

Exploring Food Waste at a Residential Youth Summer Camp: A Mixed-Methods Approach

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Academic Abstract

Up to 40% of all edible food is wasted in the United States (U.S.) and a large proportion represents consumer waste. Research on food waste is in its infancy, particularly as it relates to youth. Summer camps offer a unique setting for food-based education, with the opportunity to reach large numbers of youth. This MS thesis describes a study that used a mixed-methods research approach to explore three objectives: 1) assess food waste in a residential 4-H youth summer camp setting; 2) determine if an educational program delivered to youth ages 9-13 years, would reduce food waste; and 3) understand stakeholders' views about the benefits and barriers to food waste reduction programs in the camp setting.

The research team and camp staff developed and adapted food waste activities based on the Experiential Learning Model. Participants attended one of four weekly sessions to raise their awareness about food waste. Consumer and production food waste from three meals (breakfast, lunch, and dinner) was collected over a 24-hour cycle and weighed before and after each weekly program to determine total amount of food wasted (pounds) during each week, average waste/child (pounds), and waste/meal (percentage). Waste was collected using the direct weighing method. Paired t-tests were used to assess differences. Stakeholder interviews (n=6) were conducted with Extension Agents, camp program directors, and camp staffers involved with the program. Inductive thematic analysis was used to determine themes and subthemes.

This cross-sectional study included 864 residential campers. Over the course of the four weeks, the cafeteria produced a total amount of 3,182 lbs of food of which, 996.6 lb (30.4%) was wasted. Total consumer waste for all four weeks before and after the intervention was 76.5 lbs and 57.3 lbs, respectively. Although a decrease in consumer food waste was observed, results were not statistically significant ($p > 0.05$). Total production waste decreased from 441.5 lbs before to 390.6 lb after the intervention. Production waste, in relation to the number of servings prepared, also decreased throughout the course of the four weeks. The main themes from the stakeholder interviews emphasized the need for a food waste curriculum and adequate resources to build and sustain the capacity of the education program.

The limitations of this study included different menu items served throughout the four weeks, lack of randomization, and limited sample size of camps (n=4). This was the first food waste study conducted at a youth summer camp, which showed that food waste reduction and behavior change among campers are possible within a short time period. Further research is warranted to minimize food waste in broader contexts and in other camp settings.

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Public Abstract

Up to 40% of all edible food is wasted in the U.S., mostly from consumer waste. Research on food waste is in its infancy, particularly as it relates to youth. Summer camps offer a unique setting for food-based education, with the opportunity to reach large numbers of youth. This study aimed to explore food waste reduction at a residential youth summer camp through an awareness program. Additionally, stakeholder interviews were conducted to gain insight on the feasibility of implementing this program into other education settings.

The research team and camp staff developed and adapted food waste activities based on the Experiential Learning Model. Campers attended one of four weekly sessions that were offered. Waste from three meals (breakfast, lunch, and dinner) was collected over a 24-hour cycle, before and after the program. Waste was collected using the direct weighing method. Interviews were conducted with employees and volunteers who were involved with the summer camp.

This study included 864 residential campers, ages 9 to 13. Over the course of the four weeks, the cafeteria produced a total amount of 3,182 pounds (lbs) of food and of that, 996.6 lb (30.4%) was wasted; however, waste decreased after the awareness program. Stakeholders mentioned that the need for a food waste curriculum and resources to build and sustain the capacity of the education program were necessary for this program to continue.

As the first food waste study conducted at a summer camp, this study indicated that decreases in food waste and behavior change among campers are possible within a short period of time. Further research is warranted to minimize food waste in broader contexts and in other camp settings.

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List of Abbreviations and Acronyms

ACA – American Camp Association
ELM – Experiential Learning Model
ELT – Experiential Learning Theory
EPA – Environmental Protection Agency
4-H – 4-H Youth Organization
FV – Fruits and vegetables
HLFC – The Healthy Lifestyle Fitness Camp
lbs – Pounds
RWU! – Rock and Wrap it Up!
US – United States
USDA – United States Department of Agriculture

Introduction

1.1 Introduction

An estimated 31 to 40% of all food products are wasted in the United States (U.S.) (Buzby, Farah-Wells, & Hyman, 2014; Venkat, 2011). This amounts to approximately 37 million tons of food in landfills annually. Using the latest data from 2008, the United States Department of Agriculture (USDA) estimated that \$165.6 billion worth of food in the retail and consumer sectors were wasted annually, with 19% of the total food supply (half of all food that is wasted) being discarded in the consumer sector alone (Buzby, Farah-Wells, & Hyman, 2014).

Food loss, or postharvest waste, is defined by the USDA as “the amount of edible food, postharvest, that is available for human consumption but is not consumed for any reason; it includes cooking loss and natural shrinkage (e.g., moisture loss); loss from mold, pests, or inadequate climate control; and plate waste (Buzby, Farah-Wells, & Hyman, 2014).” To date, the majority of consumer food waste studies in the U.S. have been conducted among adult populations (Neff, Spiker, & Truant, 2015; Qi & Roe, 2016). Of the few food waste studies measuring waste amounts among children, almost all took place in school settings (Byker Shanks, 2017). Changing behavior and attitudes towards social issues holds the most potential among youth populations (ReFED, 2017). The lack of published or tested food waste reduction programs among youth highlights the need for intensive programs to be developed.

Summer camps are the second largest venue that children attend, with school being the first (Ventura & Garst, 2013). About 14 million children and adults attend some type of camp in the United States. Out of the 14 million, an estimated 7.1 million children attend a camp that is accredited by the American Camp Association (ACA) (American Camp Association, 2017). Virginia boasts one of the largest summer camp programs in the United States. All six 4-H

centers in Virginia are accredited through the ACA. As of 2017, 188,563 children participated in 4-H programs and 13,318 children attended 4-H summer camp in Virginia (Cooperative Extension, 2017).

4-H represents an ideal delivery mode and setting to support food waste education. The goal of the national 4-H youth organization is to support positive youth development. Lerner et al. (2012) conducted an ongoing longitudinal study on youth development within the 4-H program and found that 4-H programs increase the 5C's (confidence, competence, connection, character, and caring) and subsequently revealed a 6th C, contribution. Children who participate in 4-H programs tend to grasp the idea of the 5Cs, and can therefore greatly contribute to their family and community.

4-H summer camps not only serve as opportunities for fun, group-based activities, but have been proven as innovative venues for education and youth development. Programs at 4-H camp are structured through the Experiential Learning Model (ELM) and activities include playing games or active participation (Gleason, 2013). Several studies have documented that summer camps can be an effective setting to support positive attitudes toward fruit and vegetable norms (Noia, Orr, & Byrd-Bredbenner, 2014; Jennings, Nepocatych, Ketcham, & Duffy, 2016; Ventura, Anzman-Frasca, & Garst, 2014) and decreases in weight (George, Schneider, & Kaiser, 2015; Ventura & Garst, 2013). Yet, to date, no residential summer camp curricula on food waste have been identified or publicly shared. Developing a brief education program in a 4-H summer camp may raise the awareness youth to become more aware of food waste issues among youth.

This MS thesis describes a study that used a mixed-methods research approach to explore three objectives: 1) assess food waste in a residential 4-H youth summer camp setting; 2) determine if an educational program delivered to youth ages 9-13 years, would reduce food

waste; and 3) understand stakeholders' views about the benefits and barriers to food waste reduction programs in the camp setting.

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Chapter 2 **Literature Review**

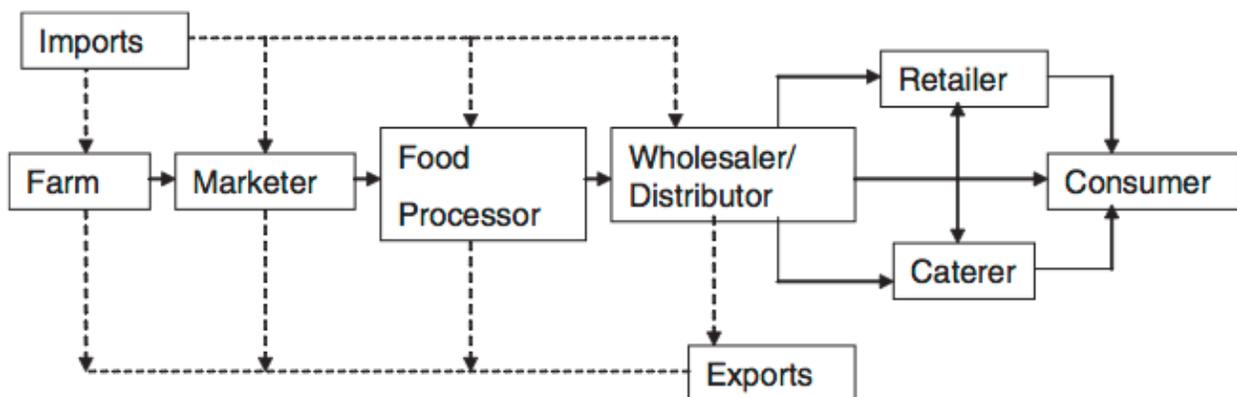
2.1 Introduction

By 2050, it is estimated that there will be a global population of 9.3 billion people.¹ Researchers and environmentalist have expressed concern that with climate change, resources will become scarce and global hunger may increase without sustainable food practices, specifically strategies to reduce food waste.¹ For example, currently in India, 35-40% of fresh produce is discarded because of insufficient cold storage options in markets, resulting in large quantities of food waste. In developed countries, such as the United States (U.S.), inexpensive food prices make it easier and more convenient to throw away food instead of saving it for later consumption.¹ These issues can be translated across countries and globally, which is why the popularity and interest in food waste has risen in the past decade.²

Media searches for food waste articles a decade ago would not have yielded many results. The issue of food waste lingered within academia and the government, and it was not until recently that food waste has begun to catch the attention of the media.² In 2014, the documentary *Just Eat It*, which highlighted the story of a couple who ate wasted food for a year, was released and gained much media coverage.³ In 2016 alone, chains such as Starbucks and Walmart have started their own efforts in reducing food waste.^{4,5} Starbucks has vowed to donate 100% of food waste to the needy and Walmart has started selling weather damaged produce, which tastes no different than the normal product, for a discounted price.^{4,5} Also in 2016, a mobile app released in the United Kingdom, *Love Food Hate Waste*, allows consumers to purchase leftover foods from restaurants at discounted prices.⁶ These efforts are starting to gain the attention of the general public and people other than environmentalists and food economists are looking for methods to reduce food waste.

