

Trash Talk: Understanding Food Waste at a Charter Elementary School in Florida

by

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## **Abstract**

Waste as a topic for anthropological investigation has enjoyed a recent resurgence in interest, mirroring burgeoning discussion among policy-makers and the general public about questions of environmental impacts, economic costs, and social detriments of contemporary waste management paradigms. While waste management in the United States has largely focused on technical and organizational solutions typically considered the domain of environmental planning and engineering (such as source reduction, recycling, and reuse), anthropology and the social sciences have become more prominently involved in efforts to inform policy-makers and researchers about the social and behavioral factors influencing waste norms and habits, particularly in educational institutions and municipal governments.

The central questions to this research were as follows: (1) What are some of the perceptions and practices concerning food waste at an environmental charter elementary school in Florida? (2) What do self-reported data on food waste behaviors suggest about disposal habits and norms? (3) What is the extent to which food is discarded relative to other types of refuse? and (4) From the perspectives of school staff and students, what are some of the factors influencing food waste?

To answer these questions, I employed both "garbological" and ethnographic methods at an environmental charter school, Learning Gate Community School, over a period of nine months, including (1) participant observation, (2) garbological audits of the cafeteria waste stream, (3) key informant interviews with students and staff, and (4) log sheets sent home to a random sample of parents to gauge the fraction of leftovers taken home that are ultimately



discarded in order to gain a more holistic understanding of the waste stream of the school cafeteria.

The results of this project support the following conclusions: (1) students at Learning Gate tend to agree that food waste is a detriment, but these concerns are subordinate to factors such as the degree of hunger at lunchtime and the perceived palatability of certain food items and (2) lunch periods are an important block of unstructured time, which Learning Gate students use for a far broader variety of activities than merely nourishment.

## **Chapter One: Introduction**

Motivated by increasing awareness of global environmental impacts and concerns about shortages of renewable and non-renewable resources, the issue of food waste has gained prominence in the past decade (Stuart 2009). Recent findings by the US Department of Agriculture, the UK Waste Resources Action Programme (WRAP), and numerous non-governmental organizations have buttressed perceptions that the present global economic paradigm is unsustainable in part due to its profligacy in material consumption and energy use, of which agriculture and food production constitute a large part.

Food waste is not merely a challenge to existing sanitation infrastructures as the single largest component by weight and volume in most US landfills (US EPA 2012), but also constitutes an enormous cost in money, energy, arable land, and fresh water, as well as contributing significantly to global climate change and local environmental damage (UN FAO 2013). Food production in the United States is a very resource-intensive sector of the economy, using up to 80 percent of the fresh water consumed in the country, 50 percent of the land, and 10 percent of the total energy generated (Gunders 2012).

Meanwhile, recent estimates place the proportion of food wasted annually in the US as high as 40 percent (Bloom 2011:xi-xii), making food waste a particularly pernicious issue. The decomposition of uneaten food in landfills is estimated to contribute up to 16 percent of the total emissions of methane (US EPA 2012), a greenhouse 25 times more potent than carbon dioxide and thus a significant contributor to climate change. The UK Waste Resources Action Programme (WRAP) has estimated that if food waste were eliminated from UK landfills, the effect on greenhouse gas emissions would be nearly equal to the removal of one fifth of the UK

automobile fleet from the road (WRAP 2011). Curbing the wastage of food could achieve significant savings in emissions and environmental impact while saving billions of wasted dollars per year.

Furthermore, food waste is nothing short of unconscionable in light of the fact that nearly one in six Americans lives in a food-insecure household (Coleman-Jensen et al 2014). Globally, 4,600 kilocalories of food are produced per capita, but less than half that is typically available for consumption, the rest lost at all phases of the food supply chain, including (but not limited to) losses in the field due to pests and weather, spoilage in transport and storage, and disposal for any number of reasons once purchased by consumers (Lundqvist et al 2008). Meanwhile, nearly a billion people globally suffer from moderate to severe undernutrition and micronutrient deficiencies (UN FAO 2011).

In the century to come, this statistic is likely to become more sobering, as the UN projects a global human population of over nine billion by 2050, and concomitantly an increased demand for agricultural land on the order of 80 percent (UN FAO 2008). This has sparked numerous efforts to address the issue of food waste from the "top-down" by municipal governments like those of Taipei, San Francisco, and New York, which have begun to integrate food collection into its municipal waste management infrastructures by using separate bins for food waste alongside receptacles for recyclable and non-recyclable garbage. Motivated by rising costs for waste disposal and the premiums that can often be gained through "green" marketing, numerous industries have integrated food waste recycling into their production sites, most prominently anaerobic digesters to convert organic matter into fertilizer and biogas and streamlined manufacturing processes to reduce waste at the source.

But efforts to address the issue of waste are not confined to the technical and

organizational solutions favored by governments and the food industry; waste has gained considerable awareness among the general public, which has prompted the integration of waste as part of educational curricula in many school districts in the United States, with the aim of grounding future generations in environmental stewardship and sustainability (UC Davis 2009, USDA ERS 2014).

Despite rising prominence of waste in public and policy discussion, the political and ecological implications of waste has been relatively "invisible" to scholarly interest, apart from those directly engaged in technical or organizational disciplines such as urban planning, environmental sciences, or engineering. But in the past decade, efforts have begun in the social sciences to contribute towards increasing the visibility of waste as not only a problem to be solved, but also a means by which the values and habits of human beings can be better understood (Evans 2011a, Molander and Lenihan 2007, Thomas 2012).

### Research Setting

In December of 2010, a research team was formed at the University of South Florida to address these questions at a more local level in order to bring these questions into the sphere of education and public awareness. This research team, called "Pathways for Organic Waste Reduction, Reuse, and Recycling (POW3R)" chose Learning Gate Community School --- an elementary charter school in Lutz, FL with approximately 550 students --- as research site, primarily because it was a charter school, and therefore more at liberty to integrate the projects conducted by POW3R into the science curriculum.

During this project, the school had approximately 550 students and 52 full-time teachers, making it comparable in size to the average of 618 students in a "typical" public combination school (i.e. kindergarten through middle school grades) in Florida (publicschools12.com). Of

these 550, 48.1 percent were male and the other 51.9 percent were female. Furthermore, participation in the National School Lunch Program (which is based on the percentage difference between household income and the Federal Poverty Line, adjusted for household size) stands at 8.1 percent eligibility for free or reduced lunch.

Learning Gate is one among many charter schools in the Tampa Bay region, but it stands out primarily because its curriculum is explicitly centered on environmental education through hands-on activities: chickens are raised on-site and the school has a sizable garden plot, through both of which students learn about ecology and environmental sciences hands-on. Compostable cafeteria waste is collected by student monitors and added to the school's compost piles, the products of which are used as soil amendments for the school garden. The school sponsors numerous field trips to local state and national parks and educational sites (such as Nature's Classroom in Thonotosassa), where students learn about native Florida ecology and environmental stewardship.

Furthermore, as of this writing, Learning Gate is the only Leadership in Environmental and Energy Design (LEED) Platinum certified primary school in the United States. It is also notable because its administrators have implemented a zero-waste policy for the school's cafeteria, which significantly reduces the degree to which it relies on municipal garbage services. Students who bring their own lunches to school are required by this policy to bring home any leftovers, and students who purchase lunches from the cafeteria must dispose of the leftovers in separated bins for compost and non-compostable wastes. As far as the author knows, this is the only school in Hillsborough County with such a cafeteria waste policy.

## Research Questions

This research sought to contribute to these understandings by addressing questions relating to food waste in an educational setting, specifically:

1. What views and practices concerning food waste are evident at Learning Gate, particularly in light of its zero-waste policy?
2. Are self-reports of waste behaviors reliable sources of data from which conclusions about the waste disposal habits and norms of a given population can be drawn?
3. What, from the perspectives of Learning Gate students, is the extent to which food is discarded, particularly relative to other types of refuse?
4. What is the composition and volume of waste produced by the cafeteria at Learning Gate, particularly the component of food waste unsuitable for composting or feeding to livestock? Furthermore, can these these data be effectively measured and used in applied contexts to inform and guide interdisciplinary research teams to address issues of food waste?

To answer these questions, I employed both "garbological" and ethnographic methods, including (1) participant observation, (2) garbological audits of the Learning Gate cafeteria waste stream, (3) semi-structured interviews with Learning Gate students, and (4) log sheets sent home to a random sample of Learning Gate parents to gauge the fraction of leftovers taken home that are ultimately discarded in order to gain a more holistic understanding of the waste stream of the Learning Gate cafeteria.

## Theoretical Foundations

Mirroring its status as the ubiquitous shadow of human activity, research on waste blurs

the lines between disciplines such as sociology, anthropology, and geography. Anthropological engagements with waste tend to center around its materiality, whether as primary data in archaeology, as a means of triangulating self-reported behaviors in contemporary garbageology, or in terms of its situatedness in rituals and norms. Sociology and geography, on the other hand, frequently examine waste as primarily linked to consumption and its role in the formation and maintenance of relationships and identity, frequently drawing on practice theory, in particular the Frankfurt School. This approach is described below and its relevance to anthropological approaches is discussed.

Practice theory is a term used to cover a broad range of perspectives on how individuals as social beings influence and are influenced by the worlds in which they live, with social structure and human agency in dynamic relationship with one another (Ortner 2006:4-18). It has been applied to social science discourse around waste (Warde 2005, Evans 2011a), taking food consumption to be a symbolic and material indicator of social status and identity. The origins of this perspective of waste lie ultimately in theories of "conspicuous consumption" advanced by Thorstein Veblen (1899) during the 19<sup>th</sup> Century. It enjoyed a resurgence in the 1950s with the Frankfurt School's observations of mass consumption conditioned by mass production. The focus of the Frankfurt School on mass consumption is a perspective employed by many scholars who currently study the roles of consumption in everyday life, situating waste as a product of the consumption of material goods, the choice of and extent to which these items are discarded being indicative of the "habitus" of the consumer.

Relevant to this discussion are the rejection of traditional food preservation and waste prevention habits common among Depression-era and wartime households in the United States and UK (Burr et al 2003, Cooper 2008) in light of the post-war economic expansion. According

to Burr (2003) and Cooper (2008), the history of the last century of consumption in the United States can be divided into three phases: Depression-era, World War II, and post-war economic expansion. Prior to and during the Great Depression, households typically resorted to a whole host of means of food

preservation and waste prevention: canning, pickling, feeding scraps to pets, selling inedible waste fats to rendering plants and rags to rag-pickers, and careful management of household food stocks through the use of recipes which sought to maximize palatability and nutritive value from leftover scraps of ingredients. Cookbooks and periodicals abounded during that period, extolling the virtues of thrift and scrupulous household management (Hawkins 2006:17-36).

Not only did households practice waste prevention methods extensively, industries and municipalities did as well. The household was both generator and end-user to an interlinked network of industries creating useful products from waste: food scraps were fed to livestock, waste fats were rendered into lubricants and fuel oil, rags were processed into paper, among other countless examples of waste being re-purposed (Strasser 2009:56-71) . Households practiced source reduction as a matter of thrift, but businesses and governments saw waste as both a problem to be solved and an opportunity to profit (Lucas 2002:12-13).

When the United States entered the Second World War in 1941, the existing network of households, rendering plants, recycling facilities, scrapyards, and factories was quickly redirected towards creating equipment and consumables for the war effort. “Victory gardens” sprung up nationwide, to the point where a significant percentage of the nation's produce for domestic consumption came from household and shared plots. “Scrap drives” converted scrap metal into airplanes and warships. Posters encouraged citizens to reduce waste, not only as a matter of personal and household thrift, but also on moral and patriotic grounds. (Hunter and



Yates 2011:3-36)

If there ever was a “golden age” in the United States for recycling, it ended a few years after the close of the Second World War, as the hegemonic expansion of the United States’ influence in Europe and East Asia contributed to a historically unprecedented economic expansion (Barbalace 2003). Soldiers coming back from the war entered university training in unprecedented numbers, thanks to the Montgomery GI Bill, and the economy of the United States again re-purposed itself, but this time to accommodate a burgeoning middle class. Disposability became a marker for class status, since disposable goods incurred lower costs in both time and effort for increasingly busy (and increasingly two-income) householders (Jansson 1995, Lucas 2002).

Anthropologists concerned with waste and consumption, however, have largely rejected the Frankfurt School's perspectives and practice theory in general, owing to their lack of grounding in empirical research. Instead, the anthropology of consumption has in recent years been strongly influenced by material culture approaches, and particularly domestic consumption (Thomas 2012:13), the earliest prominent example of which is Mary Douglas's work with economist Baron Isherwood in examining what we call "consumption" in terms of its situatedness in ritual and social norms (Douglas and Isherwood 1980). By “situatedness”, Douglas and Isherwood meant the ways in which material goods serve as “props” in a range of rituals and practices (Douglas and Isherwood 1980).

Another related perspective is that of Daniel Miller, whose work among London households emphasizes that the procurement of goods is a means of constructing and maintaining social relationships. Several interesting points are brought up in Miller's work, including his connection between the ideas of shopping as sacrifice and its link to sacrificial

economies (Miller 2009:12-15). In other words, spending lavishly on others is a form of sacrifice, since it incurs very real costs in terms of both money and time (including the time spent working for wages to afford such gifts). But this is at odds with Miller's ethnographic investigations of London householders, who emphasize thrift over profligacy; the resolution of this contradiction will be further discussed in the review of literature found in Chapter Two.

Interestingly, a handful of social science researchers are directing their attentions to the reversal of this trend, particularly among “freegans” to whom the cunning procurement of still-edible food waste is a marker of social status (Edwards 2005, Gross 2009, More 2011), or individuals and households who supplement their income through the repair and repurposing of discarded items (Reno 2009, Gregson et al 2010a). But by and far the most prominent material culture analysis of contemporary waste in the United States is that of William Rathje and the Tucson Garbage Project, a multi-sited study spanning more than two decades which combined ethnographic and archaeological methods to pursue questions of consumption directly through the lens of waste, advancing the point of view of waste as a means of empirically cross-referencing self-reports of waste behavior from informants (Rathje and Wilk 1988:617-639, Rathje and Murphy 1992:30-52, Shanks et al 2004).

Despite little emphasis on theory, Rathje's work buttressed anthropological perspectives of waste as material situated in systems of value and socio-economic status by providing extensive empirical data from households and landfills, both in the Tucson Garbage Project and in numerous sites around the United States (Rathje and Murphy 1992). This thesis emphasizes uncovering the intersections between material refuse and cultural practices in the unique setting of a primary school one with a standing zero-waste policy reflective of a stated environmental

charter and mission.

From my understanding of contemporary literature in the social sciences concerning waste and consumption, and my experiences in the field at Learning Gate, I include insights from practice theory and material/consumption studies to create a sort of "parallax view" to this complex and far-reaching issue. Briefly defined, I use practice theory to encompass a wide set of ideas about the role of material "props" and their uses in social "rituals". Practice theory as applied to consumption studies seeks to explain how material goods can contribute towards outward display of belongingness to social groups –the "habitus" which influences decisions made by consumers based on how they will be perceived if they are seen purchasing and using certain goods (Bourdieu 1990:52-63). This, I feel, is relevant to garbology, because every item procured and disposed of contains symbolic value.

Material and consumption studies has and can continue to contribute toward an enhanced understanding of what individuals and households do with their material items (particularly when used to compare what individuals they say they do with what they actually do). In a complementary way, practice theory lends itself better to answering the ephemeral "whys" of consumption and disposal, particularly since these motivations are not grounded in single causes, but rather exist at the nexus of commercial advertising, convenience in terms of both time and effort, the economics of disposability at all scales.

### Overview of Chapters

In the rest of this introduction I discuss the background for this project, including the rationale for including food waste as a topic of interest to anthropology, directions for anthropological work as part of interdisciplinary research in waste, and contributions of anthropology to the emerging body of work in "garbology,"

In the literature review (chapter two), I discuss the history of social scientific engagement with questions of waste and summarize current work on that topic, particularly work done by anthropologists and other social scientists to explore questions of material disposability, alienability, and value. I compare different theoretical approaches to understanding waste, including (but not limited to) waste's ambiguous status as material overlaid with value, and how these views of waste contribute to its "invisibility" relative to related topics of interest to anthropology, including food, socio-economic inequalities, and the impacts of waste on non-human environments.

In the methods chapter (chapter three), I discuss the means by which I employed garbological and ethnographic methods towards answering my research questions. In my data and results chapter (chapter four), my main contribution to this effort was a series of "garbological" audits performed in order to inform the engineering tracks of the project about the composition and volume of food waste from the school's cafeteria. In chapter four I also include ethnographic research into the school's zero-waste policies "on the ground," including surveys sent to parents to track the proportions of leftovers discarded at home, participant observation conducted as part of and auxiliary to the garbological audits, and interviews with students at Learning Gate.

