two groups were starting with similar attitudes and behaviors on the different topics. There were no areas where groups were polar opposites of each

other, but a few areas stand out: the life science group was more willing to bring reusable bags, while the advisory group did not always remember to recycle and thought that only certain items could be recycled.

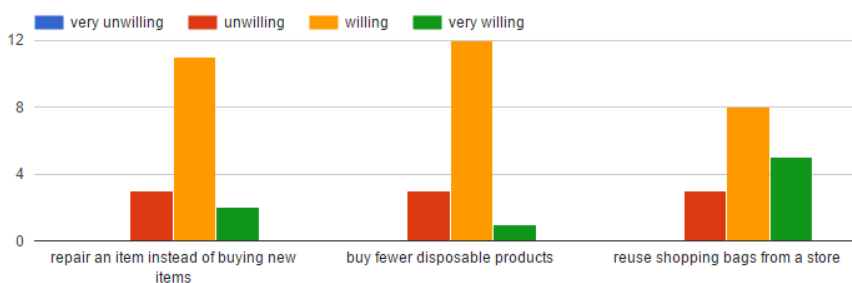


Figure 5.3 – Actions Part 3 – Post-survey – Life Science

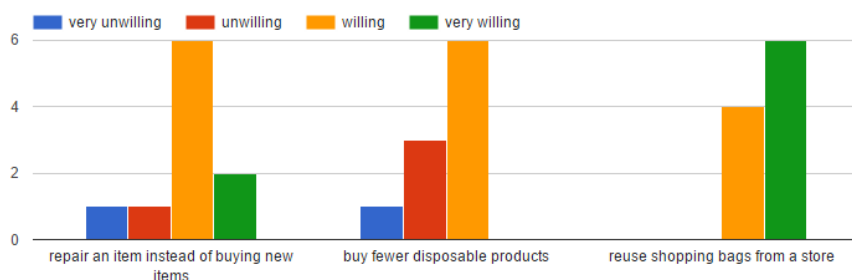


Figure 5.4 – Actions Part 3 – Post-survey – Advisory

Post-survey Analysis. Both groups appear to be willing to repair broken objects before buying new ones. The life science group has more people who are willing to buy less disposable products. They have no responses in the “very unwilling” category; however, they only have one response in the “very willing” category. It is a little surprising that the advisory group is more willing to reuse a shopping bag. This group had no responses in both the “unwilling” and “very unwilling” categories.

One thing that could have been improved was in the curriculum there could have been more activities and even engineering challenges that turn waste into something that was useful. The students in the life science group learned about the negative effects of the

items we discard. There could have been much more focus around the idea that “We are going to have items we will discard, what are other ways to make them useful?”



Figure 5.1 – Actions Part 3 – Pre-survey – Life Science

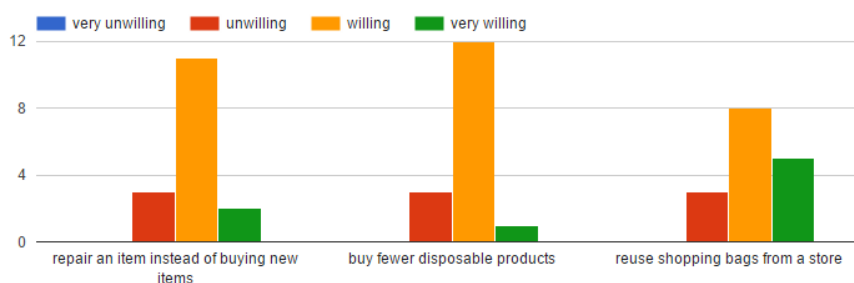


Figure 5.3 – Actions Part 3 – Post-survey – Life Science

Life Science Group Analysis. There appears to be growth in all categories, although the growth in the last category of ‘reuse shopping bags from a store’ there was very small growth of only about 2 students moving to new responses. Once again, this shows that the curriculum did have an impact on actions. One thing that will be discussed in more detail in Chapter Five is improvements to the curriculum. The last category where there was little growth shows that there is room for improvement in the curriculum to show students ways to reuse items that could be considered no longer useful.

Trash Audits

After reviewing the different curriculums that pertained to waste and actions for middle school students in chapter two, it was determined that some activities from both curriculums would work for the students in the study. However, the researcher had to

choose which lessons to use and when to present them. An outline of the whole unit can be found in APPENDIX E.

One activity that was done in order to collect more data were trash audits. Students in the life science groups participated in two trash audits to gather data on the current habits of the students in the school. Prior to the trash audits, which were unannounced, the researcher gathered both the trash and the recycling from ten different classrooms throughout two grade levels. Each pair of students was then tasked with figuring out the weight of both the trash and the recycling in each of the bins from one classroom. The trash audits were done to see if there were changes in behavior of more than just the students who participated in the curriculum. Also the students from both groups would be using all the trash cans. The students who did participate in the curriculum, the life science group, were tasked later on with making campaign materials that were posted in classrooms from where the trash and recycling bins were taken. The trash audits also served the purpose of informing the life science group what type of materials were commonly discarded improperly.