2.2 Food Waste

Food loss, or postharvest waste, is defined by the United States Department of Agriculture (USDA) as “the amount of edible food, postharvest, that is available for human consumption but is not consumed for any reason; it includes cooking loss and natural shrinkage (e.g., moisture loss); loss from mold, pests, or inadequate climate control; and plate waste.”⁷ A staggering one-third, or 1.3 billion tons, of all food produced globally is lost or wasted each year. Food loss occurs on every stage of the food supply chain (FSC).⁷ While developing countries tend to waste food during the early stages of food production, developed countries have problems with food waste during the late stages of the FSC, which are the retail and consumer stages. Food during these stages are wasted due to retail acceptance, such as the appearance of food products; and consumer behavior, such as personal food preferences.⁷



*Figure 1 Food Supply Chain Schematic.*⁸

In the United States, an estimated 31-40% of all food products are wasted.⁹⁻¹¹ This amounts to approximately 37 million tons of food ending up in landfills annually. Food waste constitutes 14.6% of total solid municipal waste, which makes it the second largest waste category, ranking behind paper and plastic waste. However, unlike paper and plastic waste, food

waste is difficult to recover, which ultimately makes it the largest waste category in landfills. Recovering waste means to recycle or repurpose items that have been discarded into the municipal solid waste stream.¹² In 2012, only 1.84 million tons (5%) of all total food waste was recovered. In comparison, paper, which was the largest waste category, had a recovery rate of 49.8%.¹²

Using the latest data from 2008, the USDA estimated that \$165.6 billion worth of food in the retail and consumer sectors were wasted annually.⁹ In the total food supply, 19% of all available food resulted as consumer food waste. The costliest items that were wasted in the consumer sector were meat, poultry, and fish; however, the most wasted items were vegetables and dairy.⁹ An average of 0.7 pound (lb) of food per capita was wasted every day, which equals to \$1.07/day. Over a year, approximately 273 lbs, which translates to \$390.55, worth of food is wasted per capita. In an average American household of 2.4 people, an estimated \$936 worth of food was not consumed.⁹

In a different study, Venkat estimated that approximately \$197.7 billion worth of food was wasted in 2009, with \$124.1 billion wasted in the consumer sector.¹⁰ Consumer waste comprised as 63% of total food waste. Venkat showed that an average individual lost about \$643.95 annually on food waste while a single family of four could have wasted up to \$1,600. In terms of volume, fruits and vegetables are the largest source of food waste in the consumer sector.¹⁰

Food waste has detrimental impacts on the environment. Food waste decomposing in landfills contribute to climate change by generating greenhouse gases; specifically methane, which is 25 times more potent than carbon dioxide.¹³ Additionally, food production in the U.S. uses a significant amount of resources; 10% of the total energy budget, 50% of U.S. land, and

80% of available freshwater.¹⁴ Food production is responsible for one-third of total anthropogenic greenhouse gas emission.² Wasted food releases at least 113 million metric tons of carbon dioxide (MMT CO₂e) per year¹⁰ and this amount of energy that is released is comparable to 2% of the total U.S. energy budget.^{10,15} Meaning that the money spent for 2% of the total U.S. energy budget is ultimately wasted through uneaten food. Energy is used at every stage in FSC which results in the release of greenhouse gases throughout the production of any given food item.⁷ Animal products require the most energy due to intensive resource and labor.¹⁰ In terms of weight, animal products constitute 30% of total waste and releases 57% of food waste greenhouse gas emissions.¹⁰ Waste from beef products alone produce about 16% of total food waste emissions.¹⁰ Vegetables and fruits which make up the largest waste category by weight (56%) only contributes to 31% of emissions since its carbon footprint is relatively low.¹⁰

As the world becomes increasingly globalized, food waste poses an immense issue because of its association with loss of money, food insecurity, and disastrous environmental impacts.⁷ Many previous efforts to communicate food waste were based on an environmentalism point of view but these efforts did not grab the attention of the general public. However, if food waste is put into an economic and money perspective, consumers and businesses tend to be more attentive and willing to reduce food waste.^{11,16}

2.3 Food Waste Awareness Among Consumers

Food waste is beginning to become a “hot topic” among consumers due to its increased social media presence.^{4,5} In the only study on consumer awareness of food waste, 53% of 500 randomly selected individuals said that they have heard of food waste and ways to reduce it in the last 12 months.¹⁷ This study assessed guilt factors (which include feeling guilty about food

waste, feeling bad about the consequences of food waste in the environment, and wasting money through food waste) and found that 77.2% of participants felt guilty about wasting food. Of those surveyed, 51.2% reported that it is too difficult to further reduce food waste in their household, 58.4% acknowledged that food waste is detrimental to the environment, and 42.1% believed that throwing away food is a major source of wasted money.¹⁷ The sample was demographically diverse and intended to represent the U.S. population.

2.4 Contributors to Retail and Consumer Food Waste

The majority of food waste in the U.S. come from the retail and consumer sectors.⁹ The Food and Agriculture Organization of the United Nations (FAO) estimated that developed nations, such as the United States, waste about 95-115 kg/capita worth of food annually.⁷ This is because food is inexpensive to produce and food production always exceeds demand.^{7,14} When compared to other countries, Americans spend the least amount of their income on food. In 2010, only 6.2% of their income was spent on food, compared to Nigerians where 56.1% of their average income is spent on food.¹⁸ With food waste becoming an unavoidable issue in the United States, the main contributors to consumer sector food waste are lack of food safety knowledge, retail quality standards, and over preparing meals.^{13,14,17,19}

In the only consumer attitudes study on food waste, 65% of the participants reported that they “worry about food poisoning” when it comes to discarding food.^{11,17} Most participants (72%) stated that they “use their own senses” and 39% rely on the “use by date (food labels)” when discarding food items, which means that many consumers are not educated on food safety or that the expiration dates on food labels are difficult to understand.¹¹ Leib et al. conducted a study on the perception of food labels and of the 1,029 individuals surveyed, 84% of those

reported that they throw out food on or past the expiration date.²⁰ About 36% believed that food date labels are federally regulated, which is a large misconception.²⁰ The type of food influences consumers on which items to discard. In regards to the “use by” date, which is a food quality indicator, raw chicken was the most commonly discarded item (50%) while breakfast cereal was the least commonly discarded item (9%).

Developed countries have a low tolerance for food appearance imperfections, which is why retailers discard edible produce that is deemed “ugly.”^{7,11} Consumers have become accustomed to buying food products of the highest cosmetic standards.^{11,14} This could be due to the fact that some consumers choose to only eat “the freshest produce” and choose not to purchase foods that look abnormal.^{11,14} For example, consumers are less likely to purchase apples from a bin that has few apples in it; instead they are more likely to purchase from a large display of apples.¹⁴ However, the apples at the bottom of the bin become bruised from the weight of the apples above them, which make them no longer marketable, resulting in retailers having to satisfy this demand by overstocking products and making immense food displays.¹⁴

Over preparation of food in restaurants and homes also leads to food waste.¹¹ Instead of donating to local food banks, most restaurants discard food if it is not sold.¹⁴ Many people in developed countries have a stigma against leftovers, which contribute to food waste.¹⁴

On a larger perspective; restaurants, caterers, and dining halls are discarding an immense amount of food daily.²¹ Some university dining halls must be able to feed thousands of students daily and over-preparation can be an issue.²¹ This places pressure on the dining hall staff to provide an adequate amount of food.

Other noted categories of food waste include impulse shopping, shopping on an empty stomach, buying special ingredients that will not be used again, and convenience.¹⁴ All of these

contributors can easily be overcome by providing more education and resources.²² More education on sell by dates and food safety and more resources for food preservation can decrease food waste.²² Increased educational and/or awareness campaigns aimed at reducing consumer-level food waste is warranted, especially since food waste is considered mainly a cultural or social problem in developed countries.^{11,22} However, food waste research is still in its infancy and more studies must be conducted to better understand consumer behaviors.¹¹

2.5 Current Food Waste Reduction Strategies

In general, reduction of food waste is fairly simple in retail and consumer sectors – simply reduce excess food purchases and surpluses.²³ It is important to note that total food waste is impossible to achieve.²⁴ In recent years, the government has shown increased interest and are offering methods to reduce food waste in terms of policy and legislation. These large-scale efforts are placed on businesses and organizations.^{14,25-27} In addition, businesses are beginning to take initiative in reducing food waste in its production and retail facilities. Current active strategies for consumers to decrease food waste remain largely in nonprofit organizations through forms of donation, education, and gleaning. However, the USDA and EPA have provided materials, education resources, and a mobile app on food date labels for consumers.²⁸

In terms of voluntary policy, the Environmental Protection Agency (EPA) and USDA have offered support and guidance for businesses and organizations; such as private, public, and government entities, looking to reduce food waste. The main policy specifically related to food waste is the USDA and EPA call to action and The Food Loss and Waste Reduction Goal, which is intended to decrease food waste by 50% by 2030.²⁹

Before the Food Loss and Waste Reduction Goal, the EPA and USDA created the U.S. Food Waste Challenge. Started in 2013, this challenge consists of two programs, EPA's Food Recovery Challenge and USDA's Food Waste Challenge, and doubled to assess the amount of food wasted among participants and serve as a platform to disseminate information on methods to reduce food waste.^{28,30} Only businesses and organizations can participate in this voluntary program. Once enrolled in the program, participants self-track their progress by setting a baseline and a goal. The results of the programs are released annually, and awards are given to the participants who reduce the most waste. No formal studies have assessed the effectiveness of the programs. However, food waste has decreased based on the shared results of the participants however. Additionally, more participants have joined each year. Currently, there are 4,621 participants as of 2017.³⁰

In terms of legislation, The Bill Emerson Good Samaritan Act protects food donors, such as businesses and organizations, from liability. Although this law has been in effect since 1996, many are not aware of it.¹⁴ With the amount of food insecure people in the United States, much of the food waste from the production and retail sectors could be diverted to homeless shelters and food pantries.¹⁴ Saving just 15% of wasted food could potentially supply meals for 25 million people.¹⁴

Two Food Recovery Acts have been introduced in Congress, one in 2015 to the Senate²⁵ and one in 2016 to the House of Representatives.²⁶ These bills intend to raise awareness about wasted food and food recovery efforts, connect agriculture producers with feeding organizations and schools, improve nutritional health of children, and provide farms with compostable materials and anaerobic digesters. If passed, the USDA must establish an office for food

recovery and study techniques for decreasing food waste and standardize methods of estimating waste on farms.^{25,26} As of 2017, these bills remain in the introduction phase.