Finally, in the discussion chapter (chapter five), I summarize and contextualize my findings, compare the limitations and advantages of the methods used in data collection, and suggest future avenues for applied anthropological research in food waste, particularly in interdisciplinary work oriented towards technical and organizational facets of waste management policy to address the mounting impacts of garbage on human and non-human environments.

## Background

In January 2012, Robert Bair, a colleague from the USF College of Civil and Environmental Engineering, and I submitted a proposal and were awarded funding from the USF Graduate School Challenge Grant program to conduct food waste research at Learning Gate Community School, an environmental charter school in Lutz, FL serving grades K-6. We were joined by two other graduate researchers, one of which was a Ph.D. student in Civil and Environmental Engineering, and the other was an MA student in the Department of Geography and Environmental Planning. Faculty advisors for the project included Dr. Daniel Yeh (Faculty in Civil and Environmental Engineering), Dr. Rebecca Zarger (Faculty in Anthropology and my thesis advisor), and Dr. Joni Downs (USF Department of Geography and Environmental Planning).

The research team will be hereinafter referred to as "POW3R," the name under which we worked, which stands for "Pathways for Organic Waste Reduction, Recycling, and Reuse." Our goals were to (1) design, construct, test, and implement an anaerobic digester to be integrated into Learning Gate's zero-waste policy and environmental education curriculum, (2) to explore uses for the products of the anaerobic digester, including a semi-solid suitable as a soil amendment in nutrient-poor soils, (3) to employ Geographic Information Systems (GIS) to explore the potential for expansion of anaerobic digestion as a food waste management option in the Tampa Bay Area, and (4) to understand the human factors influencing food waste behaviors in institutional settings, including specifics relating to the composition and volume of cafeteria food waste at Learning Gate and the impacts of the school's zero-waste policies and environmental education curriculum on the perceptions and norms relating to food waste among the Learning Gate student population.

As an anthropologist on the team, my role was primarily to collect data concerning the amount and composition of waste generated by the Learning Gate cafeteria in order to help the engineering team determine the most appropriate scale for the anaerobic digester. I also helped write the proposal and progress reports required by the USF Graduate School Challenge Grant. But my involvement was not strictly limited to sorting and weighing garbage and writing reports; I also found myself assisting in the installation and testing of the digester, a role mostly limited to fitting pipes, unclogging ports, and functioning as an extra pair of hands where necessary.

### Why Food Waste?

Food waste in particular is a topic wide open to anthropological inquiry, building on the discipline's extensive interest in questions of the symbolic value of foods (e.g., Douglas 1966), as well as the burgeoning number of anthropologists and archaeologists engaged in studies of the material configurations of waste since the Tucson Garbage Project began in the early 1970s (Rathje et al. 1992). While household garbage receives a considerable share of attention in contemporary discussions of waste, household waste as a category does not constitute the highest per capita fraction of waste. Indeed, recent research suggests that institutions (such as schools, prisons, and hospitals) waste significantly more food per capita than households --- on the order of as much as 40 percent (Gunders 2012). This suggests that addressing food waste from institutions with cafeterias could be more effective than addressing household waste. Further discussion of the literature on household and institutional waste can be found below in the chapter entitled "Literature Review".

### Food Waste Reduction, Recycling, and Reuse in the United States

Food waste recycling was a thriving sector of the industrial and household economies in

the US until the end of the Second World War. In cities of all sizes across the United States, food scraps were collected and fed to pigs, waste fats were rendered to produce industrial lubricants and any number of consumer products and the organic matrices of discarded animal bones were converted into glue and gelatin. Nearly every household practiced food waste reduction and reuse on a level that would be considered unusually diligent in this age of relative affluence and abundance; recipe books from the end of the 19th century and early decades of the 20th prominently featured recipes for leftover meat and vegetable scraps. Indeed, many familiar US food items now typically made from fresh ingredients, such as carrot cake and shepherd's pie, originated in these household practices directed at putting to use even the most miscellaneous scraps of food (Strasser 2009:18-35, 112-122). This is hardly unique to the United States, of course, but in light of the pervasiveness of disposability evident in many contemporary American foodways, this comes as a surprise to many individuals who were never exposed to these practices through relatives who were raised during the Great Depression and Second World War (Chapells and Shove 1999, Levenstein 1993).

Part of the decline of these household waste management practices can be ascribed to changes in the nature of labor US households; where previously most had at least one member devoted full-time to household management, today this is the exception rather than the general rule. A vast majority of US nuclear families have both adult members engaged full-time in work outside the home while their children are in school and extracurricular activities (Evans 2011d, Murcott 1983 and 2000, Wilk et al 1984). Furthermore, the increasing number of single-parent households means that frequently the time and effort necessary to manage household food waste along these

historically-established patterns is simply not available (Van Loon and Sabelis 1997), even when household members agree in principle on the importance of reducing food waste in their own homes (Jones et al 2008, Meah and Watson 2011).

Food, like any other material artifact imbued with symbolic value, serves multiple functions: as a means of biological nourishment, as a way of creating and reinforcing group identity, and as an economic commodity (Drackner 2005). The ubiquity of food in the lives of every human being means that food waste is equally pervasive, but not every person or group of people discards the same percentage of food. Estimates range from less than one kilogram per person per day discarded by a typical individual in sub-Saharan Africa to over 1.5 kilograms per person per day in the developed West, with the United States as an extreme case in which up to forty percent of all food is ultimately discarded without having been eaten (Gunders 2012). This constitutes not only a grave environmental risk, but also a serious economic detriment. It is not only an issue for residents near sites where waste is collected and disposed of, but also has impacts globally such as increased greenhouse gas emissions, contamination of freshwater sources, waste of the embodied energy of all stages of food production, and degradation of arable land through intensive and industrialized agricultural practices.

#### Waste as a Global Issue

Waste is a global issue; it is generated locally at every stage of economic activity, but its disposal has been rapidly globalizing as increasing numbers of cities and counties export their waste to other areas, even as far as crossing political borders. As expanding awareness of global resource depletion and climate change among citizens and policy-makers serve to challenge the material profligacy of the wealthier nations (such as the US and core member states of the



European Union), rising affluence in parts of the developing Global South (China and India, for example) have begun to intensify the economic and environmental pressures on global resources (Gustavsson et al 2011). The assumption that past populations were less wasteful than contemporary populations is not universally supported by the archaeological evidence; some estimates suggest that quite a few populations approached or exceed the current estimated per capita production of 2.4 kilograms (5.3 pounds) of garbage per day (Barbalace 2003).

However, the quoted figure obscures the fact that we currently live in a world whose population has more than tripled in the past century alone, intensifying strains on natural environments and waste management infrastructures. Not only has the sheer scale of our "throwaway society" outstripped any other in history, but also what kinds of things are thrown away has changed. More information on waste disposal norms (both historical and contemporary) will be detailed in the literature review.

### Origins of Garbology

The term "garbology" was claimed to have been a coinage of A.J. Weberman, a New York City activist and political journalist whose notoriety was assured in the 1960s by his "non-governmental garbolog[ical]" activities in sifting through Bob Dylan's trash in an effort to uncover details of Dylan's personal life in order to inform Weberman's writings on Dylan's lyrics. However, a more authoritative origin story for the coinage comes from the Oxford English Dictionary, in which the term "garbology" is listed to have first arisen in the 1960s as a technical description of sanitation workers in Australia (OED 1989).

Whatever the provenance of Weberman's use of the word "garbology," his choice of "non-governmental garbologist" was prompted by the use of "trash covers" as an investigative method by the J. Edgar Hoover administration of the Federal Bureau of Intelligence beginning in

the 1940s and 1950s, from which Weberman sought to distance himself (Scanlan 2005:196). Inspiring the later activities of "gonzo" journalists such as Hunter S. Thompson and building on the rich history of "muck-raking" journalism that figured prominently in the United States at the turn of the 20<sup>th</sup> Century, such as Lincoln Steffens and Upton Sinclair, Weberman and his writing can be rightly credited with at least popularizing the term "garbology" among the media and general public as a means of subversion of surveillance.

Garbology rests on the primary premise that one can infer a considerable amount about an individual or group through the contents of their trash receptacles. That is to say, the material remnants of past human activity can shed light on the lives of the humans that disposed of these items. Garbology synthesizes practices not only from archaeology, but also the burgeoning field of work done under such diverse headings as consumption, environmental economics, food studies, and sustainability.

### Garbology and the Tucson Garbage Project

In recent years, anthropology has indeed begun to turn its gaze towards waste management, but the history of anthropological engagement with the different material items termed "trash" by different groups of people stretches back the early 1970s, when William Rathje, Wilson Hughes, and other researchers from the University of Arizona initiated the Tucson Garbage Project to adapt and employ archaeological methods to shed insight on contemporary populations through their waste.

Among Rathje's key findings were striking discrepancies between what informants said they threw away, and what they actually threw away. Numerous misconceptions existed about the composition and volume of household garbage, particularly concerning "illicit" items such as alcohol, cigarettes, drug paraphernalia, and pornographic literature, which were hugely under-

reported by informants. This finding highlights a central concern of anthropology, namely that what people do and what they say they do are not always entirely isomorphic; informants were reluctant to reveal that they engaged in activities considered illicit in their communities, although Rathje also points out that these same informants gave strikingly more accurate estimates of the material evidence of illicit activities undertaken by their neighbors (Rathje and Murphy 1996:53:80).

Similarly, owing to their prominence as both commonplace and highly-visible against the otherwise undifferentiated mass of landfill garbage, items such as fast food containers, large household appliances, disposable diapers, aluminum cans, plastic bottles, and Styrofoam packaging were strikingly over-estimated by informants; these items altogether only constituted around five percent of landfill waste by volume; however, non-container plastic and paper waste together accounted for more than 60 percent of trash found in landfills (Rathje and Murphy 1996:151-170).

Meanwhile entire categories of municipal solid waste registered little, if at all. For example, before the Garbage Project, it was widely believed that landfills contained nearly zero percent construction and industrial debris, when in fact the figure was closer to 12 percent in the 1990s. Food and yard waste were thought to only account for three percent of landfill volume, but in fact accounted for approximately seven percent (Rathje and Murphy 1996:106).

### Contemporary Garbology and Anthropology

While the Tucson Garbage Project stands as the most widely-cited study in contemporary human waste disposal habits and norms, it has since inspired an emerging discipline of research and engagement loosely organized under the heading "garbology." In anthropology, it bridges a divide between thinking of waste as a material factor of human interactions with non-human

environments and thinking of waste as symbolic representation of value interacting with perceptions of order and purity, social prestige, and usefulness. In effect, when oriented towards contemporary populations, garbology combines theories and methods from not only archaeology and material studies, but also ethnography, allowing a more complete picture of material and social lives to be formed. Anthropologically, waste can be seen as not only in terms of the discrepancies between what people say they do and what they actually do, but also as a means of understanding the value systems in place that influence what is called "waste" and what is called "useful" (Rathje and Murphy 1992:437-447).

To illustrate how interest in garbology and education has grown, since the beginning of this project in 2011, several schools and educational after-school programs have adopted garbology into their curricula, particularly organized around themes such as sustainability and environmental stewardship. In the Tampa Bay area alone, dining halls have had their waste tracked in order to determine the degree to which food is wasted with an eye towards educating on-campus students to waste reduction habits (e.g. taking only portions that can realistically be eaten during the meal, introducing compostable take-out containers, among others) (AASHE 2011, 2014). The Tampa Bay Port Authority is also conducting garbological audits at Tampa International Airport to mitigate and reduce the amount of food wasted through improved design, signage, placement of recycling and non-recyclable waste containers. The challenge at airports in particular is the interception of multiple waste streams which arrive in pulses as aircraft and passengers arrive (ESA 2014).

Beyond the Tampa Bay area, the San Francisco Bay Area Green Schools Initiative has extensively incorporated garbology into primary and secondary school curricula. One such program was set up in 2004 at Prospect Sierra School in El Cerrito, CA; like Learning Gate,

Prospect Sierra is a combined (K-8) school (however, Learning Gate's middle school grades are taught at the school's second campus on Florida Avenue in northern Tampa). Since then, the Green Schools Initiative has expanded its program (including the use of garbology as a classroom activity) to 21 schools, including pilot programs in Kansas City, MO, Omaha, NE, and Randolph, NJ (Green Schools Initiative 2015).

### Anaerobic Digestion

Anaerobic digestion is a process by which anaerobic bacteria are used to convert organic waste into both a semi-solid digestate suitable for fertilizer and a biogas largely composed of methane, which can be used for small-scale power generation. Numerous examples abound of successful anaerobic digestion at the municipal or industrial scales, such as digesters installed at The Plant, a brewery in Chicago and the Chobani yogurt factories near Albany, NY.

However, very few examples in the United States could be found of anaerobic digesters having been built on institutional scales as small as school cafeterias. This is a crucial gap, since institutions with cafeterias tend to discard a larger figure per capita of food and other organic matter than households or industries and therefore constituted ripe opportunities for applied research. The anaerobic digester constructed by POW3R was a two-stage design built from off-the-shelf components: two household water heaters with a combined internal volume of 80 liters, and commercially-available remote monitoring and agitation equipment. A two-stage design was chosen to allow two different species of bacteria favoring different vessel temperatures to proliferate, allowing for more complete processing of organic wastes in smaller internal volumes.

Anaerobic digestion holds significant advantages over other methods of organic waste recycling. Compared to conventional composting, anaerobic digestion allows organic wastes to be converted into usable products (fertilizer and biogas) much more quickly: typically, complete

digestion takes place within three weeks to a month, while conventional composting requires three to six months (Bair 2012). An additional advantage of anaerobic digestion is that it can accept a much wider variety of organic materials than conventional compost heaps, particularly animal products and larger amounts of biodegradable packaging (cardboard and paper). This makes it of particular interest to cafeterias serving items found in typical American school lunches, such as meat dishes and liquid milk.

However, there also exist numerous disadvantages to anaerobic digestion, including its technical complexity, maintenance requirements, and costs relative to composting. Inside the anaerobic digestion chamber exists a delicate ecology, with specific temperature and pH requirements, the deviation from which could result in a drastic slowing of conversion of organic wastes into usable products. Leaks in pipe fittings or vessel walls can introduce oxygen into the system, which reduces the efficiency of the anaerobic bacteria, not to mention allowing foul odors to escape (Arsova 2010:41). Furthermore, anaerobic digesters rely on complex plumbing systems that must be able to circulate a semi-solid organic slurry through the vessels without clogging or clumping. This slurry must be mixed with varying quantities of water or liquid waste in order to maintain a low enough viscosity as not to overwhelm the pumps, while being dense enough to provide sufficient feedstock for the bacteria.

Moreover, while many anaerobic digesters are able to power themselves entirely from the biogas generated, smaller digesters typically require external power sources to run pumps and monitoring equipment. It is difficult to generate electricity from small amounts of biogas, since power generation from gaseous sources typically takes place through a gas turbine or similar combustive process; more usually, the biogas output of smaller anaerobic digesters is either used

to heat water through direct combustion, or flared off to convert methane into carbon dioxide (which is a much as eight times less potent a greenhouse gas) (Gunders 2012).

A useful and succinct framing of holistic waste management that guided POW3R's theoretical approach is the Food Waste Reduction Hierarchy developed by the United States Environmental Protection Agency (see Figure 1). The Food Waste Reduction Hierarchy (below, accessible at <http://www.epa.gov/foodrecoverychallenge/>) ranks methods of reducing or redirecting food waste by total system-level impact, with the most preferable options being source reduction and redirecting still-edible food to hungry people, and the least preferable options being composting and disposal in landfills. It is perhaps surprising that composting would rank so low on the scale, but considering the energy and materials required to produce, transport, store, and dispose of food, it is understandable why putting food to its primary use (i.e. feeding people) or preventing waste before it occurs would outrank mitigation of the impacts of disposal alone.