Recycling Bin Analysis

	Lab #1	Lab #2	Lab #3	Lab #4	Lab #5	Lab #6	Lab #7	Lab #8	Lab #9	Lab #10	Totals
Weight of recycling	4.44	1.44	1.63	2.81	12.00	1.94	1.88	1.13	0.44	0.94	28.65
Percent recycling	100%	100%	81%	94%	97%	100%	100%	60%	50%	75%	92%
Weight of garbage	0.00	0.00	0.38	0.19	0.31	0.00	0.00	0.75	0.44	0.31	2.38
Percent of garbage	0%	0%	19%	6%	3%	0%	0%	40%	50%	25%	8%
Total weight in recycling	4.44	1.44	2.01	3.00	12.31	1.94	1.88	1.88	0.88	1.25	31.03

Garbage Can Analysis

	Lab #1	Lab #2	Lab #3	Lab #4	Lab #5	Lab #6	Lab #7	Lab #8	Lab #9	Lab #10	Totals
Weight of recycling	0.50	0.00	0.50		0.50	1.81	0.44	0.50	0.44	0.00	4.69
Percent recycling	40%	0%	29%		23%	59%	27%	79%	37%	0%	34%
Weight of garbage	0.75	1.13	1.25		1.69	1.25	1.19	0.13	0.75	0.81	8.95
Percent of garbage	60%	100%	71%		77%	41%	73%	21%	63%	100%	66%
Total weight in garbage	1.25	1.13	1.75		2.19	3.06	1.63	0.63	1.19	0.81	13.64

Figure 6 – First trash audit data

Analysis. The data from the first trash audit showed that before students made the campaign materials for the classrooms, that already the students in the building had recycling habits that are fairly good. Overall in the recycling bins, only 8% of the material should have been trash. The same cannot be said for the garbage bins. In the garbage bins, 34% of the material was recyclable but was discarded in the trash. After all the numbers were taken, the students made lists of the different types of materials that were found in the wrong bins. Of the trash found in the recycle bins, most of the items that were wrongly discarded were things like gum, candy wrappers, broken pencils and pens, juice boxes, along with other food items.

For the items that were recyclable and found in the trash, the students determined that most of it was paper items: loose-leaf paper, computer paper, passes for students to and from class. Some of the items were things like water bottles and soda cans that were not completely empty. This was understandable, as not every room in the school has a sink where students are able to drain out the extra liquids. In these situations, it seemed as though students were discarding the items in the plastic lined garbage bins to avoid a mess.

Once the students went through most of the curriculum, they started to design campaign materials to share with other classrooms. These campaign materials were posters designed to help people be better informed before they discarded their waste. Many classrooms had them hanging up around the garbage and recycle bins, others had them directly attached to them. Students designed posters showing what items should or should not go in to either container. After a period of one week, the bins from classrooms were again analyzed.

Recycling Bin Analysis

	Lab #1	Lab #2	Lab #3	Lab #4	Lab #5	Lab #6	Lab #7	Lab #8	Lab #9	Lab #10	Totals
Weight of recycling	0.68	0.69	0.75	0.94	0.56	1.00	0.50	5.63	0.69	1.00	12.44
Percent recycling	100%	61%	63%	100%	46%	100%	100%	100%	58%	76%	84%
Weight of garbage	0.00	0.44	0.44	0.00	0.67	0.00	0.00	0.00	0.50	0.31	2.36
Percent of garbage	0%	39%	37%	0%	54%	0%	0%	0%	42%	24%	16%
Total weight in recycling	0.68	1.13	1.19	0.94	1.23	1.00	0.50	5.63	1.19	1.31	14.80

Garbage Can Analysis

	Lab #1	Lab #2	Lab #3	Lab #4	Lab #5	Lab #6	Lab #7	Lab #8	Lab #9	Lab #10	Totals
Weight of recycling	0.13	0.38	0.00	0.00	1.94	0.00	0.38	1.31	0.44	0.00	4.58
Percent recycling	27%	34%	0%	0%	66%	0%	38%	48%	33%	0%	34%
Weight of garbage	0.35	0.75	0.69	1.50	1.00	1.00	0.63	1.44	0.88	0.81	9.05
Percent of garbage	73%	66%	100%	100%	34%	100%	62%	52%	67%	100%	66%
Total weight in garbage	0.48	1.13	0.69	1.50	2.94	1.00	1.01	2.75	1.32	0.81	13.63

Figure 7 – Second trash audit data

Analysis. For round two, at first glance, the recycling bin analysis results show that behaviors were worse than they were the first time. The amount of garbage found in the recycling increased, while the amount of recycling in the garbage stayed the same. However, when looking more closely, this time there were more classrooms whose amount of garbage in the recycling bin total was 0%, the other classrooms had less than

ideal numbers with more than 25% of their recycling being garbage. During the second round there were also more classrooms that had 0% recycling in their garbage bins. This could suggest that in some classrooms the campaign posters were in better easy to see places, or that teachers could have had more of an influence in the discarding process.

Overall, the results of the trash audits do not give much insight to a change in behavior among the students as a whole in the middle school. If research and the campaign could have continued, there may have been more of a difference. Also, these results were from a single day. If students were to do this for a whole week, and taken an average, the results could have also been different. One thing we did not do is keep track of which classrooms' garbage we had. Some of the teachers in the building requested extra signs and some even got theirs laminated. It is possible we could have found more of a correlation between the different teachers and the trash audit numbers.

Open Ended Questions from Post Survey

Below are the results of the open-ended questions from the post survey, found in Appendix B. Students were able to type in their own responses. Some of the responses that are similar are separated due to the limitations of the tool used to collect the data. In order to get a better view and to ease the analysis, responses to both questions are included before the analysis, and each group will be analyzed separately before comparison.