Since food date labeling is identified as a source of confusion for consumers, the Food Date Labeling Act of 2016 was introduced in the House of Representatives.²⁷ This legislation intends to reduce food waste by standardizing quality and safety date food labels. Currently food date labels are not standardized and policies vary among states.¹⁴ With a nationally standardized date labeling system, food waste confusion will decrease among consumers. As of 2017, this legislation remains in the introduction phase in the House of Representatives.²⁷

Some universities and businesses have food diversion plans where excess food is donated to food pantries or composted.²¹ After implementing a food waste tracking system in a university dining hall, staff members became more aware of food waste and its monetary consequences. Therefore they felt inclined to decrease the amount of food waste that is generated in their kitchens.²¹ Using a food auditing system and increasing employee awareness decreased the amount of food waste that was generated in dining halls. In addition to increasing awareness of staff members, Burton et al. found that

Businesses have taken their own initiatives to decrease food waste among consumers. In February 2017, the Food Marketing Institute and Grocery Manufacturers Association announced that they will standardize date labels.³¹ Only two label phrases will be used, “use by,” a safety indicator, and “better if used by,” a quality indicator. Industries previously used up to ten separate label phrases. These standardized label phrases will go into effect in July 2018.³¹ An estimated 398,000 tons of food waste can be avoided if date labels are standardized throughout the entire food industry.²² However, industry initiative is not the most effective approach in reducing food waste among consumers.²²

Besides the USDA and EPA, non-profit organizations, such as Rock and Wrap it Up! (RWU!), ReFED, and Natural Resources Defense Council (NRDC), all provide resources, education materials, and methods in reducing waste for consumers.³²⁻³⁴ ReFED believes that consumer education campaigns can be the most effective approach to decreasing food waste, with the potential of diverting 584,000 tons of food, which can eliminate 2,336,000 tons of greenhouse gas emissions, save \$4,531 per ton of waste, and save 281 billion gallons of water from being wasted.³³

2.6 Educational Programs and/or Interventions to Reduce Food Waste Among Youth Populations

To date, the majority of food waste studies on consumers have been conducted on adult populations.^{11,17,35,36} No studies on food waste perceptions among youth have been conducted and of the few food waste studies conducted among children, almost all took place in school settings.²⁴ Even among these studies, reduction of food waste was never the primary goal as the studies were concerned with food consumption.²⁴ For example, several studies measuring food waste examined the impact of different interventions to change food behavior, such as placing foods in different locations of the cafeteria,³⁷ slicing apples to make them easier to consume,³⁸ and giving vegetables flashy and appetizing names.³⁹ These studies ultimately created the Smarter Lunchrooms Movement,⁴⁰ which utilizes “nudges,” non-intrusive methods of changing or improving human behavior.⁴¹ Although the smarter lunchrooms have not been adapted in all schools around the U.S., the 29,000 schools that these methods have been fully or partially adapted have shown success in increased food consumption and decreased food waste.⁴² However, the Smarter Lunchrooms Movement focus primarily on increasing consumption rather

than decreasing waste. The intervention methods are passive, meaning that the children do not actively participate in the activities, such as the placement of foods around the cafeteria³⁷ or slicing apples.³⁸ A more involved method, with active participation from children, should be considered as a strategy to decrease food waste.

The few educational programs that focus on food waste target older children, mostly teens in high school, who have critical thinking skills and an easier time understanding the topic.⁴³ Almost all of the programs available are centered around composting as a way of food recovery instead of methods to reduce food waste.⁴⁴⁻⁴⁶

Non-profit organization, Rock and Wrap It Up! (RWU!), developed a series of food waste activities for youth that focused on food insecurity, the environment, and economics.³² There are two lessons in this program, (1) learning about poverty and carbon footprints; and (2) methods to change food waste behaviors. Guilford County Schools in North Carolina adapted this program to educate children about food recovery before the implementation of a schoolwide food recovery event.⁴⁷ The program was successful and the students that participated gave positive feedback. Additionally, this education program has been endorsed by the White House, Aerosmith, and the Allman Brothers Band.³²

The lack of food waste reduction programs among youth shows that more intensive programs should be developed. This will allow children to grow up with the notion that food waste can negatively affect an individual socially, environmentally, and economically. Of the available programs, there are no studies or literature showing their effectiveness, except for the RWU! program.⁴⁷

2.7 4-H Youth Development

In 1902, the first 4-H Club began as an after-school club for children interested in agriculture. In 1914, the Cooperative Extension system was created at land grant universities and 4-H clubs were integrated into university functions.⁴⁸ The goal of 4-H is to support positive youth development. Today, 4-H appeals to many because of the broad range of activities centered around three program areas: science, technology, engineering, and math (STEM) and agriculture; healthy living; and citizenship.⁴⁹ All of the activities provided by 4-H align with their mission, motto, pledge, and symbol.⁵⁰ 4-H programs are based upon the Experiential Learning Model (discussed later).⁴⁹ 4-H programming is delivered through 13 modes such as after-school clubs, in-school enrichment programs, day camps, and summer camps.⁵¹

4-H has been at the center of a positive youth development study. Lerner et al. conducted a longitudinal study on youth development within the 4-H program.⁵² This study is ongoing and consists of nine waves of participants so far. Within the first wave of participants, Lerner et al. concluded that 4-H programs increase the 5C's (confidence, competence, connection, character, and caring) and subsequently revealed a 6th C, contribution.⁵² Children who participate in 4-H programs tend to grasp the idea of the 5Cs, and therefore can greatly contribute to their family and community. The most recent wave of participants, the ninth wave, exhibited similar behaviors and it was concluded that children who participated in 4-H displayed academic excellence and had a higher chance of going to college. Children who show the 5C's are also less likely to partake in risky behaviors, which include smoking, drugs, alcohol, teenage pregnancy, and more.⁵²

4-H summer camps provide a popular venue for reaching a large number of youth through participatory, non-traditional education activities. The activities are intended to educate

different 4-H topics and convey the principles of 4-H, such as responsibility, leadership, and teamwork.⁴⁹ Camp has also been proven to build the 5 C's.⁵² All of these aspects contribute to positive youth development.

Participation in 4-H camp has resulted in skills and leadership development. In a study conducted by Garton et al., two surveys, one for older campers (12-21) and one for younger campers (8-13), were developed and distributed among campers in 15 West Virginia counties.⁵³ There were a total of 1,541 participants in this study. The results show that the most positive impacts were in the “getting along” category for both age groups, which includes responsible citizenship and accepting differences.⁵³ Other strong positive impacts include accepting responsibility and contributing as a member of a team. The lowest score was in the “to be interested in learning” question, which implies that the campers feel that their other skills are developing more; however, the learning environment at 4-H camps is different from schools and traditional education settings. Campers may not realize that they are learning through the activities that they do each day. The skills that are learned and acknowledged can benefit the camper's experiences in other settings, such as at school or at home.⁵³

In a study conducted by Garst and Johnson on adolescent leadership skill development through 4-H camp counseling, teen counselors participated in focus groups that were intended to understand the camp counselor leadership experience.⁵⁴ Although teen counselors found that it was difficult to discuss their camp experience with peers, because camp was not viewed as a “cool” thing to do, they reported that by being a camp counselor, they became more aware of the developmental needs and individual differences of youth campers. Overall, the camp counselor experience helped instill more responsibility among teens.⁵⁴

In another study conducted by Brandt and Arnold, 83 counselor alumni were given a survey which asked questions on various skills acquired from being a 4-H camp counselor.⁵⁵ These skills were divided into three categories; personal development, working with children, and life skills. Results found that overall, alumni counselors reported self-confidence, leadership, and mentoring as the most important skills learned from their camp experience. As 4-H programs are divided into the 4 H's of the Targeting Life Skills model (hands, heart, head, and health), the Hands category was recognized as the area that impacted counselors the most.⁵⁵ This included skills in leadership, responsible citizenship, contribution, and teamwork. Older participants reported that working with children and groups were significant skills that they developed at camp. Brandt and Arnold concluded that these skills were relevant to the older alumni as they are required in workplace and family settings.⁵⁵

2.8 Education within 4-H, The Experiential Learning Model

In 4-H programs, children rarely learn through traditional classroom settings. Instead, they learn through the Experiential Learning Model (ELM), which include hands-on activities and discussions.⁵⁶ The Experiential Learning Theory was created by David Kolb and consists of a four-stage cycle of learning as well as four separate learning styles.⁵⁷ There are four stages in the original Experiential Learning Cycle: (1) concrete experience, a new experience is generally encountered; (2) reflective observation, reviewing or reflecting on the new experience; (3) abstract conceptualization, reflection gives rise to a new idea; and (4) active experimentation, where the learner applies their newly acquired skills to the real world.⁵⁷ The four separate learning styles were developed because Kolb noticed that people have different learning styles and will generally lean towards a specific style that they prefer.