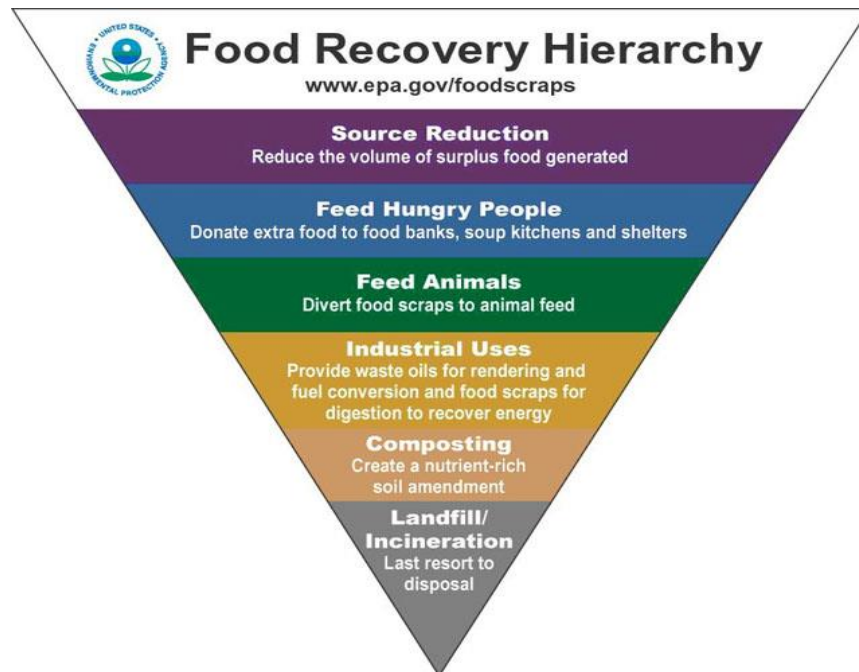


Figure 1: United States Environmental Protection Agency Food Waste Recovery Hierarchy

Anaerobic digestion is a process by which organic matter is digested by anaerobic bacteria in a sealed vessel under controlled conditions in order to ensure an environment in which the bacteria can optimally consume the feedstock and convert it into a semi-liquid “digestate.” Its chief advantages are in that it can accept a much wider variety of organic materials than traditional composting, convert food waste into useful products much more quickly than composting, and not only produces a nutrient-rich soil amendment, but also a methane-rich “biogas”, which can be used for fuel. (Arsova 2010:1-3) As such, it would fall between both extremes on the USEPA Food Waste Recovery Hierarchy, being more preferable than composting and landfill disposal because of the potential for digestion to at least partially offset its own costs through the production of methane. However, it is limited by its cost, technical complexity, the necessity for monitoring and intervention to ensure an optimal ecology within the digestion chambers, and the potential for noxious emissions and malfunctions. Therefore, anaerobic digestion is hardly a "magic-bullet" solution to the issue of food waste. However, its potential lies in its use as part of a holistic approach to waste management, including source reduction, clarification or rethinking of policies relating to re-use or donation of unexpired food items, and diversion of food wastes into composting or feeding of livestock (Arsova 2010:12-15, Redman 2010).

To summarize, waste is a complex and multi-faceted issue with which anthropology has historically engaged in differing ways. These can be broadly divided into symbolic, practice, and material approaches, with the latter being more widely emphasized in archaeology (understandable, since many ethnographic methods are ill-suited for deceased informants). What Rathje brought to the discussion was the synthesis of archaeological and ethnographic methods



to investigate a sample of contemporary informants. Although the Tucson Garbage Project was primarily oriented towards collecting data and making the public aware of the realities of contemporary disposal norms, it did little to contribute towards theoretical perspectives for the emerging field of “garbology” or ethnographies of waste. I propose that the synthesis of material, symbolic, and practice-oriented perspectives can contribute enormously to the advancement of applied anthropology's engagement with waste and consumption, a discussion that is extended in the concluding chapter of the thesis.

## **Chapter Two: Anthropology of Waste**

What human beings throw away and why they do so has long been a topic of interest among social scientists from such diverse disciplines as economics, sociology, and archaeology (Miller 1998, O'Brien 1999, Thompson 1979). In essence, archaeology uses the lasting material impacts of past human activity (i.e. garbage) as its primary informants. Indeed, much of what is known about human life in the past has been garnered from examining the middens, grave sites, and potsherds that are sometimes the only material evidence for details of human activity in a particular area, particularly for groups which left few (if any) other records.

### **Waste, Virtue, and the Commons**

Waste as a topic for social inquiry extends back to Enlightenment and post-Enlightenment conceptions of moral virtue, just stewardship over a world seen as belonging ultimately to God or some other unifying principle, and the rise of what could be later called the "Protestant work ethic" in which putting all available time and effort into betterment of self and communities was a means of material and spiritual betterment (Scanlan 2005:42, Hawkins 2006, Hunter and Yates 2011). Waste was not seen as primarily material, but rather, in chiefly moral terms as result of human negligence, ignorance, and indolence.

John Locke advanced the perspective of waste in terms of economic inequality, arguing that any harvests left ungathered in the fields by landowners was to "be looked on as waste, and might be the possession of the other" (Locke in Scanlan 2005:24-25). Writing in response to the privatization of formerly public lands as consequence of the English Enclosure Acts, Locke argued that unclaimed produce was free to use by anyone as long as the owner of the land had no

further interest, drawing on support from common law and Biblical scripture commanding that unclaimed harvests be left in the fields to be gleaned by the landless poor. This perspective would be later echoed in discourses surrounding food justice movements, particularly those associated with those referred to as “freegan” practices, such as dumpster-diving and foraging (Barnard 2011, Black 2007, Coyne 2009).

### The Early History of Consumption Studies

Social science's engagement with questions of consumption began with the questions of consumption and status raised by Thorstein Veblen, who argued that with the rise of urban life and mass production conditioned by the onset of the Industrial Revolution, cities became places where distinctions between citizens and classes were blurred through the relative anonymity of urban life (Veblen 1899). To compensate for this relative anonymity and to clarify class distinctions, the more affluent classes engaged in what Veblen termed "conspicuous consumption."

However, Veblen's impact on consumption stopped short of discussing waste; his focus was primarily on highly-visible material items signifying socio-economic status (such as housing and clothes). Furthermore, whatever Veblen's contributions to the conceptualization of consumption in the social sciences, his work has been criticized for the scant attention paid to empirical data supporting his conclusions, which hinders its applicability to this research.

Meanwhile, anthropologists in the United States were beginning to explore non-Western notions of consumption among such groups as the Haida and Tlingit, for whom the disposal of large quantities of material goods through lavish potlaches was a marker of social status; a person's generosity in giving (or profligacy in disposing) was seen as both an indication and determinant of socio-economic status (Boas 1888, Graeber 2011:192-208).

## Practice and Consumption

Indeed, much of anthropology and archaeology in North America was concerned with the material practices of the groups of people under study, but this emphasis on materiality gave way to more symbolic approaches in the mid-20th century. Waste was not to be a prominent feature in social science discourse again (whether in the United States or in Europe) until the 1950s, when the Frankfurt School of social critique began to examine of the changes to consumption patterns arising from the period of economic abundance and expanded access to mass-produced consumer goods enjoyed by much of post-war Europe and North America. (Miller 2009:4-5) Even more recently, anthropological inquiry into consumption and waste has once again sought to draw in practice theory (Warde 2005, Shove 2002 Halkier 2009) to explain consumption not so much as a material product, but rather as a set of practices conditioned by changing value systems.

It is helpful to summarize how practice theory has been applied to waste and consumption studies. Practice theory is not a single set of methodological and theoretical perspectives, but rather, attempts to synthesize traditional economic and sociological models of humans as highly autonomous agents with traditional structuralist theories, which emphasize the role of social structure on individual decision-making. As such, according to (Shove and Warde 1998), it is difficult to apply to the environmental impacts of consumption, particularly the kind of day-to-day “inconspicuous” consumption that is not subject to Veblen's and Weber's notions of consumption as differentiating social status.

Warde (2005), following Reckwitz (2002:249), takes “practice” to be a “routinized type of behavior which consists of several [interconnected] elements: forms of bodily activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion, and motivational knowledge.” But Warde distinguishes it from the plural, “practices”,

by pointing to Schatzki (1996:89), for whom practices are “coordinated entities [requiring] performance for their existence.” In other words, human activities are recursively brought into being by the very means by which individuals express themselves as agents, who in turn rely on these practices to clarify and emphasize simultaneous belonging in numerous interconnected social identities (Warde 2005).

However, within the past decade, new interest has arisen from social scientists applying practice theory to the environmental impacts of day-to-day consumption, particularly questioning the notion that individuals are rational and autonomous actors. Inge Røpke (2009) credits Warde for bringing practice theoretical perspectives to consumption studies, echoing his definition of the domain of practice theory being “constituted by social practices that are produced and reproduced across time and space, while cautioning theorists against assuming that agents know or understand the totality of their actions. In short, according to Schatzki, Røpke's view is that when applying practice theory to questions of consumption, particularly those of the environmental impacts of consumption, it is useful to think about how the interplay between the needs and wants of the subject, who is primarily aware of factors which directly and immediately impact their lives: expression of belonging and fulfillment of duties to social relations through the performance of a constellation of “rituals” of consumption (Schatzki 2002:70).

But practice theory is not without its critics in anthropology. Stephen Turner argues that practice theory's emphasis on individual agency's negotiation with abstract social contracts of unspoken (but nevertheless transmitted) knowledge is poorly applicable to all societies, and that practice theory fails to account for how this tacit knowledge is transmitted from generation to generation (Turner 1994). Sherry Ortner is another noteworthy critic of practice theory, maintaining that practice theory lacks both a recognizable concept of culture and a firm grip on

the historical contexts of power and control (Ortner 2006:11).

While I find practice theory to be useful in the context of this research, and do draw upon it for my analysis, I also maintain that it cannot be the only lens through which to view waste and consumption. Many anthropologists have focused on consumption as a means of cultural categorization of particular material items and their socio-cultural embeddedness as "props" for the performance of social roles (Douglas 1966), as conditioned in pre-industrial societies by ecological and geographic factors (Harris 1996), or through the specific use of waste as an avenue through which the values and norms relating to consumption can be inferred and cross-referenced with informants' statements (Rathje and Murphy 1992:53-80).

### Untangling Theory and Consumption

Perhaps most noteworthy among contemporary anthropologists examining consumption is Richard Wilk, whose work spans numerous areas of inquiry, from the ways through which different interest groups assign blame for climate change (Wilk 2009:265-276), to critiques of the preference by most anthropologists for the "exotic" over the "everyday" (Wilk 1999:1-5), to obstacles faced by archaeologists in studying the contemporary (Wilk 2004:61-83). It is important to note, as discussed above, that Shove and Warde (1998) pointed out that much of the application of practice theory to questions of consumption have focused more on "conspicuous" rather than day-to-day consumption. In most research under the header "consumption studies," Wilk proposes that the spectrum of theoretical perspectives can be divided under three headers: (1) social explanations focusing on power and macro-level social and political economic forces (Wilk points to Veblen and Marx, and more recently Mintz), (2) utilitarian economics (popular among archaeologists) emphasizing the pragmatic usefulness of particular items as a means of determining its social value, and (3) those based on individual choice and its manifestation in

culture (Wilk 2004:58).

The first of Wilk's theoretical perspectives on consumption and waste focuses on its situatedness, in relation to power of impersonal actors, depicting consumption as a product of class struggle, the alienation of workers, and the quest for social status. Consumption (and by extension, waste) is seen as a force that reinforces group boundaries and serves as an instrument of power. Examples cited by Wilk include Mintz's work on sugar in Britain and the Caribbean (Mintz 1979, 1985) and Burke's study of soap in Zimbabwe (1997). Burke (1997) argues that the British colonial regime used Western notions of hygiene to divide and control their subjects, making soap a means by which ethnic, class, and gender distinctions were maintained for both the colonizers and the colonized. But he criticizes the tendencies of both scholars to concentrate almost exclusively on consumption as domination or resistance, in his words “rooting out the hidden power relations that lie behind each bite of a meal, and the lather on every bar of soap (Wilk 2004:2)

Wilk's second division, that of viewing waste primarily as a material artifact and in terms of its utilitarian economic value, is the perspective he assigns primarily to archaeologists examining ancient material culture. Here, consumption and waste are seen through the lens of simple economizing behavior; if an item no longer saves labor or increases output, it is discarded or repurposed. This is one point of view that informs this research, as the rationale for POW3R was primarily to improve the efficiency of the operation of the school cafeteria out of economic motives. Just as Wilk suggests, viewing waste and consumption through only one lens is inadequate, and I cannot reduce my research to the management of food waste primarily as an economic asset. After all, it is difficult to imagine that the students at Learning Gate conduct an economist's cost-benefit analysis before

discarding an item. More than likely other explanations are necessary and it to those other explanations that attention is turned in this thesis.

Wilk's third division, that of waste as a manifestation of the negotiation on part of individuals with their socio-cultural environment, argues that wants and desires are the products of ideology and identity, and not rational choice, as is the case of the utilitarian economic point of view outlined above. Nor are they the manifestations of class struggle and power, as outlined in the first division. Wilk highlights Marshall Sahlin's "Culture and Practical Reason" (1976) in arguing that consumption is little more than the superficial reflection of underlying structural oppositions and binary categories of social order, such as belonging to dominant or dominated social groups. Wilk points out that one of the prime contributions anthropologists can bring to the discussion is its understanding of cultural differences, pointing out that even though artifacts (both tangible and intangible) adopted from "outside" are nevertheless interpreted in unique ways by different groups. This enriches the discussion about questions of diffusion of practices. As noted by Shove and Warde (1998:3-7), most sociologists and economists were primarily concerned with "conspicuous" consumption long after Veblen and Weber's interpretations continued to be taken as entirely valid within the disciplines.

While Wilk does not have much to say about garbology, I suggest that his critiques of theories of consumption leave room for the careful application of the kinds of practice theories of waste behaviors described above. Decisions about waste are rarely undertaken with thoughts of their environmental consequences in mind, since more immediate concerns (such as the appearance of cleanliness and order, signification of belonging in one group or another, economic considerations, human laziness) predominate. As such, consumption practice is constantly updated and negotiated by individuals (Reckwitz 1996, Halkier et al 2011).



## Anthropology and Public Health

Waste has also been a feature in anthropological discussion on culture and public health, a prominent example of which is Benjamin Paul's contributions to the application of anthropological principles and theories relating to waste and sanitation, suggesting that technical innovations in sanitation and waste management are improved by factoring in culturally-mediated norms and beliefs regarding definitions of dirtiness and waste (1958). According to Paul, many public health interventions were marked by three kinds of misinterpretations: (1) that 'their' beliefs and habits are odd, while 'ours' are not, (2) that 'our' ways are more advanced than 'theirs', and (3) that culture and belief are isolated elements rather than parts of an interwoven system, in which changes to one part may affect other parts in unpredictable ways (Paul 1958:2). Development efforts such as the construction of latrines instead of open-pit defecation can be hampered by misunderstandings about the cultural relevance of, say, women using their trips to places of defecation as breaks from domestic routines and opportunities to socialize with women outside their households, which underscores a key point in my research: that most activities serve more than one purpose, and that this has implications on waste behaviors, since waste exists not as a discrete conceptual category, but rather as the material shadow of nearly every human activity (Scanlan 2009:vi-ix).

## Archaeology and Garbology: the Tucson Garbage Project

The links between waste and human activity can be said to extend back to the very beginnings of archaeology. Waste often endures longer than other physical evidence of human activity particularly items preserved in anoxic conditions or made of non-biodegradable materials. In fact, much of what is known from the archaeological method has been garnered from examining the spatial distribution and material composition of garbage dump sites. Other

sites of food wastage can be inferred from the archaeological record, such as mass kill sites of Pleistocene megafauna stampeded over cliffs by hunters, mounds formed by the accumulation of shellfish consumption over centuries, and entire cities in the former Fertile Crescent built over accumulated millennia of garbage mounds (Rathje 1992:3-7).

As noted in the introduction chapter, of the most widely-cited bodies of research in the anthropological literature on questions of consumption comes from the work of William Rathje, who founded the Tucson Garbage Project as part of an archaeological seminar at the University of Arizona in 1973 (Rathje and Murphy 1992:10:12) . Initially interested in the discrepancies between self-reported and empirical figures for household waste in the Tucson area, the Garbage Project in later years would compare contemporary conceptions about the composition and volume of municipal solid waste against data arrived at through excavations of landfills at multiple sites around the United States, including the Fresh Kills garbage dump in the New York metropolitan area. This study was unique at the time in American anthropology, in that it adapted archaeological methods as a means of examining consumption patterns among contemporary informants through the material shadow of consumption, namely that of waste.

This thesis research draws in part on the methods employed by Rathje and the researchers participating in the Garbage Project, including the use of empirical data gathered from "garbological" audits of waste streams from bounded populations to compare to informant-reported figures relating to how much they thought they threw away. The perspective used by Rathje was that waste was uniquely situated as a means of exploring the behaviors and norms of contemporary populations; since waste was taken to be an inevitable result of human activity, considerable light could be shed on what people were actually doing, in contrast to the limitations of relying on what people said they were doing.