Question: Do you think your attitudes and behaviors have changed the past few weeks (toward recycling)?

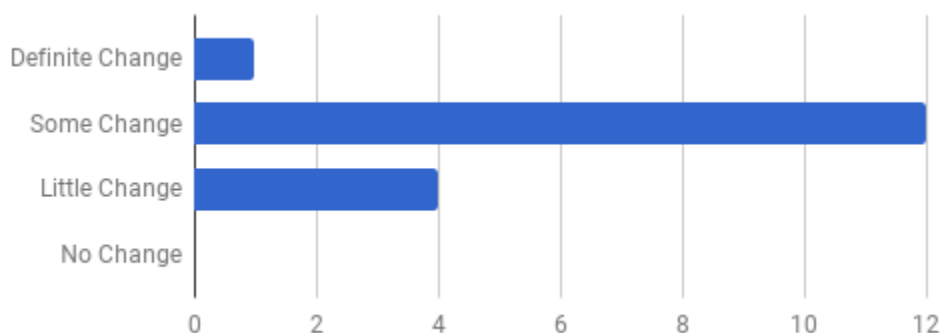


Figure 13 – Post-survey free response question 1 – Life Science

Question: Why or Why not?

because before i would always recycle plastic bags and other bad stuff but now i know
because i used to not recycle a lot but now i try to recycle more
my family doesn't recycle
my attitude has changed because i didn't know much about recycling before than i do now
everytime i see someone throw paper in the trash i want to take it out. before i use to be that person
cause i have been recycling more
because i know what to recycle now and I will recycle it
seeing what it does to our environment makes me concerned about animals and our lives
i never knew recycling was important to the world and how it helps us get natural resources back and be able to use them over until it can't be used anymore
i know that things can harm the environment if you don't recycle properly and composting can make natural fertilizer
I'm not recycling plastic bags and I'm getting yelled at for it
because i saw somethings in the trash can....
because i know what to recycle and how it will be recycled
why because i want to and why not theirs so many things like cardboard,,paper
because i now know why recycling is important to the earth and why it is helpful to everyone and animals
because i don't crush milk cartons anymore

Figure 14 – Post-survey free response question 2 – Life Science

Analysis. Looking at the answers, 12 of the 16 students in the life science group answered a strong ‘yes’, which equals 75% of students agreeing that this curriculum had an impact on their attitudes and behaviors. When reviewing the responses from the second open-ended question, where students were asked to explain why or why not, there are some trends that start to appear. Six students commented that before they did not know much about recycling or what types of material are or are not recyclable. Four of the students commented that they did not understand the importance of recycling or how recycling affected nature. Only four students, 25%, answered that there was a little bit or some change. When looking at the responses to the second open-ended question there are a few answers that stick out for possible explanations as to why attitudes and behaviors have not changed. One student responded that their family does not recycle. It is hard to change the norms inside a home and if the student does not have the opportunities to recycle, of course they will not be able to make the change.

Question: Do you think your attitudes and behaviors have changed the past few weeks (toward recycling)?

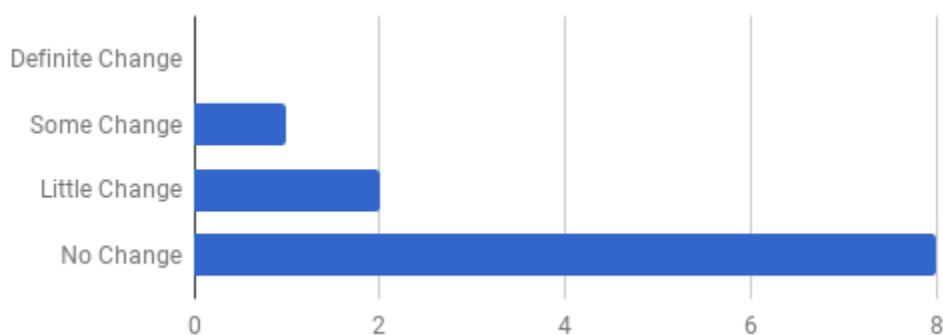


Figure 15 – Post-survey free response question 1 – Advisory

Question: Why or Why not?

I have remained adamant that people should recycle as much and as frequently as impossible
I usually recycle when ever I can
I haven't learned any more about recycling
because I don't
because I usually only throw my plate from lunch in the trash
because i always have been recycling and nothing changed
i never really thought about recycling because in my house we have a recycling bin and a trash bin
because i already did most of these things so my behavior didn't change but i do still recycle the things that i should
because Im not that type of person
idk

Figure 16 – Post-survey free response question 2 – Advisory

Analysis. In the advisory group, 8 of the 10 students responded with a strong ‘no’ to the first question. This equals 80% of the students disagreeing that their attitudes and behaviors have changed. The other 20% of students responded with ‘kinda’ and ‘not really’. Six of the students in this group mentioned that they already recycle, a few students commented that nothing has changed or that they have not learned anything new and different.