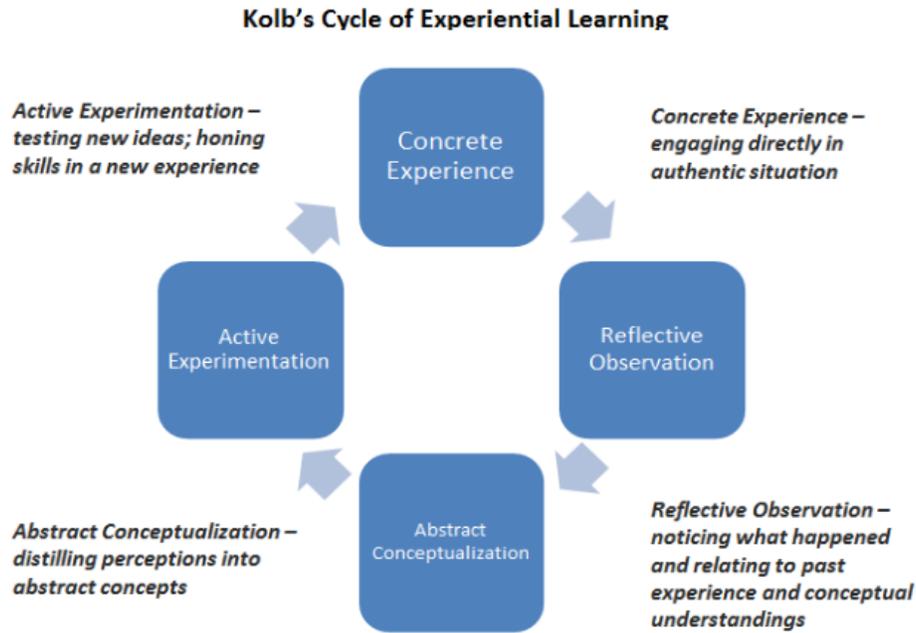
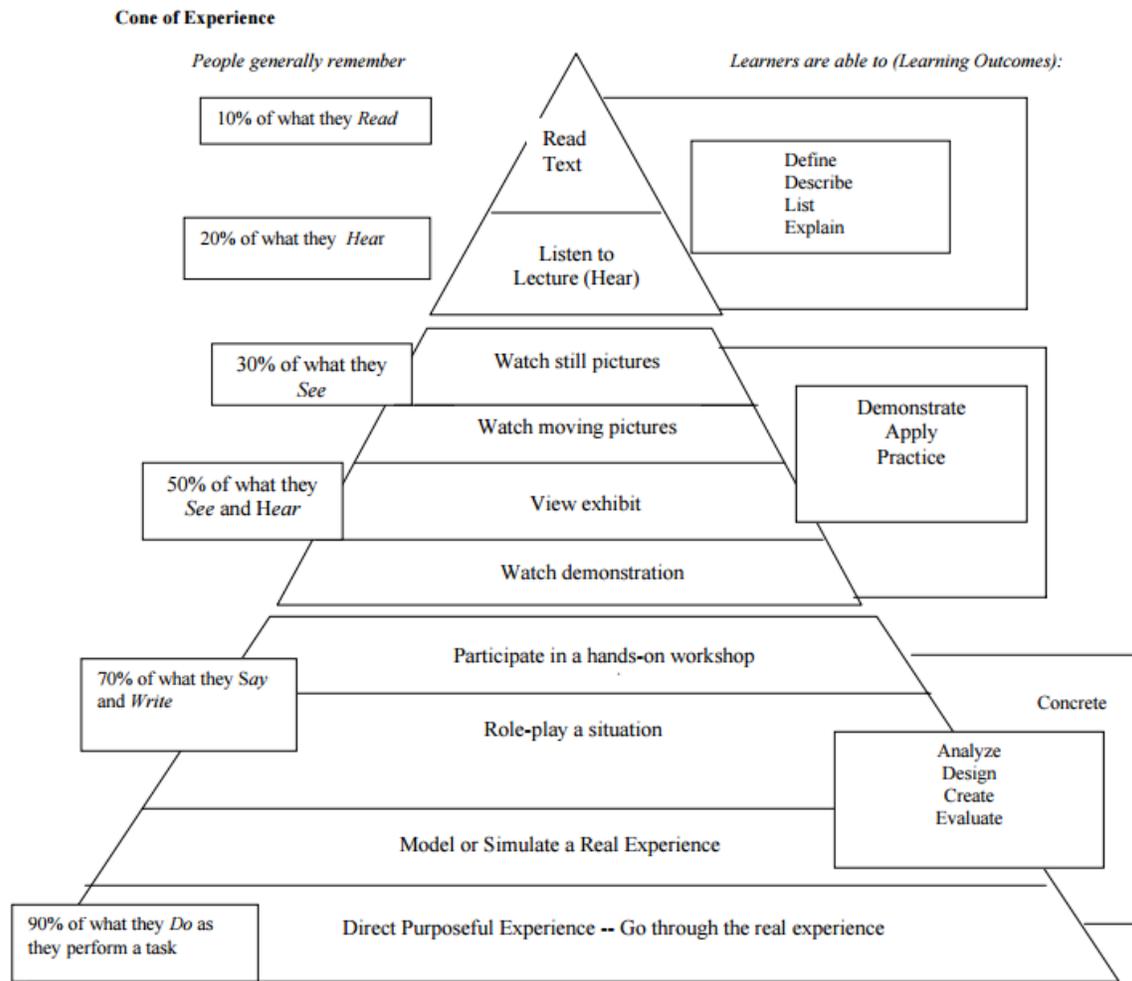


Figure 2 Kolb's Cycle of Experiential Learning⁵⁷

In relation to Dale's Cone of Experience, the Experiential Learning Theory falls into the "concrete" category, in which learners are expected to remember about 70-90% of the education lesson.⁵⁸ This category consists of activities such as participating in hands-on workshops, role-playing a situation, modeling or simulating a real experience, and direct purposeful experiences. Edgar Dale created the Cone of Experience based off of observations that people retain learning material better through concrete experiences, such as "doing" activities rather than abstract experiences such as hearing or reading learning materials.⁵⁸



Source: Adapted from E. Dale, *Audiovisual Methods in Teaching*, 1969, NY: Dryden Press.

Figure 3 Dale's Cone of Experience⁵⁸

4-H has taken Kolb's Experiential Learning Theory and adapted it to their own five-step Experiential Learning Model (ELM). Instead of the four-stage cycle, this model has five-stages: (1) experience, learners participate in the "hands-on" activity; (2) share, learners describe what they learn from the activity; (3) process, learners identify common themes and highlight important skills that were learned from the activity, (4) generalize, learners think of ways to apply their newly learned skill to other real world settings, and (5) apply, learners reflect on their new skills.⁵⁶ These stages are then generalized into three categories: do, reflect, and apply.

Experience is in the “do” category, share and process are in the “reflect” category, and generalize and apply are in the “apply” category.⁵⁶ The ELM utilizes a facilitator rather than a teacher.⁵⁹

The role of the facilitator is to introduce the activity, provide support, and guide learners so that they understand the activity. Although “hands-on” experience is crucial in this model of learning, 4-H stresses that a “hands-on” activity alone is not enough to learn a new skill. Instead, learners must use critical thinking to apply and generalize their experiences to other situations. Learners must be able to show and discuss what they learned from the activities.⁵⁶



Figure 4 4-H Experiential Learning Model⁶⁰

2.9 Camp as a Venue for Education

Many people think of summer camp as an outlet for children to deviate from the typical schoolwork, but it has been proven as an innovative venue for education. Children at camp do not expect to learn through textbooks; instead most of the programs are structured through activities that include playing games or active participation.⁴⁹ Although children may not realize that they are learning new topics, lessons from camp can leave an impression for months or years to follow.⁶¹ Another aspect of camp is that children are in a controlled environment where their activities are planned.⁶² This makes it easier to implement education programs into an environment that children find fun and exciting. Camp counselors and staff members are often viewed more as peers than teachers, which allow children to make meaningful bonds easier.⁶³ To date, food waste interventions have never been implemented at camps, but nutrition and exercise education programs have been developed and used at camps.^{61,64,62}

In nutrition and physical activity education camp programs, games and discussions are often utilized.^{61,64,62} Games that are often played include jeopardy, relay races, and scavenger hunts.⁶⁴ Discussions allow children to share their opinions as well as listen to others, which can give different perspectives on a topic. These activities allow children to creatively think outside the box.

Noia et al. implemented an intensive program to improve the camp food environment.⁶⁵ The campers were divided into two sections, participants and non-participants. Data was collected in three phases, baseline, intervention, and revised intervention. Activities included nutrition education on modeling healthy eating behaviors and providing social support for fruits and vegetable (FV) consumption; fun-fact cards; and nutrition education activities on media literacy.⁶⁵ Counselors led the education programs and provided healthier snack options. Program

evaluation occurred at each of the three phases through anthropometric measurements, modal ratings (for interest and enjoyment of the lessons), surveys on FV intake, FV norms (perceived peer intake, attitudes around FV, and perceived peer attitudes toward eating FV), frequency and variety of FVs served, and counselor support for FV intake. Vegetables variety increased throughout the program. Participants had positive attitudes toward FV norms that were statistically significant.⁶⁵

The Healthy Lifestyle Fitness Camp (HLFC), located in Fresno, California, is a free physical activity and nutrition summer day-camp for low-income overweight and obese youth aged 9-14.⁶² George et al. conducted a study to determine changes in weight, waist circumference, and waist-to-height ratio between 111 camp participants and a comparison group consisting of 29 children from another camp, which did not focus on physical activity and nutrition activities. Activities included moderate physical activity exercises, free snacks, nutrition education, and field trips. Anthropometric data was collected 2 weeks before and after camp, and 2 months afterward. When the two groups were compared, there was a significant decrease in weight and weight-to-height among the HLFC campers. George et al. concluded that nutrition and physical activity camps were crucial for the health of low-income youth as organized physical activity opportunities may not be readily available for this population.⁶²

Camp programs specific to sustainability have been developed. The Sustainable You! Summer Camp, developed by Utah State Extension for 4-H, is a five-day, three hour session, camp program for children aged 9-12.⁶⁶ The purpose of this camp is to help youth develop an understanding of sustainability concepts through activities that they can use in their everyday life. The framework for the activities were developed using the ELM. In addition to participating in the activities, campers are also required to write daily reflections in their journal. Each day of

the camp represents a different aspect of sustainability, for example activities on day 1 focus on land sustainability. Other focuses include air, food, energy, and water. Food waste is addressed in the land segment through a composting activity where campers make their own vermicompost bins.⁶⁶ So far, The Sustainable You! Summer Camp program has been adapted by the 4-H Youth Development Programs at the UC Hansen Agricultural Research and Extension Center in California.⁶⁷

Only one program has been developed for the sole purpose of reducing waste at camp but it is uncertain if the camp program occurred. Zero-Waste Whitewood was developed by 4-H Camp Whitewood, located in Windsor, Ohio.⁶⁸ The project development plan and grant proposal is available online but no literature suggest that this program was actually implemented in 4-H camps. The goal of this program is to educate youth about conservation strategies, waste reduction, and environmental stewardship to decrease the camp's environmental footprint and increase waste awareness. All forms of waste, such as food, recyclable, and general trash, were addressed in this program. Activities specific to food waste involve composting. If implemented, this program would have the potential to influence over 3,000 youth each year. The length of this camp and specific activities were not explicitly mentioned.⁶⁸

2.10 4-H Camp in Virginia

About 14 million children and adults attend some sort of camp in the United States. Out of the 14 million, an estimated 7.1 million children attend a camp that is accredited by the American Camp Association (ACA).⁶⁹ Accredited camps must pass a rigorous set of standards that upkeep the quality of camp. These standards are tested every three years so that the camps

can be reaccredited. Only 25% of all youth camps in the United States are accredited through the ACA.⁶⁹

As of 2017, 188,563 children participated in 4-H programs and 13,319 children attended overnight 4-H summer camp in Virginia.⁵¹ Virginia boasts one of the largest summer camp programs in the United States. All six 4-H educational centers in Virginia are accredited through the ACA.⁵¹ 4-H offers four types of camp experiences, cloverbud camps for ages 5-8, overnight junior camps, special interest junior camps, and day camps. Counties and cities in Virginia are divided into the six 4-H educational centers. The Northern Virginia 4-H educational Center services 17 counties and cities. These counties include urban areas such as Fairfax, Arlington, and Alexandria; as well as rural areas, such as Orange, Madison, and Page counties.⁷⁰

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Chapter 3

Exploring Food Waste at a Residential Youth Summer Camp: A Mixed-Methods Approach

3.1 Introduction

An estimated 31 to 40% of all food products are wasted in the United States (U.S.) (Buzby, Farah-Wells, & Hyman, 2014; Venkat, 2011). This amounts to approximately 37 million tons of food in landfills annually. Using the latest data from 2008, the United States Department of Agriculture (USDA) estimated that \$165.6 billion worth of food in the retail and consumer sectors were wasted annually, with 19% of the total food supply (half of all food that is wasted) being discarded in the consumer sector alone (Buzby, Farah-Wells, & Hyman, 2014).