Earlier findings from the Garbage Project were derived from the comparison of garbological audits of household garbage bins with estimates by household members of the composition and volume of the contents of their bins (Rathje and Murphy 1996:31-52). Of particular interest were that the greatest discrepancies were discovered in "illicit" materials such as alcohol containers, cigarette butts, and pornographic literature, as well as items on the other end of the "licit/illicit" continuum (health foods, for instance), while relatively neutrally-valued objects were reported with a great deal more accuracy. Even more intriguing was that responses to interview questions about specific categories of garbage (such as alcohol containers and junk food) differed when consumers of these goods were asked versus non-consumers; put another way, Garbage Project researchers gained more accurate estimates of the number of beer cans in the garbage from non-drinkers than drinkers (Rathje and Murphy 1996:133-4).

The Garbage Project later expanded beyond Tucson to the United States as a whole and shifted its focus from households to cities. Data from landfill excavations were compared against estimates from governments, waste management agencies, and interviews with members of the public, and it quickly became apparent that considerable misconceptions existed about entire categories of municipal solid waste. For example, construction debris and building material were initially estimated to have been only three percent of the volume of garbage in landfills, when in fact landfill excavations by Garbage Project teams revealed the figure to be closer to 15 percent (Rathje and Murphy 1996:110-129). On the other hand, visually-prominent items in familiar daily use, such as fast food containers and large appliances, were frequently over-estimated.

#### Contemporary Anthropology and Consumption: Drackner's Five Themes

While the Tucson Garbage Project was hardly the first time social science inquiry was directed toward questions of waste and consumption patterns, it was not until nearly two decades

later that waste would once again become a specific topic of widespread focus among anthropologists in the field. Drawing on ethnographic fieldwork in Tacna, Perú among informal waste collectors in a local municipal landfill, Mikael Drackner (2005:1-7) proposed that perceptions of waste (and by extension, answers to the question, “What is waste?”) can be discussed under five themes: (1) as an environmental risk, (2) as a social contagion, (3) as a dirty thing belonging in dirty places, (4) as an economic asset, and (5) as someone else's problem. I explore each of these themes and then explain how they are relevant to this case study at Learning Gate School.

#### Waste as an environmental risk

Waste as environmental risk figures prominently in media portrayals of the "garbage crisis." Garbage is perceived as both a vector for disease (bolstered by images of flies and maggots associated with garbage) and as a degradation of the natural environment when disposed of in places not specifically set aside for the disposal of waste (such as landfills and dumps). This definition of waste is primarily evident in the discourses of waste management, public health, and environmental planning, in which technical or organizational innovations are the most often proposed remedies to the epidemiological and environmental risks of improperly disposed waste. But these bodies are by no means the only stakeholders in waste management, and by extension, garbage-as-environmental-risk is by no means the only lens through which waste can be viewed.

Waste as a social contagion figures prominently in Drackner's (2005) discussion, mentioned above, in which he pointed out that garbage is perceived to be malodorous, filthy, and aesthetically negative by most people, a perception which prompts its complete and rapid disposal from places of human activity, lest the presence of un-managed waste reflect a parallel

"trashiness" on part of nearby residents. This can be said to be parallel to the familiar 'Broken Window Theory' (Wilson and Kelling 1982), in which signs of unregulated behavior in public places (such as broken windows and garbage strewn around) prompts further unregulated public behavior, particularly criminal or deviant activities. Here, waste can be seen as not only a risk to health and well-being, but also as a risk to the orderly functioning of public social life. This lens is often the primary one through which urban planners, public servants, and engaged citizens define waste or trash.

#### Waste as a social contagion

Waste as "dirt" belonging in "dirty" places echoes Mary Douglas's (1966) theories regarding purity/impurity as a culturally-mediated means of ordering a chaotic and unordered world. Extending Drackner's and Douglas's interpretations of waste as "matter out of place," the presence of waste signifies not only disorder in the area in which it is found, but also that waste itself is disorder manifested materially. Of Drackner's five headings under which the definitions of waste can be placed, this is one of the more prominent featured in anthropological discussions, perhaps because it is one of the theories most relevant to cultural mediation of definitions of waste as the product of consumption, which itself is conditioned by the performance of social roles.

Waste as dirt belonging in dirty places can also be applied to the precursors of garbology as a means of surveillance by the J. Edgar Hoover administration of the FBI ("trash covers" of criminal suspects), as well as the very beginnings of the recorded American use of the term "garbology," which were largely influenced by its use as a means of unofficial media surveillance of prominent public figures reminiscent of the "muck-raking" journalism of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries (Humes 2012). As such, the household waste of individuals was

examined in order to find physical evidence of deviant or criminal activities, prompting questions about to whom the waste belonged: Was it private if left in public spaces for disposal?

### Waste as a “dirty thing belonging in dirty places”

The symbolic perspectives described above may be considered to illustrate Wilk's conceptions of "social" theory (in the case of waste-as-social-contagion) or waste as "cultural" (as in Douglas' emphasis on disorder in the minds of observers). The equation of disposability with cleanliness is an illustration of this theme; objects and materials thrown away are essentially obviated from sight, while waste out of place is considered a sign of degradation and disorder (Shove 2003). How do these perspectives link back to this project? Ideas of contamination influenced the way by which POW3R went about its business; the anaerobic digester was housed in a purpose-built shed well away from the cafeteria or spaces frequented by students; it was built as much for concealment as it was for protection from the elements, since administrators and staff members expressed concerns over odors generated by the unit. This could be taken as either indicative of disorder (unexpected malodorous emissions) or simply garbage in a place where there should not be openly-visible garbage (a cafeteria or outdoor play area).

### Waste as an Economic Asset

Waste as economic asset has a long and complex history marked by rapid changes in the affluence and (by extension) waste disposal habits conditioned by rising economic affluence in the United States after the end of the Great Depression and World War II. The concept of food waste reduction, recycling, and reuse is hardly a novel idea in the United States; indeed, it was a major industry for much of the nation's history. Waste as an economic asset has been explored in anthropological research at a wide variety of levels, from the individual to that of the community, and historically as well as in contemporary behavior. A good deal of social science research has

recently been conducted on contemporary encounters with waste, including “dumpster-diving” (Barnard 2011, Black 2007, Gross 2009, More 2011), domestic cooking practices (Evans 2011a, Hunter and Yates 2011, Meah and Watson 2011), and the salvage and reuse of discarded items (Burr et al 2003, Gregson et al 2010a, Hetherington 2004, O'Brien 2007). In this thread of analysis, waste is considered at least partly from the perspective of its economic value, whether the ability to supplement or supplant incomes through the resale of discarded items or through the perceptions of detriment and degradation and the corresponding devaluation of waste and the places in which waste are found.

### Waste as Somebody Else’s Problem

Drackner (2005) examines the means by which informal waste collectors in a landfill in Tacna, Perú, whose livelihoods center around the resale of materials, are rendered invisible and marginal by other Tacneños' designations of such as "waste." Waste as “somebody else's problem” is the perspective that shortcomings in waste management are blamed on someone else. For example, Drackner (2005) relates the tendencies for the citizens of Tacna to acknowledge that while as citizens, they shared in the responsibility to properly dispose of household waste, they frequently over-estimated their own adherence to what was considered proper garbage disposal while claiming that other people were largely at fault for mounting garbage problems in the community. This point of view arises from a disconnection between the material reality of waste and the behaviors relating to waste disposal, which itself is a product of the changes in norms and habits relating to disposal. This is largely as a result of a transition from decentralized networks of informal garbage collectors (primarily interested in the economic value of materials gathered from household garbage) to formal municipal waste collection. This view of waste, as somebody else’s problem, is particularly resonant with the research at Learning

Gate school described here, especially where it concerns the discrepancies between informant-reported behaviors and empirically verified figures on waste production.

### Anthropology of Waste at Learning Gate

Shortly after the school was founded, a “zero-waste policy” at Learning Gate was put into place as a practice meant to bolster the school's status as an environmentally-focused institution, and while the policy has been largely effective in reducing both the amount of garbage generated by the cafeteria and the amount of garbage ultimately disposed of through municipal sanitation services, this policy is primarily effective because the school lacks kitchen facilities and procures food for students through catering arrangements with local food businesses, pushing waste further up the supply chain. Ultimately, the term “zero-waste” is not entirely accurate, since the school cafeteria does produce a certain quantity of garbage every day, but it was striking to me and POW3R how little waste was produced. Overall by weight, the Learning Gate cafeteria generated no more than 21.4 kilograms (47.1 pounds) of garbage during the three garbological audits discussed in Chapters Three and Four. However, due to constraints of time and project scope, I was unable to examine to what extent this reduced the system-level efficacy of the zero-waste policy.

Nevertheless, examining the policy through the lens of practice theory, with a focus on student behavior in throwing away cafeteria waste into trash, biodigester bins, or compost bins suggests that the zero-waste policy is to a good degree effective in inculcating in students the value of reduction and recycling of food waste. Students are largely aware that food waste is a detriment to more than just shrinking landfill space, and eagerly participate in the food waste reduction activities at Learning Gate, including maintaining the compost heap and feeding food scraps to the chickens kept on-site. More discussion on this topic is in the findings and



conclusions chapters of the thesis.

Despite the prominence of the Tucson Garbage Project and the emphasis on materiality in consumption studies, aside from Drackner's study (2005), waste has largely been invisible to the ethnographic gaze until relatively recently. John Scanlan (2005:914) seeks to explain some of the invisibility of waste through bringing to light some of the assumptions undergirding the sociological examinations of consumption, as follows:

1. Waste is a self-evident category of materials and objects whose value has been degraded through either use or neglect
2. Waste is the product of unidirectional and neatly linear processes of extraction, production, consumption, and disposal
3. Waste is properly the domain of organizational and technical specialties
4. Therefore, waste is most properly addressed from the "top down" by policy-makers and technological innovations.

While previous studies provide insight into the roles of waste in human societies, the degree to which these assumptions of waste's "dirtiness" and degraded value have informed (and mis-informed) waste studies has contributed to waste's invisibility to the ethnographic gaze relative to other related topics (such as food choice or consumer behavior). Because waste is the largely invisible and marginalized shadow cast by nearly every human activity throughout time, it is uniquely situated to provide profound understanding of the human populations which generate it, but it is this very ubiquity and broadness of scope that makes it difficult to examine waste from the viewpoint of a specific discipline or theoretical position.

Waste is, after all, not a problem to be confined to one set of theoretical stances or

methodological toolkits; it is an issue calling for perspectives that blur disciplinary boundaries and engage public discussions. Partly prompted by Merrill Singer's 2012 call for intensified anthropological engagement with waste (AN 2012), anthropologists have begun to build upon earlier work and expand exploration of discussions about waste. As mentioned previously, considerable anthropological research has been conducted during the past decade in the United States and Canada on the rising phenomenon of "freeganism" or "dumpster-diving" (Barnard 2011, Gross 2009, More 2011). Meanwhile, anthropologists in the UK are exploring the links between consumption and waste as a means of provisioning households and maintaining strong social relations (Miller 2009), as well as attempting to bridge the traditional reluctance of anthropologists to apply practice theory to habits and norms relating to waste (Thomas 2012).

Building on the legacy of the William Rathje and the Tucson Garbage Project, archaeological methods are in large part the basis for an emerging academic discipline termed "garbology." Garbology seeks to combine the material and symbolic to achieve more complete understandings of contemporary norms and habits regarding waste --- that is to say, using "garbage as informants" to supplement ethnographic inquiry into contemporary waste habits.

The contribution of this project to emerging anthropological understandings of waste, however, are not purely garbological, focused on material waste, nor purely ethnographic, focusing on practice of waste disposal. What is most noteworthy about this project is its strongly interdisciplinary nature, and the degree to which potential future policy intervention was integral to the project. In seeking to bring together ethnographic studies of behavior and perspectives on consumption, this work has potential for replication in settings other than schools.

### **Chapter Three: Methods**

I employed a mixed-methods approach to answer the research questions posed in the introduction and to more thoroughly understand the cafeteria operations of Learning Gate, particularly as they related to the zero-waste policy in place at the school. (The four key research questions were presented in Chapter 1). In order to address my research questions, I used four methods: (1) garbological audits covering three different school days (including one Friday); (2) participant observation with written notes covering approximately 100 hours in the field; (3) surveys sent home to parents through the school office to all Learning Gate households in order to gauge the proportion of leftovers taken home by students and ultimately discarded; and (4) key informant interviews with Learning Gate students (n = 6). I detail each of these methods below.

#### **Institutional Review**

Approval by the USF Institutional Review Board (IRB) for the research design as stated above took place on 04/29/2012, after accounting for their special requirements concerning interviewing minors. Since the extent of direct contact with minors was mostly limited to interviews and participant observation, those aspects of the study design were judged to constitute minimal risk to participants and therefore the board allowed for an expedited review. The IRB approval also allowed for the recording (through audio, photo, or video) of interviews, with only verbal assent from participants required.

#### **Garbological Audits**

Between October and December 2012, I conducted three garbological audits of the total

cafeteria waste stream from the Learning Gate cafeteria. Each audit covered all seven grades (K-6) served by the cafeteria, and was conducted in close cooperation with the engineering track of POW3R, since one of the initial goals of these waste audits was to determine the average throughput and composition of food waste from Learning Gate's cafeteria in order to optimize the scale of the anaerobic digester which was being constructed. Although normally students at Learning Gate divert their compostable food waste to the compost heap, during each of the three garbological audits, all food waste was directed to our weighing station, after which the compostable fraction separated from the garbage samples was disposed of in the compost heap by a team member.

Below is a break-down of how the four-person teams were coordinated and the methods that each wing of the team used. The waste audit teams consisted of me and three other individuals, whether from POW3R or from volunteers organized mainly through service learning-based classes taught by Dr. Zarger. A minimum of four volunteers were required to perform all the tasks involved in the garbological audit, which included (1) performing head counts of students in the cafeteria (Appendix B), (2) transporting garbage from the bins inside the cafeteria out to the sorting team, (3) confirming head counts with teachers and cafeteria staff, (4) assisting cafeteria staff in clean-up and preparation for the next lunch period, and (5) weighing and sorting the garbage generated by the cafeteria for each lunch period.

Before beginning the day, all volunteers were briefed on Learning Gate composting and zero-waste policies and were provided with instructions for their specific roles. Lunch schedules for each grade (see above) were obtained from Learning Gate administration and each team member was provided with a copy of this schedule in order to facilitate an accurate head count for each grade. Two volunteers were stationed inside the cafeteria; both team members were

primarily involved in counting students as they came in and noting how many students per grade purchased their lunches from the cafeteria, a proportion ranging from approximately a quarter or a third of the total population in the cafeteria for any given grade (Tables 1-4).

### Head Count

While one volunteer was stationed at the entrance to conduct a head count, the other was tasked with counting how many students were in the lunch line. Recording an accurate count of both the incoming students and the proportion of students in the lunch line was crucial to obtaining a per capita figure for the cafeteria waste stream by grade, since Learning Gate's zero-waste policy mandates that students who bring their own lunches to school must take home any leftovers. The only way to easily determine that proportion was to count how many students purchased their lunches from the cafeteria and to subtract that figure from the overall population of the cafeteria in order to determine the relative proportions of students who purchased their lunches from the cafeteria versus those who brought their lunches from home.

One volunteer's head count was compared against the other to check the accuracy of figures, and then subsequently confirmed with teachers present in the cafeteria. Between the beginning and ends of each lunch period, I conducted informal participant observation to gain a clearer picture of what students did during their lunch periods. This included but was certainly not limited to (1) engaging individual or groups of students in conversation, (2) walking around the cafeteria to count numbers of lunch containers in order to confirm the validity of the figures obtained from the head counts of students in the lunch line, and (3) observing interactions between students, staff, teachers, and other volunteers.

### Food Weighing

The other two volunteers were stationed outside to sort and weigh the waste, which was

labeled by grade and carried out by one of the cafeteria volunteers at the end of each lunch period. Once a garbage bag from a particular lunch period arrived at the sorting station, the contents were sorted into three categories:

1. *Compostable food waste*, consisting only of fruits and vegetables in accordance with Learning Gate composting guidelines, which specifically excluded food wastes like breads and non-dairy liquids normally considered to be compostable under the less-exclusive guidelines of other organizations, such as the University of Florida Agricultural Extension
2. *Non-compostable food waste*, consisting of all food wastes excluded from the above category, including all liquids (owing to the difficulty of excluding non-dairy liquids from the waste stream) and breads. Since this portion of the cafeteria waste was also relevant to the goals of the engineering team in optimizing the scale and design of the anaerobic digester, broad inclusion criteria were acceptable.
3. *Non-food waste*, consisting of packaging and any other waste which could neither be composted nor digested effectively. This included the Styrofoam clamshells in which cafeteria lunches were packaged, condiment packets, drink containers after manual extrusion of their contents, and the bin liners used to transport the garbage from the cafeteria to the sorting station.

