

UNIVERSITY OF EDUCATION, WINNEBA
COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

**ASSESSING STUDENTS' FOOD WASTING BEHAVIOUR IN THE DINING
HALLS OF SECOND CYCLE SCHOOLS IN THE KUMASI METROPOLIS**



**A Dissertation in the Department of Catering and Hospitality, School of Technology
submitted to the School of Graduate Studies, University of Education, Winneba, in
fulfillment of the requirement for the award of Master of Philosophy Degree in
Catering and Hospitality.**

FEBRUARY, 2021

DECLARATION

STUDENT'S DECLARATION

I, Charlotte Caitoe declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE.....

DATE.....



SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis/dissertation/project as laid down by the University of Education, Winneba.

Signature.....

Date.....

DR. MRS. LOUISE ELLEN FAGBEMI OLU

DEDICATION

This thesis is dedicated to the loving memory of my mother, Mrs. Beatrice Caitoe.



ACKNOWLEDGEMENT

My sincere gratitude goes to my supervisor, Dr. Ellen Loise Olu Fagbemi whose guidance, correction, and suggestion has helped me enormously to come out this thesis. Really, you have been amazing and an inspiration.

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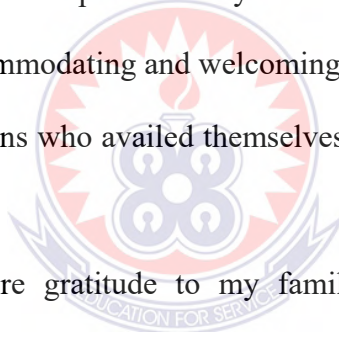


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ABSTRACT

The associated economic, social and environmental impacts of food waste have become a focal point of interest in research. With the introduction of the Free Senior High School Policy, it is anticipated that students' enrolment at school will keep increasing and in order to adequately feed and nourish the student's population, it is important to evaluate the factors associated with the food wastage behaviour of these students. To achieve this, it is imperative to investigate the behavioural causes of food waste among students in second cycle schools. The descriptive research design involved the survey of 578 students and 3 matrons sampled from some selected Senior High Schools in the Kumasi Metropolis. Questionnaire and an interview were conducted with respondents sampled through a multistage sampling method. Reliability test, convergence validity, and discriminant validity were assessed by running confirmatory factor analysis in Amos (v.23). The coefficients of the hypothesized paths were ascertained by running structural equation modelling (SEM). The study concludes that, perceived food quality, perceived behavioural control, and subjective norm, all had a direct positive effect on students' attitude towards food waste. Perceived food quality was also found to have had a direct positive effect on perceived behavioural control and subjective norm. Finally, perceived behavioural control and subjective norm were found to partially mediate the relationship between perceived food quality and students' attitude towards food waste.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Food waste has become a focal point of interest in the media, research and business. The estimated food waste globally is about 1.3 billion tons per year (FAO, 2014). About 30% to 50% of produced food end up as waste and this clearly shows that scarce resources are inefficiently allocated (Wang, Xue, Xiaojie, Shenkui, & Gang, 2018). The United States Department of Agriculture's (USDA's) National School Lunch Program serves 30 million kids every school day, however, the program also wastes about 5 million worth of edible food every school day. This amounts to 1.2 billion dollars in losses per school year (Bloom, 2018).

Starovoytova and Namango (2018) suggest high share of food waste (37%) occurs in Kenya Universities which is attributed to the fact that meals sold to students are at very low prices and highly available. Their study reports that students take large portions and discard most of the food provided to them at the canteens. They further stated that the situation calls for a change in behaviour. Quested, Marsh, Stunell, and Parry (2013) asserted that food waste is generally the result of multiple behaviours that are performed over time and this complexity of behaviour at different time points increases the likelihood of waste. A report by the Chefs for Change Ghana Foundation (CFCG), a non-profit food organization revealed that over 45% of food in Ghana goes uneaten (Ghana Web, 2017).

Food losses and food waste have been recognized widely as the main barrier to attaining global sustainability (Wang et al., 2018). Growing attention to food loss and waste is

considered in the Sustainable Development Goals (SDGs). SDG Target 12.3 calls for halving per capita global food waste at the retail and consumer levels and reducing food loss along production and supply chains (including post-harvest losses) by 2030. Reducing food loss and waste also has the potential to contribute to other SDGs, including the Zero Hunger goal (SDG 2), which calls for an end to hunger, the achievement of food security and improved nutrition, and the promotion of sustainable agriculture. The expected positive environmental impacts from reducing food loss and waste would also affect, among others, SDG 6 (sustainable water management), SDG 13 (climate change), SDG 14 (marine resources), SDG 15 (terrestrial ecosystems, forestry, biodiversity), and many other SDGs.