Food loss, or postharvest waste, is defined by the USDA as “the amount of edible food, postharvest, that is available for human consumption but is not consumed for any reason; it includes cooking loss and natural shrinkage (e.g., moisture loss); loss from mold, pests, or inadequate climate control; and plate waste (Buzby, Farah-Wells, & Hyman, 2014).” To date, the majority of consumer food waste studies in the U.S. have been conducted among adult populations (Neff, Spiker, & Truant, 2015; Qi, Roe, Foley et al, 2016). Of the few food waste studies measuring waste amounts among children, almost all took place in school settings (Byker Shanks, 2017). Effectively reducing food waste in the United States requires a shift in paradigm. Currently, food waste is an accepted social behavior; however, a shift should occur so that individuals consider the detrimental effects of waste on the economy, society, and environment (Russell, Young, Unsworth, & Robinson, 2017). Changing behavior and attitudes towards social issues show the most potential among youth populations (ReFED, 2017). The lack of published or tested food waste reduction programs among youth highlights the need for intensive programs to be developed.

4-H represents an ideal delivery mode and setting to support food waste education. The goal of the national 4-H youth organization is to support positive youth development. Lerner et al. (2012) conducted an ongoing longitudinal study on youth development within the 4-H program and found that 4-H programs increase the 5C's (confidence, competence, connection, character, and caring) and subsequently revealed a 6th C, contribution. Children who participate in 4-H programs tend to grasp the idea of the 5Cs, and can therefore greatly contribute to their family and community.

The teaching model of 4-H is based upon the Experiential Learning Model (ELM), an adapted version of Kolb's Experiential Learning Theory (ELT), which incorporates different aspects/components of learning style to address all types of learners (Gleason, 2013). Instead of the traditional four-stage ELT cycle, ELM has five-stages: (1) experience, learners participate in the "hands-on" activity; (2) share, learners describe what they learn from the activity; (3) process, learners identify common themes and highlight important skills that were learned from the activity; (4) generalize, learners think of ways to apply their newly learned skill to other real world settings; and (5) apply, learners reflect on their new skills (Gleason, 2013). These stages are then generalized into three categories: do, reflect, and apply.

Summer camps are the second largest venue that children attend, with school being the first (Ventura & Garst, 2013). About 14 million children and adults attend some type of camp in the United States. Out of the 14 million, an estimated 7.1 million children attend a camp that is accredited by the American Camp Association (ACA) (American Camp Association, 2017). Virginia boasts one of the largest summer camp programs in the United States. All six 4-H centers in Virginia are accredited through the ACA. As of 2017, 188,563 children participated in

4-H programs and 13,318 children attended 4-H summer camp in Virginia (Cooperative Extension, 2017).

4-H summer camps not only serve as opportunities for fun, group-based activities, but have been proven as innovative venues for education and youth development. Programs at 4-H camp are structured through hands-on activities that include playing games or active participation. A variety of educational programs are also offered to help support hands-on learning. Several studies have documented that summer camps can be an effective setting to support positive attitudes toward fruit and vegetable norms (Noia, Orr, & Byrd-Bredbenner, 2014; Jennings, Nepocatych, Ketcham, & Duffy, 2016; Ventura, Anzman-Frasca, & Garst, 2014) and decreases in weight (George, Schneider, & Kaiser, 2015; Ventura & Garst, 2013). Yet, to date, no camp curriculums on food waste have been identified or publicly shared. Developing a brief education program in a 4-H summer camp will allow youth to become more aware of food waste issues.

Purpose and Hypothesis

The purpose of this study was to: 1) assess food waste in a youth camp setting; 2) determine if an educational program would reduce food waste; and 3) interview stakeholders to assess the benefits and barriers of the program implementation. Food waste for meals after the education program is estimated to decrease due to increased awareness. Stakeholders may find that a benefit to offering the food waste program is that overall waste will decrease. A major barrier may include the implementation cost and sustainability of the program.

3.2 Methods

Study Design

This was a cross-sectional mixed methods study, consisting of direct food waste observations and qualitative stakeholder interviews.

Setting

This study took place at the Northern Virginia 4-H Educational Center, which is accredited by the ACA. Children ages 9 to 18, from the surrounding cities and counties, are allowed to attend the junior 4-H camps. The camp is located in Front Royal, Virginia, and is 1.5 hours away west from Washington, DC.

Materials

All weights were collected using ZIEIS (Z15-EZS, Apple Valley, MN, 2013) digital scales (accurate to 5g). Additional materials included five-gallon buckets for waste collection and corresponding lesson plans (refer to **Appendix D**).

Participants

Four out of the eight camp weeks were chosen for this study. Weeks with fewer campers were chosen given resource constraints with collecting food waste data with larger groups. Campers were from ten counties in northern Virginia: Caroline, Culpeper, Frederick, King George, Madison, Orange, Page, Rappahannock, Shenandoah, and Spotsylvania. No informed consent was required for youth participants since they did not directly participate in research activities.

Procedure

Food Waste Data Collection

All meals were served family-style, meaning that the food items were pre-portioned to the number of campers sitting at each table. Campers were free to self-serve from the serving bowls placed on the tables. Since food items were prepared in batches and separated into serving sizes for each table (either ten or seven servings per table), the most accurate method to measure the amount of total food produced was by taking three weight measurements of each portioned food item. Prepackaged and cold items were weighed first, and hot items were weighed as they came out of the kitchen. The three weights per item were averaged and multiplied by the number of tables that were being served that day.

The research team collected food waste using the direct-weighing method (Byker, Farris, Marcenelle, Davis, & Serrano, 2014). Unlike the traditional direct-weighing collection method, the research team and camp staff adapted the method to be more interactive for the campers. The campers separated their own food waste in effort to increase self-awareness. Menus were acquired before the beginning of the summer camp season and food items were divided into categories (Table 1). Two 24-hour waste collection cycles were chosen, one before and one after the day of the educational program (refer to **Appendix A** for camp schedule). Each cycle was the same for every camp week.

Table 1. Menu served during the data collection period.

Meal	Food Categories	Before Intervention Food Items	After Intervention Food Items
Breakfast			
	Entrée	Pancakes	French Toast
	Protein	Bacon	Bacon
	Fruit	Mandarin Oranges	Canned Mixed Fruit
Lunch			
	Entrée	Chicken Fajita Tacos (with lettuce, cheese, and tomatoes)	Hamburgers (with lettuce, cheese, and tomatoes)
	Vegetables	Steamed Carrots; Roasted Potatoes; Refried Beans*	Carrot and Celery Sticks; Sweet Potato Fries
	Fruit	Apples; Oranges	Apples; Oranges
Dinner			
	Entrée	Chicken Nuggets	Turkey
	Vegetables	Green Beans; Baked Tots	Broccoli Salad; Mashed Potatoes
	Grain	Roll	Roll
	Snack	Cookie	N/A
	Other Grain	N/A	Stuffing
	Fruit	Apples; Oranges	Apples; Oranges

* After week one, refried beans were swapped with steamed carrots due to unpopularity.

The waste collection area was located along a wall in the cafeteria. Five-gallon buckets were lined with trash bags and set up in two stations for the campers to access. Each food category had its own bucket. The collection station was set up before each meal and buckets were set out depending on the different food categories that were served.

At the beginning of each meal, the food categories and their corresponding menu items were written on the cafeteria blackboard for campers to reference. Food production data were collected before meal service. At the end of each meal, a camp staff member gave an announcement which started the production waste collection. The staff member explained how the food items should be disposed of. Food that was left in the serving bowls on the table were

brought up to the waste collection area by a teen counselor. The counselor would then discard the leftover food into the assigned buckets and return to his/her table with the serving bowl.

Once all of the tables discarded their production waste, a camp staff member would make an announcement for the campers to begin separating their consumer waste. The data collection crew switched the production waste buckets with consumer waste buckets. Campers scraped off their leftover food from their plates into the serving bowls that the food items came from. The same teen counselor from each table brought the serving bowls back up to the collection area and discarded them into the appropriate buckets. After all of the waste was collected, the data crew started weighing the bags of waste, keeping the production and consumer waste separate. A research team member would then ask the kitchen staff for the amount of leftover food that was not served out of the kitchen. This leftover food data would then be added to the production waste category. All waste items were weighed in kilograms and then converted to pounds. Food waste generated by volunteers and staff were kept separate from the food waste generated by the campers.

Awareness Program

The educational activities for the awareness program were adapted from existing lesson plans found on the internet and developed with the help of the summer camp staff. These activities were not research based, due to the lack of evidence-based food waste curriculums for youth. The “Whole Earth Calculator” was adapted from the nonprofit organization, Rock and Wrap It Up! and the “Leftover Challenge” and “Food Waste Surveys” were adapted from the USDA. “Text Talks” and “Weigh the Waste” were developed by the summer camp staff and research team. These activities were structured according to the Experiential Learning Model

(ELM) (Gleason, 2013). Before the beginning of the camp season, the camp staff members went through a training session where they participated in the activities and learned how to facilitate them based off of the developed lesson plans.

The awareness program took place during the afternoon program segment on the third day of the camp week (refer to **Appendix A** for camp schedule). Children were divided according to their camp groups, which consisted of 15-20 children. To accommodate for the large number of children, the activities were split into seven groups with two rotations. This means that two groups of the “Whole Earth Calculator”, “Weigh the Waste”, and “Leftover Challenge” would happen simultaneously while “Text Talks” and “Food Waste Surveys” were grouped into one activity which could accommodate two groups. This ensured that each group could take part in the same activities without overwhelming the staff members who led the activities. Each activity lasted around 8-12 minutes, depending on the camp schedule of the specific week.

The unique aspect of these activities is that the weight measurements of the consumer waste corresponded to each of the different group of campers. This meant that the weights for the different food categories changed each week depending on how much food the campers of that week wasted. After the first 24-hour cycle data collection, all of the weights used in certain activities were written onto poster boards or whiteboards and hung in the respective rooms that the activities would take place in. In order for the campers to fully understand the abstract weight measurements, comparisons were made between the weight of the wasted food to objects that they could relate to, such as the weights of gallons of milk and smartphones.

In addition to the activities, the campers were given a “challenge” to reduce waste. The amount of food they wasted in the first 24-hour cycle was displayed on a poster board in the

cafeteria along with a message asking if they could halve the amount of food that they wasted for the rest of the week. There was no incentive for this challenge.