Once sorted, each sub-sample was weighed (using a digital bench scale with 35kg capacity and 100g sensitivity) to provide a breakdown of the composition of Learning Gate cafeteria waste for the particular day in question. The figures were double-entered into a spreadsheet, cross-checked for data entry errors, and analyzed through Statistical Package for the

Social Sciences (SPSS) 21. Descriptive statistics were used primarily in order to derive a mean output based on the weighing of garbage samples of non-compostable food waste from the cafeteria in order to generate useful information for the design and optimization of the digester by other POW3R team members (engineers). Other measures included the coefficient of variation, in order to determine whether any patterns were evident. Further discussion of the analysis of these data can be found in the next chapter (Chapter Four: Results).

### Take-Home Surveys

While the garbological audits were necessary to determine the amount of food and packaging discarded by students purchasing their lunches from the Learning Gate cafeteria, it was necessary to gather data relating to the proportion of food discarded by students who brought their lunches from home in order to gain a more complete understanding of the cafeteria waste stream for the entire student population. The zero-waste policy of Learning Gate Community School mandates that students who bring their lunches from home must take home any leftovers, and so I devised a survey to distribute to parents to log over a one-week period the rough proportion of food taken home as leftovers that was ultimately discarded or otherwise disposed of.

The written surveys were administered in December 2012, coinciding with the final garbological audit. Adapted from food waste surveys available from the UK WRAP Food Waste Tracking Toolkit (<http://www.wrap.org.uk/content/supporting-resources-hospitality-and-food-service-sector-3>), these surveys were structured as five-day logs (with space for free responses) to track food items prepared, how much of each food item was brought home as leftovers, and how much of those leftovers were ultimately discarded. A five-day period was chosen for the survey to gain a more complete picture of discard patterns over a typical school week. Due to the

labor-intensive nature of the garbological audits, these could not be replicated the same week as the surveys were administered, limiting comparability between the two data sets. However, despite this drawback (and others, discussed below in Chapter Four under “Limitations”), I chose to proceed with this phase of the data gathering and incorporate these data into the study.

A total of six hundred of these surveys were printed and distributed, with a desired response rate of ten percent (Bernard 2005:255-264). Because I could not expect participants to weigh individual items, I used a five-point scale (1 = “none”, 2 = “less than one third”, 3 = “about a half”, 4 = “more than two thirds”, and 5 = “all”) for estimates of the fractional portion of originally provided food items in student lunches that were ultimately brought home and discarded. This limited its comparability with the results of the garbological audits, since the audits yielded absolute figures for the weight and composition of waste, while the surveys only had provision for estimating the fraction of waste without consideration of weight or volume. This limitation is addressed in the results chapter of the thesis. Space was provided for free responses, with suggestion that this space be used to elaborate on reasons for food having been discarded.

To facilitate completion and return of the survey, an instruction sheet and a stamped envelope were included, and in an effort to ensure anonymity and candor, I enlisted the help of the administrative staff of Learning Gate to recruit participants in order to obscure the identities of respondents to me. Participation was incentivized by prior agreement with the school principal to include credit for up to two hours toward the monthly volunteer commitments required by the school for parents of Learning Gate students. Ultimately, 54 surveys were returned, constituting 18 percent of the total surveys sent out. Once received, the surveys were entered into a spreadsheet, cross-checked for errors, and merged with the results from the other surveys for



comparability.

### Participant Observation

My first visit to Learning Gate took place in March 2012, when I began participant observation of the cafeteria and activity areas for approximately two hours per week, increasing to four hours per week once the garbological phase of the project commenced in October 2012. By the time I received IRB approval for the project in May 2012, I began recording field notes for these visits, which ultimately covered nearly 100 hours over 26 visits between March and December 2012.

The purposes of participant observation were initially to establish connections with staff and students at Learning Gate and gain the beginnings of an understanding of Learning Gate operations. Once the garbological audits began, the purpose of the participant observation method shifted towards counting and tracking students eating lunch in the cafeteria, with emphasis on non-eating activities taking place during lunch periods. This is important, because the literature suggests that for a typical half-hour lunch period, students spend an average of nine minutes engaged in eating (standard deviation seven minutes), with the remaining time used for non-eating activities like finishing homework or socializing (Conklin and Lambert 2002, Bergman et al 2004).

In most cases, I wrote my field notes in the evenings after a session at Learning Gate, since notes could not be immediately recorded in the chaotic activity of the cafeteria. These notes covered the activities I engaged in at the school, interactions with students, accounts of waste-related behaviors, conversations with other volunteers and Learning Gate personnel, and assorted commentary and thoughts: complaints about the lack of kitchen facilities (food service at Learning Gate is supplied through local businesses and restaurants, with meals prepared off-site and delivered to the school), comments about. No information that could be used to identify

individual students was included to ensure anonymity, and because no part of my research rested on the individual identities of informants.

### Semi-Structured Interviews

Between December 2012 and February 2013, I conducted and recorded in-person interviews with six students (three male and three female) from grades 3-6, representative at least in terms of gender. I decided against interviewing students younger than the third grade, because of pragmatic concerns brought up in the literature about the difficulty of yielding reliable responses from younger interviewees (Danby et al 2011, Gill et al 2008, Irwin and Johnson 2005). The shortest was 12.7 minutes and the longest was 29.3 minutes. No financial or other incentives were provided for participation. The questions were organized along four major themes (1) information relating to whether the informant typically brought their lunches from home or purchased them from the cafeteria, along with the usual frequency of either venue, (2) the use of time during lunch periods, and (3) awareness and perceptions of waste behaviors. The interview instrument included in Appendix A lays out the specific questions asked, but was intended as a rough guide to allow for opportunity to ask follow-up questions or ask for elaboration as conversation permitted.

## **Chapter Four: Results**

### **Participant Observation**

I undertook several periods of participant observation over the course of this project, broadly divided into two phases. The first phase was before the commencement of this research to familiarize myself with the organization, layout, and norms of the setting, while the latter phase was far more structured and conducted in conjunction with the garbological audits as a means of not only garnering accurate figures for the number of students eating lunch in the cafeteria, but also to better understand how students internalize and replicate food waste norms in light of the school's zero-waste mandate.

Unsurprisingly, a cafeteria in an elementary school is a very eventful and sometimes chaotic setting for anthropological research. Furthermore, the cafeteria is not the only setting at Learning Gate where lunch is eaten; not infrequently individual teachers will take their classes to eat lunch outside. Therefore, my participant observation was not confined exclusively to the cafeteria, but more broadly took place wherever students gathered to share a half hour of lunchtime.

The most apparent observation that stood out to me was the extent to which students did not spend their time eating lunch. Initially, I thought that one possible determinant of food waste was simply not having enough time to finish a meal, but it did not take many sessions of observation to discover that for the most part, students tended to stop eating well before the end of each 30-minute lunch period, suggesting that time was not a factor in their decision to consume or discard particular food items. Rather, it may have been portions larger than what was

needed, or distraction from interest in other activities, that could explain why students discarded food. Or simply, the food offerings available were not liked or wanted.

However, this finding can be taken to be at odds with the literature relating to the relative length of eating versus non-eating time in school cafeterias; the general consensus appears to be that for a typical 30-minute lunch period, the time spent eating averages around nine minutes, standard deviation 7 minutes (Bergman et al 2004, Conklin et al 2002). A time study of the kind used to arrive at those figures in conjunction with a garbological audit would have required additional research volunteers. Two more volunteers would have been needed per team to allow my impressions garnered from observations to have any significant degree of comparability.

The cafeteria itself is a large high-ceilinged room east of the school's main faculty parking lot, with two main entrances (to the north towards the classrooms and recreation fields and to the south facing an open area with picnic tables). Students typically filed in through the southern entrance, which proved to be very helpful when conducting head counts during the garbological audits (described later). The lunch line stood next to the southern entrance, while teachers sat closer to the northern entrance, where they could more easily observe the entire cafeteria while being separated enough from the bustle of the lunch period to converse among themselves. Two grades at a time typically occupied the cafeteria, separated by the two main areas in which tables were placed (one in a large alcove at the western end of the cafeteria, and another at the eastern).

Activities that took place during lunch hours apart from eating included (but were hardly limited to) socializing, doing homework, reading books, or playing games, whether alone or with classmates. At any given time, more than two hundred students (from more than one grade level) were present in the cafeteria, along with teachers, staff, and volunteers, making for a very lively

and noisy environment. From my field notes taken during one of the first sessions (in September 2012), I kept remarking on how “I couldn’t hear myself think” and wondered if it were really true that teachers are not allowed to give students aspirin. Owing to the chaotic environment and large number of people in the lunch room, and additionally to the fact that I was frequently called upon to assist cafeteria monitors and staff (for example, to clean up spilled food and open difficult containers), I was unable to conduct a time study to quantify the proportion of time spent doing various activities by students, but suffice it to say that most students appeared to be finished with their meals at least five minutes before the end of the lunch period, and most students alternated between eating and non-eating activities.

Outside the cafeteria, the environments were somewhat less structured but since classes eating outdoors were typically under the close supervision of at least one teacher and sometimes an assistant, it was easier to pick out patterns of behavior. Games and socialization appeared to take up a larger proportion of time; students would eat very quickly and then enjoy their brief unstructured time outdoors before going back to class. Fewer students would read or sit alone. Once in a while, lunch would be eaten near the garden, ostensibly in order to better link in the minds of students the connections between food and food source. One anecdote that stands out from such a lunch period was of a student taking one bite of an apple, and then immediately discarding it into the compost heap. When asked about it later, he replied that while he wasn't really hungry, he liked throwing apples into the compost heap a lot more than throwing them into trash cans. I agreed that it was better to throw food into the compost heap, and that it fun to play with compost. I asked him how he liked feeding chickens (as I kept chickens at the time), and he said that he liked that even more, because (in his words) “they were like little dinosaurs”, but that the teachers preferred that he did not feed the chickens outside of directed feeding times;

however, the compost heap was always open to contributions.

Observations like these informed development of questions asked during the interviews with students. I was curious about the ways students perceived the use of their time, and the extent to which factors such as hunger, hurriedness, and the degree to which they liked or disliked the items offered in the cafeteria affected how much they consumed or discarded. This will be further discussed below with the presentation of interview data and findings.

To illustrate these points, I draw upon the field notes I took during participant observation sessions. While my time conducting garbological audits prevented me from interacting with students at length, the preliminary participant observation sessions afforded me numerous opportunities to freely interact with students, staff, and teachers.

During one such session, conducted shortly after the first garbological audit, I was sitting near the edge of the cafeteria at an empty table, when a student approached me and asked me if I were the “garbage man,” to which I replied that I was an anthropology graduate student conducting a research project. He asked what an anthropologist was, and what was so interesting about garbage. I explained that anthropology was the study of human societies, and that garbage was interesting because one can tell quite a bit about a person's habits through what they throw away.

He laughed and told me how at home he figured out that his parents were planning on throwing a surprise birthday party for his older sister, because he discovered wrapping paper and a mostly-empty box of invitation cards in the garbage. I told him that was exactly what I was doing, which prompted him to ask what I could tell about him through his garbage. I asked him what he threw away, to which he answered that he didn't throw anything away. Skeptical, I asked him again, and after some thought, he told me he threw away a shirt his parents bought him,

which he didn't like, and then told me how he took great pains to disguise his throwing it away. I laughed and told him that I did something similar once with a pair of ugly shoes, and lied to my parents that someone had stolen them, which they did not believe. He told me his parents never found out about it, and I reassured him that he would not get in trouble, since everybody throws things away.

Another incident that stands out occurred after the conclusion of the garbological phase of the project, by which time it was firmly cemented in the minds of the students I had interacted with that I was the “garbage man.” I was in a hurry to leave for an appointment, and on my way out, threw away a food container containing the partially-eaten remains of my lunch. The compost monitor for one of the tables I was sitting next to spotted me, ran over, and berated me for throwing away compostable food --- a piece of fruit and some leftover salad. Sheepishly, I told her of my hurry, and she threatened to tell her teacher how I was breaking school rules by discarding compostable material instead of turning it over to her for collection.

Realizing that I had no legitimate argument, and pressed for time, I proceeded to reach into the garbage can and remove the offending items from the bag. I apologized and thanked her for her diligence in enforcing Learning Gate's zero-waste policy, and she smiled and said that she just wanted to see me dig in the trash again, because she found it amusing. She then told me that at home, she was starting to urge her parents to more diligently sort recyclables from non-recyclables, but wished her parents would let her feed leftover food to her dog. I reassured her that this was good of her to consider that, and to keep trying, but to be careful to avoid feeding her dog “people food.” These vignettes illustrate the ways norms for discarding food waste are shared at Learning Gate, particularly by students, as they internalize the school policies and think about how they might extend them beyond the school itself.

## Garbological Audits

The figures from the three garbological audits of the cafeteria waste stream for those days were double-entered into a spreadsheet and ordered by grade along the sequence of lunch periods. Figures were checked against field notes and volunteer logs to ensure accuracy. Separate spreadsheets were created in order to track the garbage recorded by category for each grade over each garbological audit. Given that the aims of these audits were to answer the questions relating to the composition and gross weight of the garbage produced by the Learning Gate cafeteria, descriptive statistics are sufficient to explore patterns in the data. Tables showing the results for the statistical analysis of the garbological audits are shown below and in the appendix.

*Table 1: Breakdown and descriptive statistics of 10/11/2012 waste audit*

grade	student count		food		non-food	total waste
	total	lunch line	compost	non-compost		
K	66	8	0.45	0.27	0.54	1.26
4	89	17	1.56	1.42	0.57	3.55
2	41	7	0.22	0.78	0.66	1.66
5	86	11	1.36	1.29	0.78	3.43
1	79	13	0.51	2.81	1.47	4.8
6	110	15	1.02	1.08	0.67	2.76
3	76	10	0.43	1.16	0.84	2.44
<b>all</b>	<b>547</b>	<b>81</b>	<b>5.55</b>	<b>8.8</b>	<b>5.54</b>	<b>19.89</b>
<i>mean of all grades</i>			<i>0.01</i>	<i>0.02</i>	<i>0.01</i>	<i>0.04</i>
<i>median of all grades</i>			<i>0.51</i>	<i>1.16</i>	<i>0.67</i>	<i>2.76</i>
<i>variance of all grades</i>			<i>0.27</i>	<i>0.61</i>	<i>0.1</i>	<i>1.46</i>
<i>standard deviation of all grades</i>			<i>0.52</i>	<i>0.78</i>	<i>0.32</i>	<i>1.21</i>
<i>range of all grades</i>			<i>1.34</i>	<i>2.54</i>	<i>0.93</i>	<i>3.54</i>
<i>coefficient of variation of all grades</i>			<i>50.92</i>	<i>48.69</i>	<i>31.54</i>	<i>33.18</i>
<u>Note: all weights in kilograms (kg)</u>						

In Table 1 (above), the results from the garbological audit on 10/11/2012 are shown for all seven lunch periods, as well as a column (labelled “all”) representing the sum of each category of garbage discarded over all three garbological audit sessions. It includes the weights (in kilograms) of the garbage, both in the aggregate and broken down by food/non-food and



compostable/non-compostable (which excludes non-food items necessarily). It also shows the sample size obtained from the head counts undertaken concurrently with the waste sorts, in addition to a count of the number of students in the lunch line. The count of students in the cafeteria lunch line was included because students who do not purchase their lunches at the school are required by Learning Gate zero-waste policy to bring their leftovers and packaging home; students who purchase their lunches from the school are not required to do so.