When comparing the two groups, the responses were drastically different. Almost all students in the life science group mentioned that they noticed at least some change, if not a definite change, in behaviors and attitudes. Meanwhile, almost all the students in the advisory group responded that there was no change in their behaviors and attitudes. Looking at just this answer, it is easy to see that, yes, education does have an effect on these behaviors and attitudes. The responses to the second open-ended questions gave some insight as to why. The students learned how to properly recycle so they can change their current actions and start taking action by properly recycling. Students were also able

to see the importance and the benefits of recycling. Students were also able to learn about how their actions of recycling or not recycling could affect the world around them.

Summary

Based on the data, there was a clear increase in the positive attitudes towards recycling from the group of students who went through the curriculum. Almost all of these students responded that they feel that their attitudes have changed. Many of them commented that through the curriculum, they learned new things and were concerned about some of the things that they were learning about in class. The students in the Advisory group did not have a change in attitude. Almost all of those students responded that they did not think that their attitudes had changed. Many of them commented that they had not learned anything and that nothing was different about their lives now than it was before.

The next chapter will reflect on the conclusions that can be drawn from this data. It will also reflect the findings, knowledge gained, and experiences by the researcher. Chapter Five will also highlight some areas that the researcher feels have room for improvement and personal dreams of a more in-depth curriculum. Some insights for how this research could be used in schools and how to build on it in the future will also be discussed.

CHAPTER FIVE

Conclusions

Being aware of where the materials to make products come from is one of the first steps in being able to make conscious decisions about responsible ways to discard waste. The research that I conducted focused on how educating students on the life cycle of products can affect the waste habits of students. As a teacher in a middle school setting, from day to day I would see students frequently discard items incorrectly and not think twice about it nor have anyone correct where they should discard their items. During one of the classes in my master's program, I learned about a facility that improved recycling habits just by having the receptacles available for people to use. I thought that since we already had them at school, the next step would be to educate student on how and when to recycle. While teaching class, I found myself explaining why certain things were and were not recyclable to multiple students. It became clear that students needed to have help learning how to be better at recycling.

For my topic, I decided to research how can education improve the recycling behavior and attitudes of middle school students. In order to do this, I needed to find a way to teach the students about recycling. I researched and searched out curriculum that was already out there to see if I could use it in the classroom. After an analysis of the curriculum, which can be found in chapter two, it was clear that, from the curriculums I found for my students and their grade level, some of the activities and lessons from both curriculums could be used, but not all of them. Some of the activities from each curriculum were either too low-level or too in-depth for what I wanted to cover. One of

the curriculums was from the 1980's and therefore did not cover some the topics that students can relate to or have experience with today, like electronic recycling. Also, there have been advancements in the efficiency of some of our systems and technology, along with more recent data than what had been included. For these reasons I did not feel like all of the activities in the curriculum would work well with my students. The next sections will highlight some major learnings from my research, how the research connects to the literature review, some implications and limitations of the research and ideas of how to use the research in the future.

Major Learning

From the research, it is clear that students, even at the middle school age, need help to learn about the different natural resources in our world and how we use them to create products we use and discard every day. Understanding how items are made and what resources are involved in making a product gives students a better appreciation for the limited resources we have on our Earth and an understanding of why it is important to discard them in responsible way. It can also show them how, when we do not do this, we are affecting the world around us in a negative way.

One of the activities we did in class was some product research from the 'Quest for Less' curriculum (EPA, 2005). This activity had the students pick products they use in their daily lives, figure out the different parts of the item, and then what natural resource was used to create the item. The students saw that most of the items we use every day are made from items like metals, plants and oil. We started to focus on waste and where our garbage went. Students did not know, and not all of them could explain, what happens to the stuff the garbage truck collects. Most students said 'the dump'. Students learned

about the different methods of disposal, in which they saw some positives and negatives of all options.

One of the most impactful activities were trash audits. Students saw first-hand the type of items that their teachers and peers were discarding. Many of the students were shocked about the items and commented on how obvious the more responsible choice seemed. For example, one group had a set of bins with a large amount of computer paper in the trash bin. Another group found lots of candy wrappers in the recycling. Almost all the groups found wrappers from food, like chip bags and juice boxes, in the recycling bins. It was interesting to hear many of the students say how easy it would be to discard the items in the correct bins.

Students still did not know how the items that we put in the recycling get recycled. One day we talked about how we use these single sort systems that allow all recyclables in the same bin. We were able to watch some clips of how the recycling facility works and some products that are being made from recycled materials. Students saw how the different items got separated; how after each step, there were people involved to check the quality of the separation and how items that make it to the wrong area can affect the whole system. I thought this was super cool to see. I wish we could have gone to see it in person, but on the videos, all the employees were wearing hard hats, which could indicate that there might be a few safety hazards. I think I learned some of the most interesting things this day, like how you should not crush plastic milk cartons because they will act like cardboard and be separated incorrectly, and how plastic film and bags that make it past, will clog the entire system and the whole system will have to be shut down and unclogged.

On this day, one of the other teachers suggested a video about plastics to me. The students watched the clip from CNN student news that showed how plastics were ending up in the oceans and birds were mistaking the shininess of the plastic for fish. The birds would eat them or bringing them back to their young and the birds were dying. They were found with stomachs full of plastic that was undigested. Students commented in the post-survey and the focus groups that they did not know the stuff they discard here could possibly end up other places in the world and harm wildlife.