Stakeholder Interviews

The research team conducted stakeholder interviews to assess the barriers and benefits of the overall waste reduction program and its potential implementation into the 4-H curriculum. Brief, semi-structured interviews were conducted with the staff and volunteers at the Northern Virginia 4-H Educational Center. Interviewees were asked the same set of questions. Probing questions were asked based off the stakeholder's job position.

The interview was designed using the Outcomes for Implementation Research framework (Proctor et al., 2011). Implementation outcomes in this framework includes acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration, and sustainability. This framework was used to gauge the ability to implement and sustain an educational awareness program within a 4-H center setting (Appendix F). All participants provided implied consent by participating in the interviews.

Institutional Review Board

Approval for the stakeholder interviews was obtained from the Virginia Tech Institutional Review Board on December 6th, 2017 (**Appendix C**).

Data Analysis

The results from the food waste data collection were entered into and analyzed in Microsoft Excel. Paired t-tests were used to determine the significance ($p < 0.05$) among absolute

variables. The food waste data was normalized so that food items could be compared with one and other.

Qualitative interviews were transcribed and analyzed by hand for themes and subthemes (Braun & Clarke, 2006). An inductive thematic analysis approach was used to organize codes. Themes were developed by one coder based on occurrence. Major themes were identified as perceptions or thoughts that showed up most often.

3.3 Results

Food waste collection

The number of participating campers ranged from 150 to 300 per week. In total, 864 campers participated throughout the four weeks. Observations were conducted on the four pre-chosen camp weeks. The smallest week (Week 1) had 150 campers while the largest week (Week 3) had 300 campers.

Across all four weeks, a total of 518.0 pounds (lbs) of total waste (consumer and production wastes combined) was generated before and 448.5 lbs of waste was generated after the awareness program (Table 2). When consumer and production waste were separated out, total consumer waste before the intervention equaled to 76.5 lbs before the intervention and 57.3 lbs after the intervention. Production waste equaled to 441.6 lbs before and 391.2 lbs after the intervention. The biggest difference of consumer waste deduction was observed in Week 1; waste before the intervention equaled to 25.0 lbs and decreased to 13.0 lbs after the intervention. Consumer waste decreased in all weeks except for Week 2, where waste actually increased from 13.06 lbs pre-intervention to 13.10 lbs post-intervention.

Table 2. Waste by week, before and after the program intervention.

Week	Before Program Consumer Waste (lb)	After Program Consumer Waste (lb)	Before Program Production Waste (lb)	After Program Production Waste (lb)	Total Before Program Waste (lb)	Total After Program Waste (lb)
<i>Week 1 (n=150)</i>	25.0	13.6	149.3	123.3	174.3	136.9
<i>Week 2 (n=218)</i>	13.0	13.0	90.3	99.9	103.3	113.0
<i>Week 3 (n=300)</i>	20.7	15.4	126.0	91.5	146.7	106.9
<i>Week 4 (n=196)</i>	17.6	15.1	75.9	76.4	93.6	91.5
<i>Total waste (lb)</i>	76.5	57.3	441.5	390.6	518	448.5

The level of production waste decreased consistently throughout the data collection period. The total production waste for Week 1 was 123.3 lbs and decreased to 76.5 lbs by Week 4. Similar trends were observed in total waste. Week 2 and 4 resulted in a higher amount of production waste post-intervention; waste increased from 90.32 lbs to 99.91 lbs and from 75.9 lbs to 76.4 lbs, respectively. The largest decrease for production waste was during Week 3; waste decreased from 126.0 lbs to 91.5 lbs, post-intervention. After the intervention, total waste decreased from 136.9 lbs in Week 1 to 91.6 lbs in Week 4. Despite downward trends and declines, the reduction of all types of waste, combined and separated, was statistically insignificant ($p>0.05$) (Table 3).

Table 3. T-tests determined significance of waste amounts, before and after the program intervention.

	p-value consumer waste	p-value production waste	p-value total waste
<i>Week 1</i>	0.32	0.74	0.57
<i>Week 2</i>	0.99	0.89	0.86
<i>Week 3</i>	0.45	0.69	0.58
<i>Week 4</i>	0.15	0.99	0.94
<i>All weeks</i>	0.11	0.64	0.22

The average percent of wasted food was determined by adding both the production and consumer waste together, and then dividing it by the total amount of food produced that specific week. Over the course of the data collection period, 3,182 lbs of food were produced and of that amount, 966.6 lbs (30.4%) were wasted. The percentage of total food wasted also fluctuated by week. Week 1 had the lowest percentage of waste (28.8%) while Week 4 had the highest (32.3%) (Table 4). Although insignificant ($p > 0.05$), week one showed the largest decrease for total waste (36.1% before to 22.9% after intervention). Total waste for Weeks 2 and 4 increased after the intervention. For Week 2, waste increased from 29.6% to 32.2%, while waste for Week 4 increased from 31.2% to 33.3%, respectively.

Table 4. Percentage of food wasted per week.

<i>Week</i>	% Food Wasted Before program	% Food Wasted After program	% Total Food Wasted
<i>1</i>	36.1	22.9	28.8
<i>2</i>	29.6	32.2	30.9
<i>3</i>	34.0	28.7	30.7
<i>4</i>	31.2	33.3	32.2

Since the number of participating campers varied each week, it was important to calculate the average amount of waste each camper produced (Table 5). This was determined by taking the production, consumer, and total waste of each week and dividing it by the number of campers that participated in each specific week. Consumer waste per child was low; the average consumer waste per child equaled to 0.097 lbs pre- and 0.070 lbs post-intervention. However, the average production waste per child equaled to 0.54 pounds before and 0.56 lbs after the intervention. To discern the total amount of food wasted per child at the camp, production and consumer waste were combined. This resulted in an average total waste of 0.65 lbs per child before the intervention, to 0.56 lbs per child after the intervention. Total waste reduction was observed for all weeks except for Week 2, where total waste per child increased from 0.47 lbs to 0.52 lbs.

Table 5. Average food wasted per child.

	Before Program Consumer Waste per child (lb)	After Program Consumer Waste per child (lb)	Before Program Production Waste per child (lb)	After Program Production Waste per child (lb)	Total Before Program Waste per child (lb)	Total After Program Waste per child (lb)
<i>Week 1 (n=150)</i>	0.167	0.091	0.995	0.822	1.162	0.913
<i>Week 2 (n=218)</i>	0.060	0.060	0.414	0.458	0.474	0.518
<i>Week 3 (n=300)</i>	0.069	0.051	0.420	0.305	0.489	0.357
<i>Week 4 (n=196)</i>	0.090	0.077	0.388	0.390	0.478	0.467
<i>Average Waste</i>	0.097	0.070	0.554	0.494	0.651	0.564

Comparing Waste by Meal

Each meal served foods that all weighed differently. When observing total waste amounts for specific meals, breakfast produced the lowest amount (19.9 lbs) of waste while dinner generated the highest amount (474.2 lbs). To compare waste from each meal, the average percent of food wasted was determined by categorizing waste by meals, and then dividing the amount wasted by the amount produced. Consumer waste across all three meals decreased after the intervention (Table 6). Production waste after the intervention decreased for breakfast and dinner, but lunch waste increased. Before the intervention, breakfast resulted in the least amount of food waste, 24.0% of total breakfast items were wasted (Table 4). While lunch resulted in the highest amount of waste (42.1%). After the intervention, lunch resulted in the least amount of food waste (20.4%) while dinner resulted in the most (35.4%).

Table 6. Waste percentages by meal, before and after the program intervention.

<i>Meal</i>	% before program consumer waste	% after program consumer waste	% before program production waste	% after program production waste	% Total waste, before intervention	% Total waste, after intervention
<i>Breakfast</i>	4.0%	2.7%	20.0%	20.8%	24.0%	23.1%
<i>Lunch</i>	4.7%	4.3%	37.5%	14.7%	42.1%	20.4%
<i>Dinner</i>	5.5%	3.5%	23.2%	31.9%	28.7%	35.4%

Comparing Waste by Food Category

When observing waste amounts for specific food categories, all categories showed a reduction of waste amount except for entrée (Table 7). Entrée waste increased post-intervention; 19.1% pre- to 20.4% post-intervention. Snack generated the least amount of waste (9.3%). Categories that resulted in large percentages of waste include vegetable, fruits, and other grains. The grain category showed the largest percent decrease of waste after the intervention (22.1% to

11.1%, after the intervention). The entrée, vegetable, and fruits categories showed a negligible amount of change (less than 2% decrease, before and after the intervention). Vegetable production waste resulted in the largest significant reduction of waste; 290.4 lbs before intervention to 144.1 lbs intervention (p=0.001).

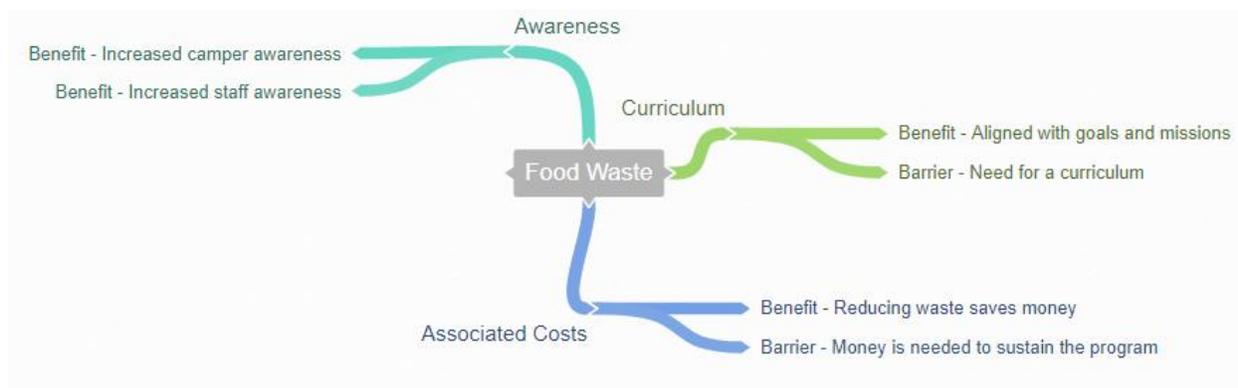
Table 7. Waste percentages by food category.

<i>Food Category</i>	% before program total waste	% after program total waste
<i>Entrée</i>	19.1%	20.4%
<i>Vegetable</i>	41.4%	38.6%
<i>Protein</i>	11.4%	7.3%
<i>Grain</i>	22.1%	11.1%
<i>Other Grain</i>	N/A	42.5%
<i>Snack</i>	9.3%	N/A
<i>Fruit</i>	41.0%	42.6%

Stakeholder Interviews

Six stakeholder interviews were conducted. Participants included two Extension Agents, one camp program director, one junior camp coordinator, and two camp staff members. All of the participants were working at or were affiliated with the Northern Virginia 4-H Educational Center during the data collection period. Major overarching themes included need for a food waste reduction educational curriculum, costs associated with food waste, and increased awareness of food waste.