*Table 2: Breakdown and descriptive statistics of 10/25/2012 waste audit*

grade	student count		food		non-food	total waste
	total	lunch line	compost	non-compost		
K	72	7		0.83	0.35	1.18
4	75	13	1.46	0.69	0.75	2.9
2	76	12	0.69	1.42	0.75	2.86
5	88		0.65	1.06	0.78	2.5
1	70	10	0.54	2.47	1.01	4.02
6	103	13	0.08	1.22	1.08	2.37
3	78	11	0.54	1.35	0.41	2.3
<b>all</b>	<b>562</b>	<b>66</b>	<b>3.97</b>	<b>8.21</b>	<b>4.78</b>	<b>16.95</b>
<i>mean of all grades</i>			0.01	0.01	0.01	0.03
<i>median of all grades</i>			0.6	1.22	0.75	2.5
<i>variance of all grades</i>			0.2	0.34	0.08	0.73
<i>standard deviation of all grades</i>			0.45	0.58	0.28	0.85
<i>range of all grades</i>			1.38	1.78	0.73	2.84
<i>coefficient of variation of all grades</i>			63.65	39.99	32.34	28.24
<u>Note: all weights in kilograms (kg)</u>						

Table 2 (above) shows the results from the garbological audit undertaken on 10/25/2012, and is organized in the same manner as Table 1: weights of food in kilograms, number of students in the cafeteria arranged by Learning Gate’s ordering of lunch periods, and descriptive statistics for the sum of samples (taken to the total number of students having eaten in the Learning Gate cafeteria on that day). What is immediately apparent are the high coefficients of variation in food waste, in all but once case exceeding 30 percent. This is likely due to the relatively small number of garbage samples measured (seven per day, 21 in total), and might be

more adequately explicable if more garbological audits were undertaken.

Furthermore, while these figures can be compared with those of Table 1 (above) and Table 3 (below), it must be noted that data are missing from this table, specifically the compostable food waste weights for kindergarten, and the lunch line count of the fifth grade. The former was due to difficulties in setting up, while the latter was thanks to the fact that half of the fifth grade class was on a field trip that day.

*Table 3: Breakdown and descriptive statistics of 12/15/2012 waste audit*

grade	student count		food		non-food	total waste
	total	lunch line	compost	non-compost		
K	53	16	0.21	0.15	0.06	0.41
4	85	23	0.5	1.04	0.59	2.12
2	75	23	1.91	2.36	1.26	5.52
5	89	13	2.24	2.16	0.74	5.14
1	75	21	0.09	3.82	1.09	4.99
6	107	24	1.12	2.09	2.68	5.88
3	80	14	0.66	1.14	0.52	2.31
<b>all</b>	<b>511</b>	<b>134</b>	<b>6.5</b>	<b>12.59</b>	<b>6.88</b>	<b>25.97</b>
<i>mean of all grades</i>			<i>0.01</i>	<i>0.02</i>	<i>0.01</i>	<i>0.05</i>
<i>median of all grades</i>			<i>0.66</i>	<i>2.09</i>	<i>0.74</i>	<i>4.99</i>
<i>variance of all grades</i>			<i>0.7</i>	<i>1.39</i>	<i>0.71</i>	<i>4.51</i>
<i>standard deviation of all grades</i>			<i>0.84</i>	<i>1.18</i>	<i>0.84</i>	<i>2.12</i>
<i>range of all grades</i>			<i>2.15</i>	<i>3.67</i>	<i>2.62</i>	<i>5.47</i>
<i>coefficient of variation of all grades</i>			<i>65.65</i>	<i>47.86</i>	<i>62.4</i>	<i>41.77</i>
<u>Note:</u> all weights in kilograms (kg)						

The results of the audit on 12/15/2012 (see Table 3, shown above) are particularly noteworthy, because of the higher proportion of students purchasing their lunches from the cafeteria lunch line (therefore increasing the total amount of non-food and food waste), and the higher coefficient of variation of total waste. The first point might be explained by noting that this audit took place on a Friday, which is traditionally “pizza day” at Learning Gate. The second is more difficult to explain, and might have been clearer if more garbological audits were undertaken to increase the sample size. At present, all that can be said is that that particular “pizza day” was one in which students threw away both a greater amount of garbage (from all

categories) and showed much higher variation by grade as to the total amounts of garbage discarded.

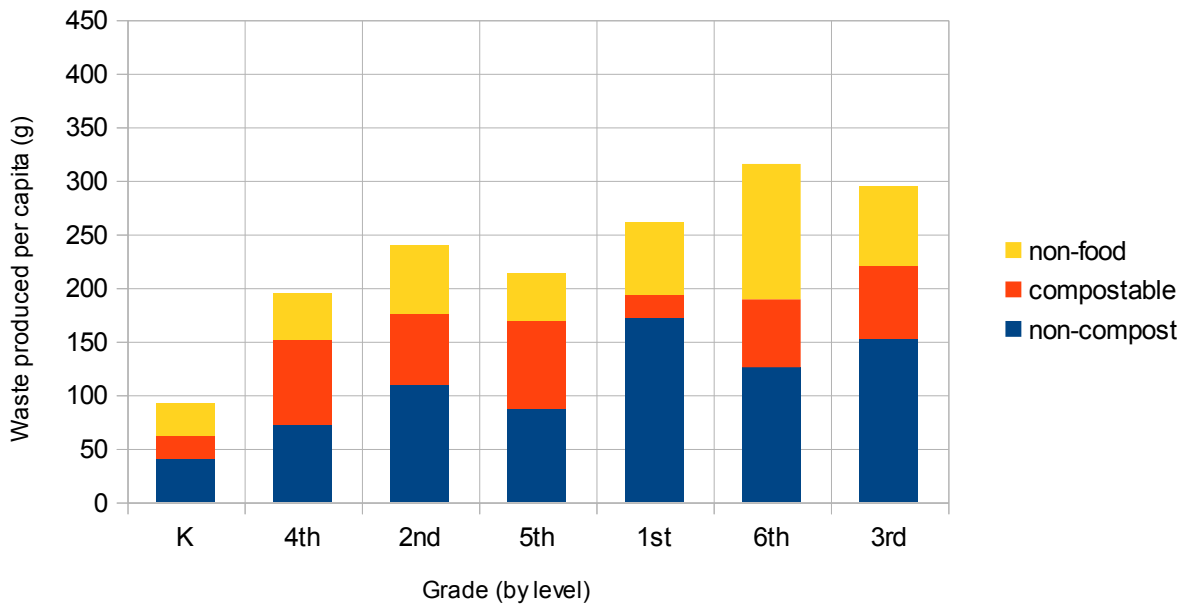
*Table 4: Aggregated Sum of All Audits*

grade	student count		food		non-food	total waste
	total	lunch line	compost	non-compost		
K	191	31	0.66	1.25	0.95	2.85
4	249	53	3.52	3.15	1.91	8.57
2	192	42	2.82	4.56	2.67	10.04
5	263	24	4.25	4.51	2.3	11.07
1	224	44	1.14	9.1	3.57	13.81
6	320	52	2.22	4.39	4.43	11.01
3	234	35	1.63	3.65	1.77	7.05
<b>all</b>	<b>1673</b>	<b>281</b>	<b>16.24</b>	<b>30.61</b>	<b>17.6</b>	<b>64.4</b>
<i>mean of all grades</i>			0.01	0.02	0.01	0.04
<i>median of all grades</i>			2.22	4.39	2.30	10.04
<i>variance of all grades</i>			1.67	5.70	1.37	12.35
<i>standard deviation of all grades</i>			1.29	2.39	1.17	3.51
<i>range of all grades</i>			3.59	7.85	3.48	10.96
<i>coefficient of variation of all grades</i>			133.32	130.43	111.27	91.28
<b>Note:</b> all weights in kilograms (kg)						

Table 4 (above) shows the aggregated sum of all three garbological audits, useful for understanding some basics of the cafeteria waste stream. A key finding is that the mean number of kilograms of garbage (from all categories) discarded by each student was not subject to much variation, it remained around 0.01 kilograms per student. This is likely a low-end figure, thanks to the number of students who bring their own lunches to school, and therefore, do not always discard their packaging in the school’s trash bins, instead carrying their waste home with them. Learning Gate’s “zero-waste policy” requires that students who bring their lunches from home must also take home any leftovers. I attempted to address this gap by using take-home surveys to determine at least some figures as to the amount of this component of the cafeteria’s waste stream, further discussed below under the header “Take-Home Surveys”.

Across all grade levels, non-compostable food waste constituted the largest proportion of cafeteria garbage, both in absolute terms and proportionally per person. This is partly due to the criteria used to separate garbage items by category; non-compostable waste was operationally sorted from compostable food waste by any non-compostable component. Efforts were made to separate compostable components of dishes from non-compostable dishes, but the liquid that collected at the bottoms of each bag was by necessity included in the non-compostable category, thanks to components such as liquid milk and meat-based sauces that are non-compostable by Learning Gate composting guidelines.

Non-food waste, which included packaging, utensils, and inorganic components of food items (e.g., Popsicle sticks), constituted the second-largest category by weight (17.6 kilograms). This included the Styrofoam containers for lunches purchased in the Learning Gate cafeteria and the weight of the plastic garbage bin liners used to collect and transport the cafeteria garbage. Finally, compostable food waste constituted the smallest category of waste (16.2 kilograms) collected from the garbological audits. A more detailed view of these data is in Figure 3.



*Figure 2: Per Capita Figures for Learning Gate Cafeteria Garbage*

Figure 2 represents the weight (in grams) of the three categories of cafeteria waste used throughout these studies, as collected from the garbage bins in the Learning Gate cafeteria. These are not aggregate figures, but rather, per-capita figures calculated in an attempt to determine which grade level produced the most garbage per person, and to elucidate any patterns by age or timing of recess period. As discussed above in the section detailing the results of the participant observation sessions, no clear pattern emerged to support a hypothesis that either student age or whether a student ate lunch before or after recess was a determinant in how much garbage a student generated. However, other factors might contribute towards finding patterns in the garbage discarded from the cafeteria, including (but not limited to) food items served, differences in portion sizes relative to student grade level (if any), and differences in non-eating behaviors among students from differing grade levels (e.g. reading, socializing, and doing homework).

An indeterminate fraction of the garbage in the Learning Gate cafeteria waste stream was

generated by students who brought their own lunches, obscuring the effect of the zero-waste policy on the cafeteria waste stream. School policy dictates that students who bring their own lunches from home take home any leftovers and packaging; however, this cannot be perfectly enforced, and an indeterminate proportion of these students threw away their garbage into the cafeteria waste stream. Furthermore, considerable mixing of liquid and semi-solid components occurred during collection, transport, and sorting, but this does not detract from the overall aims of the garbological audits, which were to provide a set of figures for non-compostable components of cafeteria garbage in order to facilitate optimal scale for the anaerobic digester, as well as to provide a measure of the results of waste-generating behavior for the students.

Initially I was interested in what patterns might emerge related to the ages of students and amount of waste generated, or timing of lunches and amount of waste generated. After considering the variability in the results of the audit data, it is not possible to determine whether a clear pattern emerged to support a hypothesis that either student age or timing of lunch before or after recess was a determinant in how much garbage a student generated. More garbological audit data would be needed to effectively test these hypotheses. However, based on participant observation and other data sets, it does appear that other factors may contribute towards patterns in the garbage discarded from the cafeteria. These include food items served, differences in portion sizes relative to student grade level (if any), and differences in non-eating behaviors among students from differing grade levels (e.g. reading, socializing, and doing homework).

From the participant observation sessions, several other factors arose, including the fact that on Fridays (which are traditionally “pizza days” at the school), a surprisingly large amount of pizza was evident in the garbage cans. Although most students I spoke with mentioned that pizza was one of their favorite food items, it was not clear precisely why so much pizza was

discarded; upon further reflection, it might be that pizza is simply more prominent against the backdrop of packaging waste and non-pizza food waste, similar to Rathje and Murphy's observation that Americans tended to over-estimate the proportions of landfill waste made up by household appliances and food packages (2002:152-154).

However, the figures from the garbological audit listed in Table 3 (above) suggest that a higher proportion of non-compostable food waste was measured on that day (12.59 kilograms versus the 8.8 and 8.21 grams shown in Tables 1 and 2, respectively). Since pizza is not compostable according to Learning Gate guidelines, this could be taken to support my observation that indeed, pizza was a major component of that day's food waste.

#### Take-Home Surveys

Ultimately, 54 out of 300 surveys were returned, constituting a response rate of 18.0 percent. Estimates for the amount of compostable, non-compostable, and non-food items were taken from written descriptions of food items; whole fruits and vegetables were assigned to the category "compostable" along with loose packaged fruits, nuts, and vegetables (which contributed to the non-food item numbers). Food items that did not meet the selection criteria for "compostable" were figured among the non-compostable items. Items which contained packaging or non-food components likely to be discarded were added to the non-food category. It bears repeating here that these figures are estimates by parents of the fraction of food wasted by their children, versus what was packed in the lunch that morning and taken to school, and do not reflect the absolute weights of food items that were gained from the garbological audits. Furthermore, it was not feasible to ask that parents weigh the food at home, since that would require access to an accurate kitchen scale; this requirement would likely have decreased the response rate due to increased respondent burden.

*Table 5: Breakdown of survey responses by number of items listed*

		Mon	Tue	Wed	Thu	Fri
<b>food</b>	<b>compostable</b>	108	116	132	142	131
	<b>non-compostable</b>	133	148	108	117	101
	<b>total</b>	241	264	240	259	232

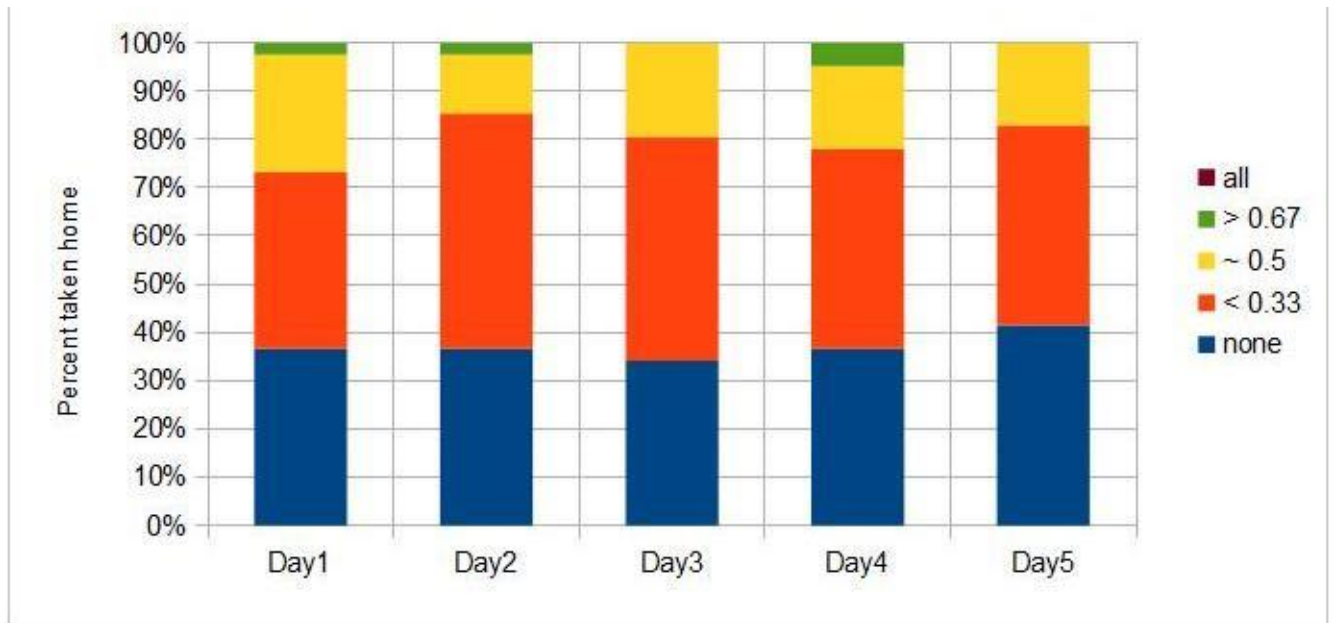
Table 5 (above) shows the division of food items by the three categories used throughout the garbological audits in an attempt to determine what kinds of food were packed for lunch. "Compostable" stands in for "fruits, vegetables, and other items deemed suitable for composting by Learning Gate guidelines", "non-compostable" stands in for all food items deemed unsuitable for composting in accordance with school policies, and "non-food" is a proxy for packaging, disposable utensils, and other inorganic and inedible items packed as part of a student's lunch. The figures in Table 5 are simple counts of responses, owing to the structure of the surveys and the limitations of the method.

While these data reflect rough proportions of items taken home as leftovers and discarded, the responses constitute nominal data only and cannot be readily compared with the results from the garbological audits. However, they are worth reporting, since they represented an attempt to account for the "gap" in cafeteria waste data, as student remove waste from the school's waste stream and add it to their household waste stream, as a result of Learning Gate's zero-waste policy and its requirement that students who pack their lunches bring leftovers home.