I think that students need to be reminded of the importance of our resources and making sure that we discard items properly to help preserve our environment for generations. Maybe it was the home I grew up in or my interest in science, but my parents were alive during a lot of the environmental movements and learned about why it was important to practice the 'Three R's'. They passed this knowledge on to me. Many of my students today have parents who were born in the 1980's when many of these programs were in school and so maybe they assume they will learn about it at school. As a science teacher, I see a big shift to engineering as being a focus of curriculum, but clearly, we need to work in some recycling or environmental education; it seems like it is starting to get lost.

Literature Review

One of the more helpful resources I found was from Boyes and Stanisstreet (2012) who found that the willingness to act was higher if the person believed it would be helpful. I know I had to show students why it was important. When we talked about natural resources, we calculated our carbon footprints and students could see why their footprint may have been higher than someone next to them. The website the students

used to calculate their footprint was great at giving them student friendly options to help them reduce their footprint, so students could see themselves doing these actions to help the earth.

Again, one of the things the students saw was the video where people were finding animals with plastic in their digestive systems and they saw beautiful locations that were not as pristine due to trash that had made it many thousands of miles away from where it started. The students referred to this video throughout the focus groups and surveys. Clearly showing them this first would have been a bigger hook for the students to get them interested and engaged from day one. Showing them how they were impacting nature may have given them the usefulness of the action that Boyes and Stanisstreet (2012) talked about that can lead to a higher “willingness to act”.

Austin, Hatfield, Grindle, and Bailey (1993) found that if recycling containers and trash containers are near each other, more items would end up in the correct containers, as opposed to if there were only a trash or only a recycling container. My students did two trash audits where overall the results were not different, even with the addition of signs that helped to tell students where the materials they were discarding go. I think that this is just part of the behaviors of middle school students, they do not always read everything in front of them. The previous study was done at in a college level setting.

Barr (2007) and Schwab (2014) found that norms play a large role in the behaviors of recycling. Barr (2007) learned that seeing other people recycle has more of an impact than just having intentions alone. There are a few sides to this that it would change with social group. Schwab (2014) found that as people saw others recycling, they themselves would start to accept the norm and recycle more as well. For the students in

my class, some students made comments during class that at their homes, they do not recycle much. At school students are reminded to recycle. Both locations have different norms. Sometimes it is hard for students to be able to recognize and be aware of the different norms. I did find it interesting the stories that came from student about them trying to inform the members of their household about how to recycle better. One student even commented in the post survey that they were getting in trouble at home for not recycling plastic bags, but this student had learned not to recycle them because of the harm they can do.

Implications

The data collected shows that students who are educated about the topic of recycling will have an increase in positive attitudes and behaviors. If we are able to help our students to have more positive attitudes and behaviors now, maybe it will spread to future generations. Students at the middle school age can start to think about habits they are forming and can possibly be more proactive to make more earth conscious decisions that help to preserve natural resources or do not produce a lot of extra waste.

This research shows that there is a need to build in more recycling and waste curriculum with students at the middle school level. Students found it interesting to learn about where the items we discard go. This is not something that is always thought about in today's world. A recycling and waste curriculum has a great connection to life science and the topic of human interactions with natural systems. There are even opportunities to work in engineering activities and challenges.

At the end of the curriculum, during one of the focus groups I had a student who asked if all 7th grade classes were going to be doing the same unit. This particular student

commented that they knew other people in the school that have a big interest in the topic and would be really enjoy it. My colleagues were interested to know how it went and if the students liked it as well. There are some areas that could be improved and there is room for some added projects.

Limitations

Unfortunately, I think there were a few limitations to my research project. If I could do this again, I would add in more projects and some engineering challenges. As mentioned before in chapter four, we watched videos of items that get discarded incorrectly or shouldn't be recycled. In order to teach the students alternative options, I would work in more activities and challenges for students to turn these objects into something useful and present them to the class. One activity I originally discarded was making a terrarium out of a plastic 2-liter bottle. This activity has the students take an item that would normally be discarded and turn it in to something that can be used to start a garden. Looking back, I only had 16 students. I could have easily obtained enough bottles for the class. However, if this curriculum was taught across the whole grade, this might be more difficult to do. Another activity that I think I overlooked was making a birdhouse from discarded materials. We are lucky that our school has a courtyard and students would be able to see their project out there.

Another limitation was that I did this unit in November and December. In Minnesota, it is not a great time to be doing schoolwork outside. I think that if this unit was done in the spring or fall, it could lend itself to more outdoor learning. There could have been a day where students volunteered to clean up a local park. I feel that by the end of the unit, it may have been too focused on negative impacts of humans and a simple

project like making a birdhouse or terrarium or cleaning up a local park, could have made the students feel like they had a positive impact on nature.

In schools, I would like to see the issue of waste brought into the cafeteria. We talked about composting as an option for food waste. I know from personal experience at summer camps there could be contests between different groups of people who would eat to waste the least. This challenge, however, could go two ways. In schools the lunchroom staff are required to have students take food from all the groups, so what I have seen is a lot of food that is wasted because students don't always want to eat it. However, it could go the other way, if there were contests to not waste, maybe students would eat all the food groups that they have to take. In my school, students also use disposable Styrofoam trays. I would love to see the students tackle these issues.

Future Research

In the future, I think a project based curriculum that helps students have more of a hands-on impact would be amazing. Because of the time of year this study was done. There was not a lot of opportunities to do outside based lessons and projects. As previously mentioned there are activities that can be done in the classroom and some that can be done outside. One topic that I would have liked to spend more time on in class is composting. Composting offers some great new knowledge. There are lots of chemical changes going on for the science kids to watch and observe. At our school in particular, there is a courtyard that has flowers and students would be able to use the compost to help grow plants.