Food loss and waste decrease the quantity or quality of food along the food supply chain. Food loss result in a decrease in the food supply which is intended for human consumption at all stages of the food chain. Food loss occurs at the production, harvest, post-harvest, processing stages and at the table, and it must be reduced to create a sustainable food supply chain (Papargyropoulou, Lozano, Steinberger, Wright, bin Ujang, 2014; Kummu et al, 2012).

Definitions of food loss and waste are not universal. In general, food loss encompasses the reduction in the edible food dry mass or nutritional value across the food supply chain (growing, harvest, processing, production, storage, transport and distribution). Food waste refers to food for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil (FAO, 2013). High levels of food waste impacts negatively on the environment as it is related to greenhouse gases emissions (Graham-Rowe, Jessop & Sparks, 2019). Beside the environmental impact of food waste,

Marx (2015) reported that it is ethically unjustifiable to waste food in a world where one out of nine people do not have sufficient access to nutrition. In this regard, it is important that the levels of food wasted be reduced. Food waste occurs at all stages of food supply chain; from agriculture, industrial manufacturing and processing, retail as well as household consumption (Mirabella, Castellani & Sala, 2014).

Food which is wasted impacts significantly on food service operation since it results in wasted money. The amount of money spent on food and labour cost does not fulfil its intended purpose. Also, the economic impact of food waste causes unnecessary strain and demand on each area of food production and food service (Buzby, Farah-Wells & Hyman, 2011). Accordingly, Buzby et al. (2011) reported that the United States management practices usually fail to notice the continual financial losses laid out when food is wasted. The sole economic impact of food waste brings about worthless strain and demand on each sector of food production and food service. The abundance of food waste represents the significant loss of money and countless resources used to produce, store, transport, prepare and serve food that will not fulfil its intended purpose. Previous studies in Europe suggest that food service industry like hospitality and health sectors are the third largest source of food waste with plate leftover as the main source (Beretta, Stoessel, Baier, & Hellweg, 2013; BIO Intelligence Service, 2013). According to Parfit, Eatherly, Hawkins and Prowse (2013), 920,000 tons of food are being wasted per year in the UK, out of which 75% are avoidable with an increasing concern over school food service.

Beretta et al. (2013) and Parfit, Barthel and Macnaughton (2010) believe that consumers are the single biggest producers of food waste. Accordingly, Qusted et al. (2013)

revealed that consumers waste about 330kg of food per year per household in UK. Farr-Wharton, Foth and Choi (2014), however asserted that 65% of food waste generated could be averted by more sustainable behaviour, therefore, consumer behaviour ought to be changed urgently. It is of more significance that consumer behaviour changes not only in the private contexts such as home but also in the public contexts such as restaurants and in school service food unit. Food waste prevention is a promising avenue for reducing food waste. Following that, several studies have investigated consumers' food waste behaviour (Bravi, Murmura, Savelli, & Viganô 2019), with the objectives of developing effective and efficient interventions program for food waste mitigation.

Increase in enrolment of pupils in the Junior High Schools as a result of the introduction of the Free Compulsory Basic Education led to an increased demand for Senior High Schools' education in Ghana (Abdul-Rahman, Rahaman, Ming, Ahmed, & Abdul-Rahman, 2018). For this reason, parents were left to pay their wards school fees which put pressure on the family's income. As part of the Government's strategies to curb this economic pressure on parents, the Free Senior High School Policy introduced by the President Nana Addo Dankwa Akuffo Addo's Government (4th Republic of Ghana), is seen by many as a step in the right direction. Currently, the policy on the Free Senior High School education provides free education for students which includes free meals for boarding students. The policy of Free Senior High School aims at increasing enrolment, improving quality through academic performance and most importantly reducing the burden on parents from paying their wards school fees. In Ghana, Senior High School education covers three years for students between the ages of 14 to 18years (could be less or more). There are 863 (562 public and private 301) Senior High Schools in Ghana (Ministry of Education, 2016). Ashanti region has 134 public schools out

which 13 schools are within the Kumasi Metropolis (Ghana Education Service, Ashanti Region, 2020).

Just like other sustainable issues, the use of technological solutions alone will not do the job, a change in behaviour and culture is paramount for the achievement of any substantial change (Redman & Redman, 2014). There is the need to raise awareness and promote a sense of guilt to help reduce food waste (Miroso, Munro, Mangan-Walker, & Pearson, 2016).