The number of participants who indicated that their child brought their lunches to school on the particular day in question was consistent throughout the week, with the exception of Friday, when a significant enough number of respondents did not bring their lunches to school. A likely explanation of this discrepancy lies in the fact that Friday is "pizza day." The fact that Fridays are frequently half-days at the school could also contribute towards explaining the lower figures for students who bring their own lunches, as well as the slight increase in the proportion

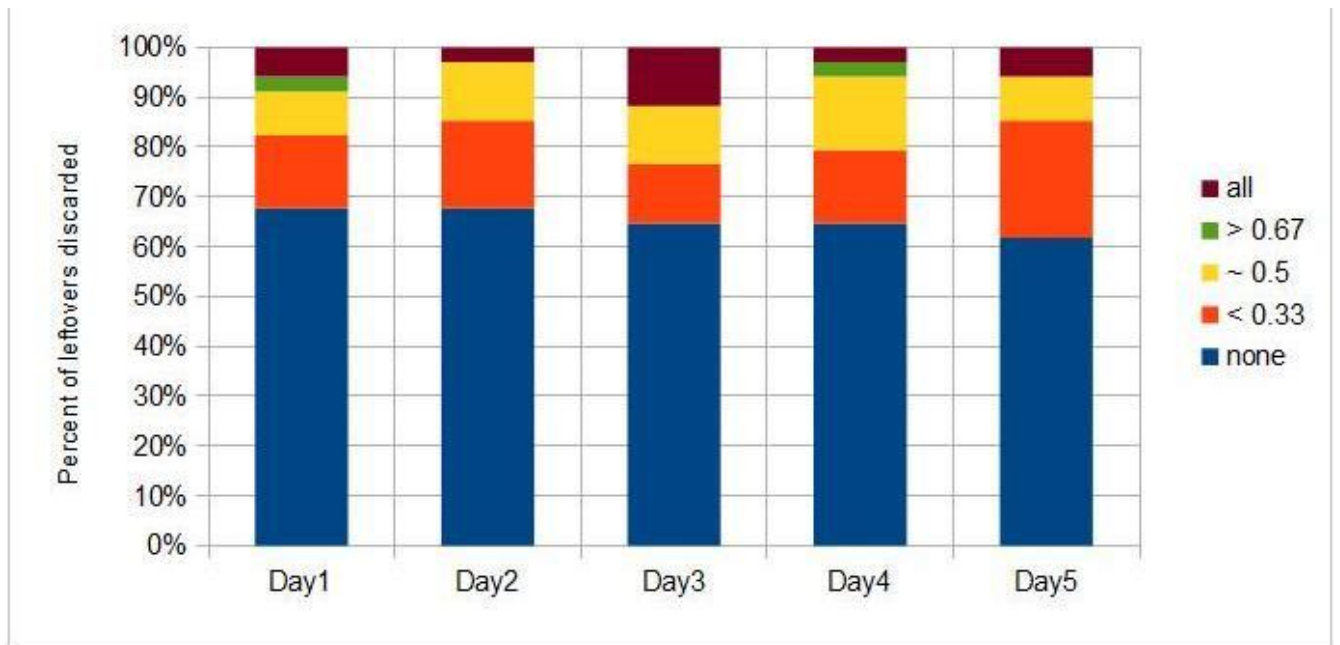


of food items discarded as part of leftovers as shown in Figure 3 (below).



*Figure 3: Percentage of total lunches taken home each day as leftovers*

Figure 3 (above) shows the percentages of responses to the question, “Based on what your child brought to school, what portion was taken home as leftovers?” The two most frequent answers on all days were either “none” or “less than one-third.” As a proportion of what was packed for lunch on each day in question, more food was brought home as leftovers than was eaten during lunch time, though there is no clear day-by-day pattern to how much was taken home.



*Figure 4: Percent of leftovers discarded*

Figure 4 (above) breaks down the responses to the question, “Based on what was taken home as leftovers, how much was ultimately discarded?” These figures are based on simple counts of items listed and categorized by the criteria listed above. Overwhelmingly respondents tended to indicate that none or less than one-third of a particular food item brought home as leftovers was ultimately discarded.

While this cannot be taken to be as accurate or reliable as the weights measured through the garbological audits, it at least constitutes an attempt to capture the degree to which Learning Gate’s leftovers policy influences the cafeteria waste stream. However, even if the take-home surveys included a provision for weighing the food items listed (instead of having parents estimate the fraction wasted), these figures still might not be entirely comparable, since I frequently observed students who brought their lunches from home throwing packaging and unfinished food into the cafeteria garbage cans. To what extent this suggests that unfinished food

items from lunches end up in the cafeteria waste stream is unknown; it is just as likely that the disproportionately high number of responses at the low end of the scale might be either due to many items from lunches having simply not been taken home (whether eaten at other times than lunch periods or at home or discarded during lunch periods) or to limitations arising from being unable to determine the weight or volume of the food items listed in the garbological audit results (Tables 1 – 4, above).

Analysis of the types of items parents (or kids) pack for lunches from home can shed some insight into the types of waste that are typically generated. I divided items listed on surveys by parents by the three categories used throughout the garbological audits, in an attempt to determine what kinds of food were packed for lunch. "Compostable" refers to "fruits, vegetables, and other items deemed suitable for composting by Learning Gate guidelines", "non-compostable" refers to all food items deemed unsuitable for composting in accordance with school policies, and "non-food" is a proxy for packaging, disposable utensils, and other inorganic and inedible items packed as part of a student's lunch. These results are presented in Figure 5.

This is informative because it allows greater insight into what proportion of waste brought home by Learning Gate students might be potentially compostable at home and what consists of waste likely to end up in the landfill. Compostable waste brought home is at best a rough estimate, however, it appears that only 1/3 of the waste or leftovers would be compostable.

Broadly, the parent survey results suggest the following trends:

1. That throughout the week, the proportion of food items not discarded was more or less constant (although on Fridays a slightly higher proportion of food was consistently discarded).

2. Of that which was discarded, very little of what was packed was thrown away entirely (eg. Leftovers were eaten at home with little thrown out or added to the waste stream of the household).
3. The majority of what was discarded was at least partially eaten.

### Semi-Structured Interviews

The results of the interviews with Learning Gate students are presented below, with quotations where appropriate. In order to facilitate ease of reading and to ensure that confidentiality was maintained, I elected not to use real names, assigning participants code numbers instead. This was necessary, given both the small size of the school and the status of the participants as minors. While the viewpoints discussed below should not be taken as generalizable to all schools or even all charter schools with environmental foci, they are nevertheless noteworthy and contribute towards answering research questions posed in this research.

I formally conducted six interviews with students: one from the third grade (male), two from fourth (one male, the other female), two from fifth (both female), and one from sixth (male). These students were selected with the approval and assistance of teachers, and interviews were conducted during recess periods, since the teachers and I agreed that this would be the least-disruptive time in which these interviews could take place. Below are the results of the six interviews undertaken.

### Timing of lunch and recess periods

When respondents were asked about the timing of lunch periods, two indicated that their recess periods were typically before their lunch periods, while the other four indicated that theirs

were after lunch. Since Learning Gate classroom activities frequently include a significant outdoor component, students enjoy far more opportunities for physical activity and play than those in many other elementary schools, so the effect of having recess before or after lunch is somewhat lessened. It is worth noting that of the four who indicated that their recess periods followed their lunch times, three remarked that they frequently did not feel hungry during lunch time.

One respondent, whose recess period came after lunch time, had the following to say: “I’m usually hungry when it’s time for lunch, but if I eat too much, when it’s time for recess, I can’t run around. I feel sick if I do that. That’s only when I eat too much, though; most of the time I can eat and have no problem, but sometimes I get sick to my stomach.”

While all respondents agreed that throwing away food was a problem and to be avoided, most explained their views in terms of the "disgust" factor inherent in rotting food waste more so than other rationales (e.g., economic and environmental impact or socio-economic inequality). When asked about environmental problems as a follow-up to the food waste questions, many respondents listed cars and household garbage as prominent contributors to environmental damage, but did not specifically mention food waste as a major component of household garbage.

#### Use of time during lunch periods

Supporting the observations of the cafeteria conducted during the garbological audits, five out of six of the respondents indicated that they frequently used lunch periods for activities other than eating. Activities such as socializing with classmates and reading figured prominently, but rarely to the exclusion of eating lunch. Only two respondents indicated that they unintentionally left meals

unfinished because they did not have enough time to eat them, supporting the findings of the participant observation sessions described at the beginning of this chapter. However, being that the participant observation phase was more to support the garbological audits in order to provide accurate figures for the engineering team, it was not practical to conduct time studies for comparison with the literature (Bergman et al 2002, Conklin and Lambert 2004).

### Waste Behaviors

While all respondents admitted to throwing away at least some food, only one (6<sup>th</sup>) estimated his fraction of food thrown away to be less than half, and only infrequently. When probed further into the reasons for discarding food, he replied: “Sometimes I'm not hungry when it's time to eat, so I eat a little bit --- because I know I'll be hungry later --- but can't finish it all. Sometimes when I leave it for later, I forget about it, and by the time I remember it, it's gross and I have to throw it away.”

The students at Learning Gate spend much of their days in a structured and often rushed environment, hindering the sort of planning necessary to minimize waste in one's life. Through my observations in the cafeteria and conversations with students and faculty, it is apparent that the boundaries between meal times and times designated for other activities are often blurred in the course of one's day. Frequently, leftovers are kept with the best of intentions to eat them at a later time, but unanticipated exigencies arise, which of course confounds even the best intentions. A more extended discussion of the research findings from the waste audits, participant observation, and surveys is found in Chapter Five.

## Chapter Five: Discussion and Conclusions

In this discussion chapter, I return to my original research questions and summarize how and to what extent this project contributed toward their answers. Before addressing them one by one, I restate them below:

1. What views and practices concerning food waste are evident at Learning Gate, particularly in light of its zero-waste policy?
2. Are self-reports of waste behaviors reliable sources of data from which conclusions about the waste disposal habits and norms of a given population can be drawn?
3. What, from the perspectives of Learning Gate students, is the extent to which food is discarded, particularly relative to other types of refuse?
4. What is the composition and volume of waste produced by the cafeteria at Learning Gate, particularly the component of food waste unsuitable for composting or feeding to livestock? Furthermore, can these these data be effectively measured and used in applied contexts to inform and guide interdisciplinary research teams to address issues of food waste?

Concerning the first question, (“What views and practices concerning food waste are evident at Learning Gate?”) from the interviews and observations undertaken, I would state that most students take at least some steps to minimize their food waste, if even only in compliance with the existing zero-waste policy. As discussed above in the results chapter, some students seem to enjoy the methods by which waste is disposed of more than source reduction; recall the anecdote about the student who took a bite of an apple and then immediately discarded it into the

compost.

In order to answer the second question (“How reliable are self-reports of waste behavior?”), I would agree with Rathje and Murphy (1996:53-80), in that self-reported estimates of the quantity and composition of one's own waste stream are unreliable, particularly when there exists even a slight degree of social pressure to refrain from indiscriminate discarding of material. This is where the triangulation of ethnography and garbology is particularly powerful, since while self-reported estimates are unreliable, merely examining the composition and volume of a garbage can cannot tell as complete a story about the habits and perceptions of those who disposed of the material in the first place. Finally, although I initially intended that the garbological audits and take-home surveys would provide a more complete picture of the total food waste footprint of the Learning Gate student population, it became evident that the two data sets were unable to be effectively compared to one another, given that I could not guarantee the same degree of accuracy from respondents as I could through empirical measurement. Several factors contributed to the lower reliability of the surveys: (1) the fact that amounts of food discarded were necessarily expressed as fractions of total volume rather than absolute weights, (2) the fact that these surveys relied entirely on self-reported patterns of behavior, and (3) the fact that these surveys were not completed at the same time as the garbological audits. That last factor was perhaps the greatest drawback to my research design; I did not anticipate that I would continue receiving surveys as much as a month past the conclusion of the garbological audits.

Addressing the third question (“How much food do Learning Gate students think is wasted?”), most would agree that some quantity of food is discarded without having been eaten, but students were unable to accurately estimate the proportion of food wasted, except in very broad fractional terms (such as “less than one-half”). Therefore, I do not believe I can answer



this question fully, primarily since cafeteria garbage was intermingled non-compostable food waste and non-food waste in general, students were unable to provide estimates for the amount of food waste generated compared to non-food waste. This is in line with one of Rathje and Murphy's major points, that individuals tend to drastically over-estimate more prominent items (such as diapers and appliances, in the case of Rathje's informants), when indeed empirical measurement of the composition and volume of landfill waste confirm that such visually-prominent items constitute only a small proportion of actual garbage generated, both by weight and by volume (Rathje and Murphy 1996:151-170).

Finally, to answer my fourth question ("Can reliable figures for food waste be determined?"), I can say that the figures arrived at through the garbological audits were relatively accurate, thanks to the fact that:

- 1) I could reliably capture almost all of the garbage discarded in the Learning Gate cafeteria through careful monitoring and timely collection of garbage bags from all waste bins in the cafeteria
- 2) The scale used to measure the weight of the garbage samples was accurate to a tenth of a gram,
- 3) The garbological audit team was careful to exclude the weight of garbage bags and weighing containers when measuring the volume of garbage samples.

Meanwhile, confounding factors included (but were not limited to):

1. Mixing of garbage discarded between grade levels, as more than one grade level was typically present in the cafeteria at one time
2. The exigencies of conducting a garbological audit in the sometimes-chaotic environment

of a school cafeteria, particularly the necessity to coordinate between team members who might be called upon by cafeteria staff and students to assist with other tasks, such as clean-up of spilled food

3. The fact that individual classes sometimes held their lunch periods in settings other than cafeterias, disposing of their garbage in non-designated bins nearby. However, for the purposes of the project, the figures generated were accurate enough to optimize the scale and design of the anaerobic digester, which, after all, was only intended to be one intervention among many to enhance Learning Gate's zero-waste policy.

This was an important rationale for planning and executing the garbological audits, since if the digester's volume was insufficient to handle the cafeteria's non-compostable food waste stream, there would still be a portion of the waste stream composed of food, and if it were designed to be too large, feedstock would have to be introduced to keep the population of the bacteria in the fermentation chambers fed.

Nevertheless, despite the problems inherent in obtaining reliable food waste figures from these garbological audits, I feel that the figures were useful to the engineering team, particularly since they contributed to the successful scaling of the digester to an appropriate volume. Furthermore, it is surprising just how little waste was generated from the cafeteria overall; at the end of the day, the entire volume of garbage from the cafeteria fit into two standard 55-gallon garbage bags and never exceeded 26 kilograms (54.6 pounds) for nearly 600 students.

However, the data from the garbological audits and the take-home surveys are not comparable, for a number of reasons, not the least of which is that the garbological audits relied on weights and the take-home surveys relied on self-reported estimates of food waste by fraction.

As pointed out by Rathje and Murphy (2002), among others, self-reported estimates of nearly anything asked of informants are at best unreliable and at worst bear no resemblance to the actual realities uncovered through other means of gathering data.

### Limitations

Limitations of the implementation of the garbological audits mostly lie in the labor-intensive nature of the method, making it difficult to do more than the number of audit sessions completed. This contributed to the variability of the data, but since no significant problems were encountered towards the primary goal (i.e. deriving an average throughput of digestible food waste), the only significant drawback of this limitation was in its applicability towards generalization of these waste figures for Learning Gate.

Part of this was mitigated by choosing different days of the week, especially the one session conducted on a Friday, which was a regularly scheduled "pizza day". This was important, since pizza was listed in the interviews as among the most favored food items by students. However, on the one garbological audit conducted on a Friday, significant amounts of pizza were found in the garbage, despite the degree to which students favored pizza over other lunch offerings. But nevertheless, owing to the unique practices of Learning Gate, particularly in its zero-waste policy, generalizability to other public schools in the United States is limited.

Additionally, given constraints of time and attention, the participant observation conducted before and during the garbological audits made it difficult to determine the proportion (if any) of students who brought lunches from home but supplemented their lunches with items purchased à la carte from the lunch line. The take-home surveys confirmed this suspicion, but it is difficult to infer a precise figure for the percentage of students who did so. Future studies that employ garbological audits in conjunction with ethnographic methods are better left to dedicated

research teams than individual researchers, owing to the labor-intensive nature of garbological methods.

### Comparison with the literature

The literature suggested several definitions of waste, including waste as the material manifestation of disorder and "dirtiness" (Douglas 1966, Hawkins 2006) the specific configurations of waste behaviors as a proxy for socio-economic affluence and status suited to analysis through the lens of practice theory (Thomas 2012), and a material phenomenon subject to differing valuations by different people (Drackner 2005). The primary aim of this research was not to arrive at understandings of what people called "waste", but this question is relevant, since categorizations of waste affect both the implementation of policy from the "top-down" and the individual manifestations of waste-related behaviors.