Figure 1. Themes and subthemes that were generated from the interviews.



Food Waste Education Curriculum

The need for a food waste reduction program at the 4-H center was commented on by all stakeholders. The two subthemes that were mentioned was the need for an educational food waste curriculum to continue the existing program and the program’s alignment with the goals and missions of 4-H.

Need for a food waste curriculum –

Stakeholders mentioned that if the educational portion of the program were to be continued and adopted by other 4-H centers and programs, a curriculum must be created. One camp staff member said, “I think the biggest thing would be just designing a curriculum and educating the staff to ensure that they’re complying with all the tasks of the program that [you] would like to implement.”

Goals and missions of 4-H –

Stakeholders said that the purpose of the awareness program aligned with the goals and missions of the 4-H program. One Extension Agent said “One of the 4-H missions is to teach

kids to be good stewards to the environment and to have healthy living habits. I think this program aligned pretty well with those goals.”

Costs Associated with Food Waste

The topic of resources to sustain the program was brought up by every stakeholder. Stakeholders mentioned that money would be saved because of reduced food waste and money would be needed to sustain the education program.

Reducing food waste saves money –

Stakeholders acknowledged that reducing food waste could allow the 4-H center to spend less money on food. One Extension Agent said, “The 4-H center needs to find opportunities to cut cost. This [waste reduction program] is a good opportunity to reduce unnecessary costs at the 4-H center. In general, the kids should be eating balanced meals and the center should find foods that the kids want to eat. Serving foods that result in a lot of food waste seems like it is wasting the center a lot of money.”

Money needed to sustain the education program –

Stakeholders mentioned that money is needed to sustain the program at the center. A camp staff member said that, “programs are usually offered because of some sort of grant. Last summer, the focus was on STEM because there was a grant. So the first thing that they [the program coordinators] need is time. So as long as there isn’t a grant blocking off the time, that’ll be important.” Even if time was allotted for the program, another staff member mentioned that,

“[monetary] costs for educating the staff to ensure that they can fully comply with the program [will be necessary].”

Awareness of Food Waste

Stakeholders all agreed that the food waste reduction program increased the awareness of food waste among the campers and staff members. Therefore, this theme was split into two subthemes, staff awareness of waste and campers’ awareness of waste.

Staff awareness of waste –

One camp staff member said the food waste reduction program, “helped everyone be more aware of it [food waste] and how much food everyone wasted. Specifically, the people who were producing it – so the kitchen [staff].”

Camper awareness of waste –

All stakeholders agreed that the program brought food waste awareness to the campers. Although the stakeholders said that they could not measure how much information the campers actually retained, it allowed them the opportunity to reflect on food waste and challenged them to think more critically about where their food waste goes. One staff member said, “The fact that the kids went up there [the food waste collection stations] and dumped it into the containers [collection buckets] they could very clearly see which foods were being wasted, it was still very obvious to the kids where the food was being wasted. ... I don’t know if they necessarily reflected, but it gave them the opportunity to reflect, like [hypothetically speaking] “oh I didn’t

eat very much of my spaghetti” or “I didn’t eat very much of my mashed potatoes.” Those kinds of things.”

5.1 Discussion

Comparison of the results to other food waste studies

This study was unique from other food waste studies as the researchers could differentiate between consumer and production waste. Previous food waste studies conducted among the same age group occurred in school settings where foods were pre-portioned for each student (Byker, Farris, Marcenelle, Davis, & Serrano, 2014; Niaki, Moore, Chen, & Cullen 2017; Smith & Cunningham-Sabo, 2013). At this camp, children were able to serve themselves due to the family-style serving model thus leading to the extremely low amount of consumer waste (0.097 lbs before and 0.070 lbs after the program, per child). This shows that the children are able to accurately gauge how much they intended to consume. However, production waste was high (0.554 lbs before and 0.564 lbs after the program per child), meaning that the kitchen produced an excess amount of food. When consumer and production waste were totaled together and then averaged per camper (0.651 lbs before and 0.564 lbs after the program per child), results were comparable to school food waste studies conducted on children of the same ages (Niaki, Moore, Chen, & Cullen 2017; Smith & Cunningham-Sabo, 2013). Niaki et al. (2017) found that children in grades 4-5 wasted an average of 18.2% of total food served while children in grades 2-3 wasted an average of 25.2%. The schools that were included in this study served limited-income populations and 50% of the students were eligible for free and reduced lunches. In school settings, meals were pre-portioned while at this camp setting, children dined family-style. In this study, 30.4% of the total food prepared was ultimately wasted. So, overall, the amount of total food wasted was higher than school-level studies, based on production waste. The results highlight the challenge in balancing self-regulation and self-serving with food waste.

Production waste, in relation to the number of portions served per week, consistently decreased throughout the data collection period, responding to both the popularity of food and waste they observed as time passed. Kitchen staff reported replacing some menu items; refried beans were replaced with steamed carrots after the first week; and all serving sizes were decreased. For ethical and programmatic reasons, these changes were not restricted for research purposes.

Menu planning and food pairing might also be a contributor to food waste. For example, the dinner after the intervention resulted in a higher amount of production waste than dinner before the intervention. This could be associated with the pairing of food items. The foods served in the post-intervention dinner appeared to be more energy dense and heavy in starches (mashed potatoes, rolls, and stuffing). Therefore, higher food waste could be attributed to the campers reaching satiety sooner.

Food waste differences by meals were observed. Breakfast generated the lowest amount of waste, but the least amount of food (by weight) was prepared for breakfast. This could be due to the offering of energy dense foods, such as bacon and pancakes, although beyond this scope of this study. The camp schedule can also be associated with food waste. Dinner resulted in the most amount of waste. Activities leading up to dinner include a snack time in the middle of the afternoon, pool and recreation time, and a one-hour break before dinner. Snacks such as hot dogs and slushies were available for purchase at pool and recreation time and many campers had the opportunity to snack on food brought from home during the one-hour break. Other activities, on the other hand, throughout the day did not allow campers time to snack. Before lunch, campers attended classes such as canoeing and rock climbing. These classes required the campers to be more active, and thus might have led to higher food consumption.

The identified challenges of implementing a food waste reduction curriculum include costs and time needed to sustain the program and need for a structured food waste curriculum. Benefits of conducting a food waste reduction curriculum include increased staff and camper awareness of food waste and ultimate reduction of food related costs. This was the first study to explore stakeholder attitudes of implementing a food waste curriculum in an educational setting. Only one previous study used a qualitative approach to assess stakeholder perspectives of food waste behaviors and reduction initiatives among youth (Blondin et al., 2014).

Impact and Effectiveness of 4-H Programs (Implications)

Participation in 4-H leads to the development of the 5 C's (caring, competence, confidence, connected, and character), which results in contribution and reduced risk behavior (Lerner & Lerner, 2013). These results are measurable and positively impact society. Although the program was brief, it still had the potential to positively affect the campers. As mentioned through the stakeholder interviews, participants believed that this program allowed campers to become aware of food waste issues. Although this study could not follow campers after they left camp, the lessons that they learned could have carried into their school and home environments.

The benefits of using the ELM as a backbone for activities and lessons hold higher potential for learner retention. An estimated 70-90% of all lesson material is retained through using hands-on methods (Anderson, 2017). Throughout the data collection period and the brief awareness program, campers could have retained more information in this type of learning environment than in a traditional classroom setting.

All of the stakeholders acknowledged that the educational awareness program complied with the goals and missions of the 4-H organization. Specifically, this program fit comfortably

within the missions of the healthy living and agriculture sectors (National 4-H Council, 2016). Interviewed stakeholders were all connected to the 4-H program and viewed the program as an asset to increasing campers' awareness of food waste.

Limitations

Limitations include differences in menu items throughout the camp week and lack of randomization and resulting sample size (864 campers divided over $n = 4$ camp weeks). As noted, differing menu may have affected food waste amounts. For example, post-intervention dinner – which consisted of turkey, rolls, stuffing, mashed potatoes, etc., resulted in the highest proportion of food wasted across all meals served. This could be due to campers' food preferences or the pairing of food items.

Due to the exploratory nature of this study, the research team aimed to observe the natural food waste behaviors of the campers. Therefore, the research team limited its interference with camp policy. However, this led to the lack of randomization, as campers were allowed to sit anywhere they wanted to in the cafeteria. Therefore, the research team was not able to randomize and track individual campers' progress throughout the intervention period.

Limitations for the stakeholder interviews include the lack of kitchen staff and campers as interview participants. Considering the perspectives of the kitchen staff could provide insight on food production practices within the kitchen and meal service management within the cafeteria. Kitchen staff members were not recruited due to high turnover rate. Campers could have provided details into the success of the awareness program as they could have mentioned methods of implementing lessons learned within their home and school environments.

Future Directions

This was the first exploratory food waste study conducted at a youth summer camp. Results from this study, although insignificant, showed that waste reduction is possible. Further research is warranted to examine food waste and tease out various factors that could not be controlled for in this setting. The results could then be applied to broader contexts and other settings. For example, 4-H centers across Virginia or the U.S. could be compared with one another.

This study can be replicated in a more controlled summer camp setting where randomization is possible. At this specific camp, campers were divided into “packs,” which consisted of 10-15 children each. In a more controlled setting, the campers could sit in their respective packs during mealtimes, which would allow the research team to track the food waste of each pack. This would result in a larger sample size.

The amount of food waste in this study could also be attributed to the availability of outside food. A future study could look at food waste of meals if outside foods were forbidden. Controlling for this factor would give a more thorough picture of the extent of food waste in a summer camp environment.

Future studies could also look at the impacts of camp scheduling on food waste. At this specific camp, activities before lunch included outdoor classes such as canoeing and rock climbing. However, activities leading up to dinner included a snack break, pool and rec time (where campers could purchase snacks at the pool), and a one-hour break in their dorms (where campers had the opportunity to snack on foods brought from home). Including more physical activity in the afternoon could reduce food waste at dinner.

In addition, the education awareness program can be implemented and expanded to local 4-H clubs and schools. The use of a structured food waste reduction curriculum can allow

educators in these settings to use a more interactive approach for food waste education. Since 188,563 children participated in some sort of 4-H programming in 2017 (Virginia Cooperative Extension, 2017), the implementation of this program carries the potential of reaching large numbers of youth. In addition, the inclusion of this program in schools carries a much larger potential.