1.2 Statement of Problem

Food that is produced and not consumed impacts negatively on the environment and cost money. While food accessibility for the hungry and needy remains an issue, some amount of food served in some second cycle schools is a plate leftover and wasted. With the introduction of Free Senior High School Policy by the President Nana Addo Dankwa Akuffo Addo's Government (4th Republic of Ghana), it is anticipated that students' enrolment at schools will keep increasing annually and in order to adequately feed the student population, it is imperative to evaluate the factors associated with the food wastage behaviour of students in high schools. Changing this human behaviour is increasingly becoming an area of significant in research with focus on better understanding why food is wasted particularly at the Senior High School level. Individuals' attitudes are expressed to be influenced by the norms of the society (Tarkianen & Sundqvist, 2005). Therefore, it is important to acknowledge and address the link between attitudes of students and the components of subjective norms and perceived behavioural control in relation to how they perceive the sensorial quality of the meals served to them at the dining hall. Owing to the ever-growing population in the free Senior High School, more food would have to be supplied in greater quantities and

if food served becomes a plate leftover, it contributes to food wastage. Huge amount of food waste has a critical impact on sustainability, as it is associated with high levels of greenhouse gasses emission and depletion of resources (Graham-Rowe et al., 2019). These problems have contributed to several global sustainability issues such as climate change and food security. The natural breakdown of food produces a greenhouse gas emission as methane gas. These emissions are 21 times more potent than carbon dioxide which significantly reduces air quality (Harvard Law School, 2014).

Whereas a growing attention has been paid to the evaluation and mitigation of post-harvest losses in developing and emerging countries (Affognon, Muntungi, Sanginga & Borgerneister, 2015; African Postharvest Losses Information System, 2011), data on student's food waste in the dining hall of Second Cycle Schools in Ghana is largely missing. What's more, as Ghana gradually finds its feet in urbanization and the Free Senior High School Policy gradually becomes a pivot in the Second Cycle Schools, and the supply of food by the government becomes more prominent, students' food wasting behaviour should be an issue of concern and therefore, more research and first hand data on their food waste behaviour should be of importance.

When it comes to waste as pertaining to foods, studies abound the literature. Wang et al (2018) studied Horeca (Hotels, restaurants and cafeteria) food waste and its ecological footprint in Lhasa, Tibet, China. Stockli, Dorn and Leichti (2018) sought to find out how normative prompt reduce consumer food waste in restaurants. Lorenz, Hartmann, Hirsch, Kanz and Langen (2017) also assessed the determinants of plate leftover in one German catering company. WRAP (2011) conducted an investigation in a number of schools in England in order to understand the nature and causes of waste in this sector and the

potential impact of corrective actions. Casimir (2014) conducted a research in food waste at the school level in Uppsala, Sweden. In Ghana, Rutten and Verma (2014) investigated the impacts of reducing food loss in the nation. Miezah, Obiri-Danso, Zsofia, Fei-Baffoe and Mensah (2015) studied the municipal solid waste characterization and quantification as a measure towards effective waste management in Ghana. Whereas the above studies focus on food waste and its related issues, others also focus on waste management system. The issue is that when it comes to food waste as a phenomenon in Second Cycle Schools in Ghana, there seems to be a gap in the literature to that effect and so this study seeks to address that gap. A study by Gunders (2012) suggests that institutions such as schools and hospitals waste significant amount of food (as much as 40%) per capita than households. This implies that, it is more crucial to focus on addressing food waste in institutions with cafeterias than addressing household food waste.

From the foregoing, this study is grounded on the premise that minimal work exists in the study of food waste in Second Cycle Schools' dining halls in Ghana. Sequel to this, the current study assesses the food waste behaviour in the dining halls of Senior High Schools.

1.3 Purpose of the study

A share of the total amount of food waste in Ghana is also derived from students in Senior High Schools. Students from various Senior High Schools have a fair contribution to food waste in Ghana, which by no means stand for a problem and needs to be reduced in order to reach a more sustainable world. Therefore, the purpose of this study is to assess the causes of students' food wasting behaviour among students and waste management practices in the dining halls of second cycle schools in Kumasi Metropolis.