As stated previously, one confounding factor to self-reported estimates of garbage generated by individuals and groups was the fact that certain categories of visually-prominent or socially-deprecated materials were largely either over- or under-estimated. Perhaps the best example is how the Tucson Garbage Project's breakdown of municipal landfills showed that individuals who were asked to estimate the percentages by weight of particular categories of garbage --- specifically construction debris, appliances, packaging --- consistently listed estimates significantly higher than the figures of the same landfills measured by the personnel of the Garbage Project. Meanwhile, other categories of waste showed interesting patterns; individuals could more-or-less accurately estimate the amount of "illicit" materials, such as beer cans, cigarette packs, and junk food, while significantly underestimating the amounts they themselves discarded (Rathje and Murphy 1996:151-170).

This can be at least partially explained by practice theory, particularly how individuals

negotiate the material and the social. Of particular interest is the recent resurgence of the interest in day-to-day “inconspicuous” consumption (Shove and Warde 1998) in response to critiques of consumption studies focusing on total systems (Wilk 2002, Halkier 2011). For instance, the Styrofoam lunch containers in which meals purchased from the cafeteria were delivered stood out visually against the undifferentiated mass of food waste in a typical garbage bag, but as a proportion of total garbage by weight and volume, actually amounted to a very small contributor to the cafeteria's total waste stream.

This brings to mind a finding of Rathje and Murphy (2002), in which informants consistently over-estimated the amount of packaging and household appliances in municipal landfills, primarily because these items were both commonplace and visually distinct from most other types of garbage. Furthermore, this constitutes a major limitation of take-home waste surveys, since parents might consider food waste to be “illicit,” and so under-estimate the degree to which they or their children discard food, in line with the ways in which the Tucson Garbage Project’s informants mis-estimated their own disposal of alcohol containers and junk food.

The above point about mis-estimation of certain categories of waste might be in part better explained by the fact that waste is simply ubiquitous and undergirds everything human beings do from day to day (Hawkins 2006). It is difficult to rely on self-reported data about food waste from informants, since everybody eats, and most everybody in the United States eats every day. The sheer ubiquity of food and the frequency with which human beings interact with food makes it very difficult to accurately estimate how much is eaten and discarded, especially considering that food is not only consumed during meal times, but also at intervals throughout the day outside of formal meal times.

The effectiveness of the zero waste policy is facilitated by the fact that Learning Gate

lacks one major source of food waste by virtue of its not having a certified kitchen on-site, which pushes much of the waste further up the supply chain to the kitchens of the businesses with which Learning Gate has catering arrangements. While this means that Learning Gate produces relatively little garbage relative to similarly-sized institutions (Stuart 2009:131, Gunders 2012), the extent to which this reduces the amount of garbage produced *somewhere* is beyond the scope of this project, and therefore indeterminate.

Furthermore, while garbological audits in conjunction with ethnographic methods are an effective means of determining the volume and composition of an institution's waste stream, their effective employment is hampered by the necessity of coordinating with numerous parties, including (but not limited to) assistants, administrators, students, and cafeteria staff.

Furthermore, the extent to which garbological audits influence the type and amount of items disposed of is unknown, but probably non-negligible; students were aware of my activities and purpose for being there, to the extent that I was known as the "garbage man". It is difficult to imagine that my presence did not have some effect on students' activities.

Moreover, one of the secondary goals of the project was to address the beliefs and perceptions students at Learning Gate had on topics intersecting with the school's curriculum, particularly the environmental detriments of garbage. Ample literature exists from Rathje (1986) on (Molander and Lenihan 2007, Bloom 2011, Evans 2011a) documenting ethnographic subjects' difficulty in perceiving their own waste behaviors as less inaccurately as they do those of others. However, I do not believe I have adequately come up with a picture of the perceptions of students, apart from the fact that they by and large do not find these policies entirely remarkable. Perhaps this is because they are just "following the rules" at their school and don't have other experiences to compare them to. This limitation primarily is due to the small number of

interviews conducted (n = 6), and the design of the interviews themselves, which focused mainly on garnering background information to support the garbological audits and take-home surveys. This problem could be addressed through future research by comparing a traditional school cafeteria's waste stream with that of Learning Gate school as well as comparing their perceptions of waste in general.

The insights into the perceptions and beliefs of students described here are supported by participant observation during the implementation of the garbological audits (100 hours). The project could have been much improved by taking a "bottom-up" view for research design, first interviewing individual students to better understand their perceptions, and then following up after the conclusion of the project to see if anything has changed. As of present, no plans exist to follow up, owing to the gap of time since this writing and the conclusion of this research. However, findings and the thesis will be shared with Learning Gate Community School and they may be able to build upon the conclusions.

### Potential Applications

One of the initial goals of POW3R was to seek out a non-charter public school in order to replicate this project and compare the differences in curricula and practice; this proved to be impracticable and overly ambitious in the time frame of an MA project, but by no means is this possibility closed off in the future. As of this writing, I am unaware of any other anthropological research project that combined garbology with an active intervention involving the design and testing of an anaerobic digester to capture a portion of the food waste stream of a school cafeteria, representing a promising new direction for applied anthropologists interested in conducting interdisciplinary research in environmental and educational settings.

Furthermore, since the digester was constructed with a budget of less than a thousand

dollars, potential exists to pursue such applied research in developing countries, where the anthropological toolkit of ethnographic methods could multiply the effectiveness of interventions long considered mostly the domain of technical and medical experts. This project is also very scalable; ours was perhaps the smallest scale at which the confluence of garbological audits, ethnographic investigation, and technical intervention could take place, but such a project could be easily applied to communities and municipalities at minimal cost.

Moreover, while this project was not necessarily informed by the perspectives of practice theory from the beginning (being more oriented towards the practical support of an engineering project), an intriguing direction for future inquiry into consumption and waste behaviors could do well to incorporate some recent work from the perspectives of practice theory, particularly that relating to food consumption (Halkier et al 2011). Much of consumption studies has been criticized for underemphasizing theory (Wilk 2002), primarily owing to its relative “invisibility” relative to other topics of inquiry until the 1970s (Strasser 2009:13). The very breadth and depth of waste, as the “material shadow” of all human activity (Hawkins 2006:ix) demands by its very nature a multi-disciplinary approach, since waste underlies everything and as such, everyone has a different definition of what it is and why it might be a problem (Drackner 2005).

Some potential specific points of inquiry come to mind. While the investigation of institutions, such as schools, is amenable to ethnographic methods, effectively understanding its waste footprint from a “whole-systems” perspective rapidly becomes an exercise requiring immense logistical coordination between stakeholders. These include school administrators, staff, teachers, parents, and students, as well as researcher personnel. A research team was necessary, as was discovered in the process of carrying out the project. Those interested in investigating questions of waste might consider focusing on smaller aspects of the system.



Considerable literature already exists concerning the disposal of waste at the household level (Evans 2011a, 2012b, Wilk and Rathje 1992), at universities (Burr et al 2003, Molander and Lenihan 2007, Jones et al 2008, USF STARS 2010), and nationwide (Bloom 2011, Gunders 2012), but potential is ripe to expand consumption studies beyond global systems and down to the level of institutions and individuals, where questions relating to the “whys” of waste can be more effectively addressed (Wilk 2002).

Finally, potential exists for the expansion of this project within educational settings. Learning Gate was a particularly welcoming environment for our research, thanks to its close ties with the University of South Florida and its status as a charter school, but as food waste becomes an increasingly prominent issue (O'Brien 2007, Wilk 2009, Thomas 2012), the role of applied research in educational settings with the goal of contributing to the development of curricula to educate future generations in the importance of minimizing waste is likely to follow suit. After all, waste is not only a wide-open frontier for anthropological inquiry (particularly its applied and multi-disciplinary tracks), but also a pressing question now and in the century ahead, when the environmental impacts of profligate disposal have already begun to negatively impact human societies (Barbalace 2003, Bloom 2011, Wilk 2009).

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### **Appendix A: Interview Instrument**

1982 Broken Windows: The police and neighborhood safety, The Atlantic.

WRAP (Waste and Resources Action Programme)

2011 New Estimates for Household Food and Drink Waste in the UK.



	<u>Question</u>	<u>Response (circle one response per question)</u>	<u>Instructions</u>
<b>1</b>	Do you usually bring your lunch from home?	Yes No Not applicable — I don't eat lunch	If yes, proceed to 2a If no, skip to 2b End interview
<b>2a</b>	How often do you bring your lunch from home?	Sometimes (1-2 times/week) Most of the time (3-4 times/week) Always (5 times/week)	Proceed to 2c
<b>2b</b>	How often do you get your lunch from school?	Sometimes (1-2 times/week) Most of the time (3-4 times/week) Always (5 times/week)	Proceed to 2c
<b>2c</b>	What things do you normally have in your lunches?	(free-list)	Proceed to 2d
<b>2d</b>	What are some of your favorite food items?	(free-list)	Proceed to 3
<b>3</b>	Do you normally feel hungry at lunch time?	Yes No	If yes, proceed to 3a If no, skip to 4
<b>3a</b>	How often do you normally feel hungry at lunch time?	Sometimes (1-2 times/week) Most of the time (3-4 times/week) Always (5 times/week)	Proceed to 4
<b>4</b>	Apart from eating lunch, what other things do you do during lunch time?	(free-list)	Proceed to 5
<b>5</b>	Do you think throwing away food is a problem?	Yes No	If yes, skip to 5a If no, skip to 6
<b>5a</b>	Why is throwing away food a problem?	(open response)	Proceed to 5b
<b>5b</b>	How big of a problem is throwing away food?	A little bit of a problem A pretty big problem A huge problem	Proceed to 5c
<b>5c</b>	What can we do to lessen the amount of food thrown away?	(free-list)	Proceed to 6
<b>6</b>	How much food do people usually throw away?	Only a little of their food Some of their food A lot of their food	Proceed to 6a
<b>6a</b>	What kinds of food do people normally throw away?	(open response)	Proceed to 7a
<b>7</b>	What do your teachers tell you about throwing food away?	(open response)	Proceed to 7a
<b>7a</b>	What do your parents and family tell you about it?	(open response)	Proceed to 7b
<b>7b</b>	What about your friends? What do they think?	(open response)	Proceed to 8
<b>8</b>	Is there anything else you would like to share with me about food at Learning Gate?	(open response)	End

### Appendix B: Participant Observation Timing

time	action	count
10:45	count Kindergarten as they come in	
10:50	count Kindergarten at lunch line	
10:55	count 4th Grade as they come in	
11:00	count 4th Grade at lunch line	
11:05	count trays at Kindergarten tables	
11:15	count trays at 4th Grade tables	
11:20	count 2nd Grade as they come in	
11:25	count 2nd Grade at lunch line	
11:30	count 5th Grade as they come in	
11:35	count 5th Grade at lunch line	
11:40	count trays at 2nd Grade tables	
11:50	count trays at 5th Grade tables	
11:55	count 1st Grade as they come in	
12:00	count 1st Grade at lunch line	
12:05	count 3rd Grade as they come in	
12:10	count 3rd Grade at lunch line	
12:15	count trays at 1st Grade tables	
12:25	count trays at 3rd Grade tables	
12:35	count 6th Grade as they come in	
12:40	count 6th Grade at lunch line	
12:55	count trays at 6th Grade tables	

	Begin	End
K	10:45	11:15
4	10:55	11:25
2	11:20	11:50
5	11:30	12:00
1	11:55	12:25
3	12:05	12:35
6	12:35	1:05

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix C: Take-Home Survey Instrument



Dear Participant:

My name is Steven A. Williams and I am a graduate student at the University of South Florida. As part of my thesis research and final project I am examining the habits and perceptions of discarding food items at Learning Gate Community School's cafeteria. Because you are a parent or legal guardian of a student at Learning Gate, I am inviting you to participate in this research through completing the attached log sheet, which is intended to complete an ongoing study of the type and quantity of garbage produced by the school's cafeteria.

The log sheet will require that you track the type and approximate amount of food brought home by your child or children, and will at most require fifteen (15) minutes a day to complete over the course of one school week (five days). The school has agreed to allow you to fulfill up to two (2) parent volunteer hours in exchange for your participation and completion of this log sheet. No known or foreseeable risk is anticipated as a result of your participation in this study, and no personally identifiable information will be kept or published as part of this study. Responses to this survey will be entirely unknown to me (the researcher); however, Learning Gate will need to know whether you completed the log sheet in order to credit you with volunteer hours.

If you choose to participate in this study, please refer to the section titled **Log Sheet Instructions** on the following pages and fill out the log sheet as completely and honestly as possible. When completed, please send the response in the stamped envelope provided to **1703 E. Fern St. Tampa, FL 33610**. Participation is strictly voluntary and you may refuse to participate at any time.

Thank you for taking the time in participating in this study. The data collected will provide useful information regarding habits and perceptions of discarding food in school or other institutional settings and will contribute to existing and future zero-waste initiatives. Completion and return of this questionnaire will indicate your willingness to participate in this study, but if you have questions or would like a summary copy of this study, please contact me (the principal investigator) at [sawilli2@mail.usf.edu](mailto:sawilli2@mail.usf.edu).

Sincerely,

**Steven A. Williams**  
MA Student (Applied Anthropology)  
University of South Florida  
(813) 451-5620  
[sawilli2@mail.usf.edu](mailto:sawilli2@mail.usf.edu)

### **Log Sheet Instructions**

The log sheets on the following pages are intended to record foods prepared for your student or students and track the portion of food brought home and ultimately discarded. An example of a fully filled-out log is included on the first page of the log sheets (titled "Example"). The time per day to complete these logs should not exceed fifteen minutes, and is meant to cover five days of lunches prepared and brought to the school by your child or children.

#### *Instructions by Column*

##### Type of food prepared

Under the column "Type of food prepared", please write briefly each course or food item included in your child or children's lunches.

##### Amount brought home

Under the column 'Amount brought home' please indicate the approximate proportion of each item listed from your child or children's lunches brought home by checking off one of four options:

- (1) none (that is, the item or course was fully eaten with no left-overs)
- (2) less than half
- (3) more than half
- (4) all (that is, nothing of the item or course was eaten).

##### Amount discarded

Under the column 'Amount discarded', please indicate which proportion of any leftovers was ultimately thrown away without being eaten. For instance, if you prepared a sandwich for your child, he or she ate half of it at lunch, brought home the other half, and ultimately threw the left-overs away, then you would check 'more than half' under 'Amount brought home' and 'all' under 'Amount discarded'.

##### Reasons discarded

Under the column 'Reasons discarded' please briefly provide a reason (if any) for the disposal of the food item in question. Potential reasons include (but are not limited to) spoilage, staleness, or because your child finds the item disagreeable.

If you have any questions about the instructions provided, or the log sheets on the following pages, please email or call me (Steven A. Williams, principal investigator of this study) at [sawilli2@mail.usf.edu](mailto:sawilli2@mail.usf.edu) or (813) 451-5620.

Example

Type of food prepared (list below)	Amount brought home (check one)				Amount discarded (check one)				Reasons discarded (write below)
	none	less than half	more than half	all	none	less than half	more than half	all	
Peanut butter and jelly sandwich	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	went stale
Apple slices	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	spoiled
Potato chips	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Juice box	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
String cheese	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ate rest at home
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Day 1

Type of food prepared (list below)	Amount brought home (check one)				Amount discarded (check one)				Reasons discarded (write below)
	none	less than half	more than half	all	none	less than half	more than half	all	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Day 2

Type of food prepared (list below)	Amount brought home (check one)				Amount discarded (check one)				Reasons discarded (write below)
	none	less than half	more than half	all	none	less than half	more than half	all	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Day 3

Type of food prepared (list below)	Amount brought home (check one)				Amount discarded (check one)				Reasons discarded  (write below)
	<i>none</i>	<i>less than half</i>	<i>more than half</i>	<i>all</i>	<i>none</i>	<i>less than half</i>	<i>more than half</i>	<i>all</i>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Day 4

Type of food prepared (list below)	Amount brought home (check one)				Amount discarded (check one)				Reasons discarded  (write below)
	<i>none</i>	<i>less than half</i>	<i>more than half</i>	<i>all</i>	<i>none</i>	<i>less than half</i>	<i>more than half</i>	<i>all</i>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Day 5

Type of food prepared (list below)	Amount brought home (check one)				Amount discarded (check one)				Reasons discarded  (write below)
	<i>none</i>	<i>less than half</i>	<i>more than half</i>	<i>all</i>	<i>none</i>	<i>less than half</i>	<i>more than half</i>	<i>all</i>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	