I would recommend for future research to build a curriculum with hands on activities that revolve around taking action. In Minnesota, sixth grade students learn

about natural resources and that part of the curriculum would fit very well there. This grade can do some engineering challenges around natural resources and reusing or transforming the products. Seventh grade learns about ecosystems and how humans can impact those systems. I think they could build on the knowledge of how products we make and discard are affecting the world around us. These students could do projects to turn items that are discarded into useful things for nature, something that affects plants and animals in an ecosystem. Eighth grade students study more earth science topics, but there is a lack of environmental aspects to the standards. The students do have to prepare for a state standardized test, so students review the information from the previous grades. Students in eighth grade, being “leaders of the school”, could design or get involved with more of a service learning project around Earth Day to get kids in the younger grades involved in actions we can take to reverse the impact we are making as humans. I think it would be a great thing to see the eighth graders leading a small group in an activity or lesson that helps inform others and encourages positive action. Eighth graders have the ability to design and create something that they care about. We are lucky at our school that we are within walking distance of many parks and an elementary school. We could have the students go to the elementary school and do activities with the younger students. These students would hear the passion of the older students and make recycling a norm in their lives.

Using the Results

Reflecting on the need for schools to teach this topic to students, I think it would be best suited for a life science class, but is able to be taught in all science classes. One interesting way to teach it in all grades is to split up the curriculum and cycle it through

all the different science content areas. When the curriculum gets broken down it can make it easier and more manageable to implement in the classroom during the school year. I have found through my years of teaching, that implementing a three or four-week unit can throw off the units of study for the whole rest of the school year. If you were able to break it up into pieces and students revisit the information each year it could be less disruptive and the students would have more exposure to the content.

Summary

Overall, I feel that this project was a great success. Students learned more about recycling and how it works for the different materials. I learned more about the process of recycling different materials as well. I think students really took away the importance of disposing of waste properly and the effects improper disposal can have on the world and the animals who live here with us. The outlook for the continuation of this curriculum in the school are good because of the support from the administration, colleagues and custodial staff. I am very excited to continue to work with students and colleagues to help inspire others to act responsibly to better help our world.

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APPENDIX A

Pre-Survey

Recycling Attitudes and Behavior Questionnaire – Before

Attitudes

The following are ways the environment can affect people indicate your level of agreement.

Statement	Strong Disagree	Disagree	Agree	Strong Agree
Recycling helps to save natural resources				
Recycling is inconvenient				
Only recycling certain materials is helpful				
I should not waste anything if it can be used again				
I would feel guilty if I did not recycle my waste				
Recycling saves energy				
I don't think to recycle or forget				
Me recycling won't make a difference				

Behaviors

The following are actions that can affect the environment

How often do you recycle the following	Never	Rarely	Sometimes	Usually	Always
Glass					
Metal – food and drink cans					
Paper					
Plastics					
Newspaper					

How willing are you to do the following	Very Unwilling	Unwilling	Willing	Very Willing
Encourage others to recycle				
Correct the way an item was discarded (if it was trash and put in the recycle bin, remove it and put it in the trash bin)				
Bringing a reusable bag when shopping				
Buy unpackaged fruits and vegetables or very little packaging				
Reuse old food containers – yogurt, butter, cottage cheese				
Use dishcloths instead of paper towels				
Repair an item instead of buying new items				
Buy fewer disposable products				
Reuse shopping bags from a store				

APPENDIX B

Post-survey

Recycling Attitudes and Behavior Questionnaire – After

Attitudes

Please indicate your level of agreement of the following.

Statement	Strong Disagree	Disagree	Agree	Strong Agree
Recycling helps to save natural resources				
Recycling is inconvenient				
Only recycling certain materials is helpful				
I should not waste anything if it can be used again				
I would feel guilty if I did not recycle my waste				
Recycling saves energy				
I don't think to recycle or forget				
Me recycling won't make a difference				

Behaviors

Please indicate the level of your behaviors of the following.

How often do you recycle the following	Never	Rarely	Sometimes	Usually	Always
Glass					
Metal – food and drink cans					
Paper					
Plastics					
Newspaper					

How willing are you to do the following	Very Unwilling	Unwilling	Willing	Very Willing
Encourage others to recycle				
Correct the way an item was discarded (if it was trash and put in the recycle bin, remove it and put it in the trash bin)				
Bringing a reusable bag when shopping				
Buy unpackaged fruits and vegetables or very little packaging				
Reuse old food containers – yogurt, butter, cottage cheese				
Use dishcloths instead of paper towels				
Repair an item instead of buying new items				
Buy fewer disposable products				
Reuse shopping bags from a store				

Do you think your attitudes and behaviors have changed in the last few weeks?

Why or why not?

APPENDIX C

Focus Group Questions

Focus Group Questions

1. What lesson/activity had the largest impact on your thoughts regarding waste?
 - a. Why?

2. What was your biggest learning from this class?
 - b. One fact or myth you have learned

3. Why do you think recycling is important?
 - a. What is your biggest reason/motivation to recycle?

 - b. If you needed to persuade someone to recycle. What would you tell them?