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Chapter 4

4.1 Conclusion

This was the first study conducted on food waste in residential summer youth camp setting that showed food waste reduction is possible among youth using an educational curriculum to raise awareness about this issue. Although results were not statistically significant, the total amount of food waste decreased after the program intervention. The perceptions of stakeholders from semi-structured interviews were positive as all stakeholders agreed that the awareness program was beneficial to the campers. Stakeholders also mentioned concerns about monetary costs needed to sustain the program. Many factors affected the lack of statistical significance related to the food waste reduction program. Future initiatives can be implemented to further assess the potential of educational programs to raise awareness and influence production and consumer behaviors to reduce food waste in this setting. Further research is warranted to minimize food waste in broader contexts and in other camp settings.

Appendix A. Camp Schedule

	Day 1 Sunday (campers arrive in afternoon)	Day 2 Monday (full)	Day 3 Tuesday (full)	Day 4 Wednesday (full)	Day 5 Thursday (campers leave after lunch)
Food Waste Activity	Data collection - Dinner (5:15-7pm)	Data collection - Breakfast and Lunch (7:15-9am) (11:30am-1pm)	Intervention with campers (12:30-1:30pm)	Data collection - Breakfast, Lunch, and Dinner (7:15-9am) (11:30am- 1pm) (5:15- 7pm)	Wrap up

Appendix B. Data Collection Form

Day & Date: _____
 Meal: _____
 Name: _____

Type of Waste _____

**NOVA 4-H Camp
 Food Waste Log**

Item	Individual Weight (kg) (Packaged Items)	Weight #1 (kg) - Before Meal	Weight #2 (kg) - Before Meal	Weight #3 (kg) - Before Meal	Average (kg) - Before Meal	Weight #1 (kg) - After Meal	Weight #2 (kg) - After meal	Weight #3 (kg) - After meal
Main Entrée (1)								
Main Entrée (2)								
Main Entrée (3)								
Vegetable (1)								
Vegetable (2)								
Mixed Item								
Fruit (1)								
Fruit (2)								
Fruit Juice or Lemonade								
Milk – unflavored								
Milk – flavored								
Other								
Other								

Appendix C. Institutional Review Board Approval



Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120, Virginia Tech
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-4606 Fax 540/231-0959
email irb@vt.edu
website <http://www.irb.vt.edu>

MEMORANDUM

DATE: December 6, 2017
TO: Elena L Serrano, Susan Chen
FROM: Virginia Tech Institutional Review Board (FWA00000572, expires January 29, 2021)
PROTOCOL TITLE: Exploring Food Waste at a Residential Youth Summer Camp
IRB NUMBER: 17-994

Effective December 6, 2017, the Virginia Tech Institution Review Board (IRB) approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at: <http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As: **Expedited, under 45 CFR 46.110 category(ies) 5,6,7**
Protocol Approval Date: **December 6, 2017**
Protocol Expiration Date: **December 5, 2018**
Continuing Review Due Date*: **November 21, 2018**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Appendix D. Lesson Plans

Weigh the Waste

Objective

This activity will help children visualize how much food is wasted by utilizing the pre-intervention data.

Materials

Cans of food

Scales

Plastic bins

Procedure

1. Brief introduction. Ask questions like:
“How many pounds of vegetables were wasted yesterday?”
“How about fruits or entrée?”
Facilitator will be provided with a sheet that has pre-intervention data.
2. Divide into groups of 5-6 children and assign each group a food category (veg, entrée, fruit, etc.).
3. Allow each group to construct something that equals the weight of the category they were assigned with. Tell the groups to fill the bins with the amount of rocks that they think will weigh as the weight they were given. This way, not everyone will be at the scales and filling their bins.
4. Group presentations.
5. Facilitator asks discussion questions.
“Did the amount of waste surprise you?”
“Which food category surprised you the most?”

Conclusion

Now that the children have gotten the chance to see how much food was wasted, ask if they are surprised to see if one food group was wasted more than the others.

Itinerary

Minute 1 – introduction

Minute 2-8 – construction time

Minute 8-10 – presentation

Minute 10-12 – discussion (if time allows)

Leftover Challenge

Objective

This activity will allow children to create dishes out of leftovers from the pre-intervention data collection.

Materials

Worksheets

Writing utensils

Procedure

1. Brief introduction of the activity. Ask questions like:
“Which types of food do you think was wasted the most yesterday?” Explain the rules of the activity.
2. Divide children into groups of 5-6. Hand out worksheets. Each worksheet will have different food items with space to extra ingredients if needed.
3. Allow the groups to make a meal that they would like to consume with the leftovers.
4. Groups will present their meals.
5. Discussion and application. Facilitator can ask “Is this a meal that they would be able to create at home?”

Conclusion

Children will creatively think about methods to reuse foods that are leftover instead of simply discarding them.

Itinerary

Minute 1 – introduction

Minute 2 – 6 plan meals

Minute 6- 10 presentation

Minute 10 – 12 applications and discussion

Whole Earth Calculator

Objective

Children will be able to calculate how many meals can be prepared out of the food that was wasted in the pre-intervention data collection.

Materials

Calculators

Worksheets

Writing Utensils

Procedures

1. Break children up into pairs – try to pair younger children with older children. Each worksheet will have different numbers and information. Each pair will receive a worksheet.
2. Pairs will solve math equations on their own sheet of paper regarding how many meals could have been prepared using wasted food.
3. Pairs will swap worksheets.
4. Discussion time. Facilitator can ask questions such as “How surprised are you at the number of meals that could have been prepared?” “How did you feel about the amount of food can be wasted in a year?”

Conclusion

Children will be able to think about how much wasted food can impact others and the environment, not just themselves or their families.

Itinerary

Minute 1 – 7 – math activity

Minute 7-10 – discussion

Text Talks

Objective

This activity allows children to share their thoughts on food waste by answering questions that are written on white boards.

Materials

White boards or poster paper
Markers

Procedures

1. Children will walk around the room and write answers to each question that are written on the white boards.
2. Discussion at the end.

Sample Questions

What do you think about the amount of food that is wasted?

Why do you think people waste so much food?

How can you waste less food at home?

How can you decrease food waste at school or at camp?

How can you rename certain foods so that children will eat more of that food?

- For example, carrots can be renamed “x-ray vision carrots” to make it more appealing to children.

How are some ways that you can use your leftovers?

How can food waste impact the environment?

Itinerary

Minute 1-8 – allow children to answer questions.

Minute 8-10 – discussion and application.

Food Waste Surveys

Procedures

Children will learn fun facts about food waste and fill out a survey on items that they wasted during the pre-intervention data collection.

Materials

Survey worksheets

Writing utensils

Procedure

1. Brief introduction about food waste. Inform the students on how much food is wasted in the US and give visual representations of how much food is wasted. Include some fun facts.
2. Hand out surveys.
3. Discussion if time allows.

Itinerary

Minute 1-3 – Introduction, fun facts about food waste.

Minute 3-8 – Complete surveys

Minute 8-10 – discussion

Appendix E. Interview Guide

Exploring Food Waste at a Residential Youth Summer Camp Interview Guide

Welcome

Thank you for taking part in this study. Today I am going to ask you some questions about the 2016 Summer Food Waste Reduction Program at the Northern Virginia 4-H Center, and how the staff at the site can engage in responsible food-waste management practices in the future.

Before we get started, I would like to go over the consent form that I emailed you. The purpose of conducting stakeholder interviews is to identify the perceived/reported benefits, barriers/obstacles, and the potential for developing, implementing and sustaining a food waste-reduction program within the Northern Virginia 4-H Center and other 4-H Centers around Virginia. This study will include various stakeholders, such as extension agents, kitchen managers, etc., who work with or are involved with the Northern Virginia 4-H Center. The results of this study will be used for a masters thesis, published in a scientific journal, and presented at conferences.

This interview will take about 15-30 minutes and audio will be recorded. There are no risks or benefits in participating in this interview. You may choose to not answer any questions and may withdraw from this interview at any time. Your identity will be kept confidential and your identifying information will be stored in a secure location. Upon the completion of this project, your information will be destroyed. Your responses to this interview will not affect your employment status or performance evaluations.

Do you have any questions about this study?

Do you consent to participating in this interview?

(If participant says YES, continue with the interview. If NO, do not continue.)

Introduction

Can you give me a brief description of your job? What is your title and what are your job responsibilities?

Acceptability

Now we are going to move onto specific questions regarding the food waste reduction program.

How comfortable are you in addressing food waste at the 4-H center?

How would you describe the value of this project to someone who did not know anything about it?

What do you believe are the benefits of **conducting** a food waste study and reduction program?

(For those identified as EXT. AGENTS, CAMP STAFF) What do you believe are the benefits of **offering** a food waste reduction class for 4-H campers?

Adoption

How likely is it to continue to offer food waste classes for 4-H campers at the 4-H center? Please explain.

How likely is it for the 4-H center to continue to reduce food waste at the 4-H center?

Appropriateness

How useful is a food waste reduction program for the 4-H camp?

(For EXT. AGENTS, CAMP STAFF) How well did the food waste class fit with the 4-H camp mission and goals/objectives?

Feasibility

How practical is it for the 4-H center to address food waste reduction?

(For KITCHEN MANAGERS) How did your food production change overall? How did your food production change during the weeks that the study was not taking place?

Fidelity

What is needed to ensure that the food waste measurement for 4-H campers is conducted as designed?

(For EXT. AGENTS, CAMP STAFF) What is needed to ensure that the food waste class for 4-H campers is taught as designed?

What were some difficulties that the children encountered in the data collection portion of this project?

Implementation Costs

What are the implementation costs and other related resources needed to reduce food waste (e.g., staff, funding, and equipment)?

Penetration

Since the completion of conducting the food waste study, what do you see as challenges to further reducing food waste at this 4-H center? Other 4-H centers?

How can this project be implemented in other 4-H camps/centers? What recommendations/advice would you provide? How about specific recommendations/advice to those who have your position at other centers?

How could this program be improved? Expanded? Other?

Sustainability

What changes, if any, were made as a result of the program and study?

What would be required for food waste classes to be always included in the 4-H camp curriculum?

What systems would need to be in place to ensure food waste reduction was a priority? (e.g., monitoring, support from extension administration, and other support systems)

Closing Questions

What did you see as the biggest “take-home” message for the 4-H campers?

What did you see as the biggest benefit or challenge to offering this program at this 4-H camp?

Now that another 4-H camp year has passed, have you noticed if, or how, this study continued to impact staff at the center?

What would you like to see happen next in regard to food waste?

(For EXT. AGENTS, CAMP STAFF) How do you see the 4-H campers applying what they learned from the food waste awareness program at home? School?

(For EXT. AGENTS) Have you included food waste awareness programs into your local 4-H organization?

Thank you for your participation in this interview. Your answers are valuable and will guide us in understanding the benefits and challenges of this waste reduction program from your point of view.

Additionally, your responses provide insight for those who are interested in implementing a food waste awareness program into their camp.