4. What change can you agree to make now in your life?

5. What changes will you make in the future?

APPENDIX D

Trash Audit Data Sheet

Recycling Bin Analysis

	Lab #1	Lab #2	Lab #3	Lab #4	Lab #5	Lab #6	Lab #7	Lab #8	Lab #9	Lab #10	Totals
Weight of recycling											
Percent recycling											
Weight of garbage											
Percent of garbage											
Total weight in recycling											

Recycling Bin Analysis

List below some of the types of objects that were in the recycling bin that should have ended up in the trash.

Garbage Can Analysis

	Lab #1	Lab #2	Lab #3	Lab #4	Lab #5	Lab #6	Lab #7	Lab #8	Lab #9	Lab #10	Totals
Weight of recycling											
Percent recycling											
Weight of garbage											
Percent of garbage											
Total weight in garbage											

Garbage Can Analysis

List below some of the types of objects that were in the trash bin that should have ended up in the recycling.

APPENDIX E

Curriculum

Lesson Topic: Natural Resources and Products

Grade Level: 7th grade

Length of Lesson: 2 – 55 minute class periods

Stage 1 – Desired Results	
<p>Content Standard(s): Minnesota Science Standards</p> <p>5.3.4.1.1 – Identify renewable and nonrenewable energy and material resources that are found in Minnesota and describe how they are used.</p> <p>5.3.4.1.2 – Give examples of how mineral and energy resources are obtained and processed and how that processing modifies their properties to make them more useful.</p> <p>5.3.4.1.3 – Compare the impact of individual decisions on natural systems.</p> <p>5.4.4.1.1 – Give examples of beneficial and harmful human interactions with natural systems.</p> <p>8.3.4.1.1 – Describe how mineral and fossil fuel resources have formed over millions of years, and explain why these resources are finite and nonrenewable over human time frames.</p>	
<p>Understanding(s)/goals</p> <p>Students will understand:</p> <p>The difference between renewable and nonrenewable resources.</p> <p>The differences in required energy necessary to produce products from different resources.</p> <p>The connections between natural resources and the products they purchase and discard.</p>	<p>Essential Question(s):</p> <ul style="list-style-type: none"> • What are the differences between renewable and nonrenewable resources? • Where do the products we buy come from?
<p>Student objectives (outcomes):</p> <p>Students will be able to: List various natural resources and some products that contain the natural resources.</p>	
Stage 2 – Assessment Evidence	
<p>Performance Task(s):</p> <p>Students will read about and watch a video on natural resources.</p> <p>Students will research the different resources defined in class and list 10 items made from each.</p> <p>Students will then be assigned products from daily lives. They will need to look up the different parts of the objects and what they are made of and then determine which natural resource was used to make that part.</p>	<p>Other Evidence:</p> <ul style="list-style-type: none"> • Students will be able to link products to the natural resources.

Stage 3 – Learning Plan**Learning Activities:****Materials:**

Video highlighting different natural resources

Reading material about the different natural resources – what they are, where they are found, how materials are used to make products

List of common products used every day, one for each student

Computers

Timeline:

Show students the video -5 minutes

Read through the informational material – 25 minutes

Assign students the different resources and have them research products they make – 25 minutes

Assign a product from the list to each student and have them research the parts and then the resource used. – 40 minutes

Debrief and discuss the different natural resources – 15 minutes

Lesson Topic: Garbage

Grade Level: 7th grade

Length of Lesson: 3 – 55 minute class periods

Stage 1 – Desired Results	
<p>Content Standard(s): Minnesota Science Standard</p> <p>4.1.2.1.1 – Describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products and services are created and used.</p> <p>5.3.4.1.3 – Compare the impact of individual decisions on natural systems.</p> <p>5.4.4.1.1 – Give examples of beneficial and harmful human interactions with natural systems.</p> <p>6.1.2.1.2 – Recognize that there is no perfect design and that new technologies have consequences that may increase some risks and decrease others.</p> <p>6.1.2.1.4 – Explain the importance of learning from past failures, in order to inform designs of similar products or systems.</p> <p>7.4.4.1.2 – Describe ways that human activities can change the populations and communities in an ecosystem.</p> <p>8.1.3.3.3 – Provide examples of how advances in technology have impacted how people live, work, and interact.</p>	
<p>Understanding(s)/goals</p> <p>Students will be able to understand:</p> <p>What happens to the objects that are discarded.</p> <p>How our systems have changed throughout history and their impact on the environment.</p> <p>Show how technologies have improved to better protect the world around us.</p>	<p>Essential Question(s):</p> <ul style="list-style-type: none"> • Describe the different options for disposal for the items that we discard.
<p>Student objectives (outcomes):</p> <p>Students will be able to:</p> <p>Describe how garbage is disposed of and how this disposal has improved/changed over the years.</p>	
Stage 2 – Assessment Evidence	
<p>Performance Task(s):</p> <p>Students will first read about a few of the different disposal options for trash. Then students will watch Bill Nye – Garbage.</p> <p>Students will about how landfills are made and the different layers.</p>	<p>Other Evidence:</p> <ul style="list-style-type: none"> • Students will be able to list the different methods of trash disposal. • Students can argue which method of disposal is best and why. • Students will be able to correctly identify items as garbage or recycling.

<p>Students will then assemble a model of a landfill to learn how new designs and technologies have changed landfills. Students will conduct a trash audit of neighboring classrooms to get base line data on disposal habits of the students in the school.</p>	
Stage 3 – Learning Plan	
<p>Learning Activities: Materials: Bill Nye – Garbage Informational material on the options for disposal. A copy of the Edible Landfill and all materials from EPA- Quest for Less 2005</p> <p>Timeline: Read a bit about the different options for disposal – 10 minutes Bill Nye – Garbage – 30 minutes Learn more on in depth on landfills – 10 minutes Assemble and eat an edible landfill – 55 minutes Learn about items that are and are not recyclable – 8 minutes Conduct a trash audit – 45 minutes Decide what items people have a hard time discarding. – 5 minutes</p>	

Lesson Topic: Alternative Waste Options

Grade Level: 7th grade

Length of Lesson: 3 – 55 minute class periods

Stage 1 – Desired Results	
<p>Content Standard(s): Minnesota Science Standard</p> <p>4.1.2.1.1 – Describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products and services are created and used.</p> <p>5.3.4.1.3 – Compare the impact of individual decisions on natural systems.</p> <p>5.4.4.1.1 – Give examples of beneficial and harmful human interactions with natural systems.</p> <p>6.1.2.1.2 – Recognize that there is no perfect design and that new technologies have consequences that may increase some risks and decrease others.</p> <p>6.1.2.1.4 – Explain the importance of learning from past failures, in order to inform designs of similar products or systems.</p> <p>7.4.4.1.2 – Describe ways that human activities can change the populations and communities in an ecosystem.</p> <p>8.1.3.3.3 – Provide examples of how advances in technology have impacted how people live, work, and interact.</p> <p>8.3.4.1.2 – Recognize that land and water use practices affect natural processes and that natural processes interfere with human systems.</p>	
<p>Understanding(s)/goals</p> <p>Students will be able to understand: The different options for waste and how they save energy. Their carbon footprint and ways they could minimize it. The different processes that allow materials to be recycled and items that can be made from the discarded waste.</p>	<p>Essential Question(s):</p> <ul style="list-style-type: none"> • Describe the alternative ways that waste can be disposed of. • Describe the energy savings that happen when recycling occurs. • What types of things attribute to our carbon footprints?
<p>Student objectives (outcomes):</p> <p>Students will be able to: Describe and calculate their carbon footprint. Describe how recycling different materials can save energy and use less natural resources.</p>	
Stage 2 – Assessment Evidence	
<p>Performance Task(s):</p> <p>Students will use a student friendly webpage to calculate their carbon footprints.</p>	<p>Other Evidence:</p> <ul style="list-style-type: none"> • Students will be able to determine what contributes to their carbon footprint.

<p>They will be able to compare their footprints with others in the country. Students will investigate different methods of disposal including recycling of different materials and composting. Students will watch video clips of how the recycling process works and ways in which our waste can be a benefit or harm.</p>	<ul style="list-style-type: none"> • Students can identify the different materials that are recyclable. • Students will use the information gained to help with the next lesson of making informational materials.
Stage 3 – Learning Plan	
<p>Learning Activities: Materials: Computers with internet access Video clips about recycling</p> <p>Timeline: Students should calculate their carbon footprint using a website. – 50 minutes http://calc.zerofootprint.net/ Assign students the different material to learn about how it is recycled and the amount of energy saved – 30 minutes Go over the research and share information with one another – 20 minutes Find clips that highlight the recycling process, issues when waste doesn't end up where it should, ways in which waste is being recycled into new materials. – 30 minutes Lead class in discussion on why it is important to discard of waste in more responsible ways. – 20 minutes</p>	

Lesson Topic:

Grade Level: 7th grade

Length of Lesson: 4 – 55 minute class periods

Stage 1 – Desired Results	
<p>Content Standard(s): Minnesota Science Standard</p> <p>5.3.4.1.3 – Compare the impact of individual decisions on natural systems.</p> <p>5.4.4.1.1 – Give examples of beneficial and harmful human interactions with natural systems.</p> <p>7.4.4.1.2 – Describe ways that human activities can change the populations and communities in an ecosystem.</p> <p>8.1.3.3.3 – Provide examples of how advances in technology have impacted how people live, work, and interact.</p> <p>8.3.4.1.2 – Recognize that land and water use practices affect natural processes and that natural processes interfere with human systems.</p>	
<p>Understanding(s)/goals</p> <p>Students will be able to understand: What products people have issues with discarding.</p>	<p>Essential Question(s):</p> <ul style="list-style-type: none"> • What makes an effective poster? • Were the posters effective?
<p>Student objectives (outcomes):</p> <p>Students will be able to:</p> <p>Create and design posters to encourage others to discard their waste correctly.</p> <p>Decide if posters were effective based on trash audit.</p>	
Stage 2 – Assessment Evidence	
<p>Performance Task(s):</p> <p>Students will create posters to inform people what belong in what bins</p>	<p>Other Evidence:</p> <ul style="list-style-type: none"> •
Stage 3 – Learning Plan	
<p>Learning Activities:</p> <p>Materials:</p> <p>Paper</p> <p>Markers/color pencils/crayons</p> <p>Computers</p> <p>Timeline:</p> <p>Students revisit the list of items not correctly discarded. – 5 minutes</p> <p>Students need informational posters for both recycling and trash on their own and submit to teacher – over 2 class periods</p> <p>Students should conduct a trash audit on the last day to decide if posters had an impact on the recycling habits. – 50 minutes</p>	