1.4 Research objectives

- To determine the effect of perceived food quality on students' attitude towards food wastage.
- To examine the mediatory role of perceived behavioural control and subjective norm on students' attitude towards food wastage.
- To determine the effect of food quality on perceived behavioural control and subjective norms.
- To examine the effects of food waste management practices on food waste in the Senior High Schools in Kumasi Metropolis

1.5 Research Questions

- What are the effects of perceived food quality on students' attitude towards food wastage?
- What is the mediatory role of perceived behavioural control and subjective norm in students' attitude towards food wastage?
- What are the effects of food quality on perceived behavioural control and subjective norms?
- To what extent does the current food waste management practices adopted by the Senior High Schools in Kumasi Metropolis affect food wastage?

1.6 Significance of the Study

This study is beneficial among stakeholders of Senior High Schools on how to manage food waste in the dining halls and formulate policies that could help mitigate it

This study extends literature in the food waste and management practices in the fields and informs policy direction in the area.

The research work will contribute to emerging research stream by providing a more holistic understanding of the causes of students' food waste behaviour in Senior High Schools.

The results of this study will enable students to reduce leftover plate and encourage them to attend dining during meal times.

This study would address perceived barriers to sustainable food waste management programs tailored for Second Cycle Schools in Kumasi Metropolis.

1.7 Scope of the study

This research will solely focus on and investigate students and matrons who are involved in food waste generation and its management in the dining halls of Senior High Schools. The study population is the Kumasi Metropolis with the target population being boarding house students and matrons. This decision is made to attain reliable insights from the students and matrons and gain perspectives on food waste behaviours. As a further contribution to relevant content, the study will be conducted exclusively on students and matrons of Second Cycle Schools in the Kumasi Metropolis. Food waste has been categorized into avoidable waste, possibly avoidable waste and unavoidable waste (WRAP, 2008). This study focuses primarily on avoidable food waste (plate waste food, that is, food served but left-uneaten and discarded).

1.8 Limitation of the study

Translation of some aspects of the interview results into English language as reported by the respondents could change the actual meaning of the responses. There is a possibility that what the researcher may have observed and the interpretations given to it using the observational guide may be different from the actual meaning students and kitchen staff may have given to the observed situation. Again, the study samples came from only schools in the Kumasi Metropolis and for this reason results from the study will not be a representative of all schools in Ashanti Region and Ghana at large.

1.9 Organization of the Study

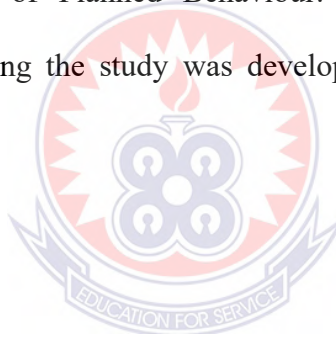
This study is structured in five chapters. Chapter one will focus on introduction which will include the background, which gives a general overview of the study; statement of the problem, which is the exact gap in knowledge, for which reason this study is being conducted. It will also be focused on the objectives and research questions, which forms basis for data collection; purpose of the study, and significance of the study. Other items in the same chapter will be scope of the study and limitation as well as organization of the study. Chapter two of this research work will emphasize on review of related literature on topics related to food waste and waste management. Chapter three will spell out the research design, data collection instrument and procedure for analyzing the data. Chapter four will deal with the results of the study findings. The outcome of the study will be presented here. Chapter five will deal with discussion of the results in relation to the literature reviewed. The discussion will focus on the key findings of the research and inferring would be made in relations to past studies that are related this work. Chapter six will focus on the summary of the major findings, conclusions and recommendations

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews related literature on food waste and the factors related to student food waste behaviour. The chapter reviewed literature on the concepts, theories and empirical studies on the subject matter. The reviewed concepts included food waste concept and definitions, causes of food waste in schools, the relationship between perceived food quality and students' attitude towards food waste, the mediatory role of subjective norms and perceived behavioural control in students' attitude towards food waste and influence of socio-demographic factors on food waste, The main theory reviewed was the Theory of Planned Behaviour. Beside the reviewed theory, a theoretical framework guiding the study was developed based on the theory and the reviewed empirical studies.



2.1 Concept of Food Waste

In the 1990s and early 2000s, waste recycling was the focus of increasing attention. Issues of food waste was ignored until mid-2000s; the change resulted due to the increasing awareness of food waste levels and associated impacts (Metcalf et al., 2012). It is estimated that one-third of edible food produced for human consumption is wasted globally each year (FAO, 2017; Goebel, Langen, Blumenthal, Teistcheid & Ritter, 2015; Graham-Rowe, Jessop & Sparks, 2014). Food waste generated by households in the UK accounts for 7.3 million tonnes of a total food and drinks each year (WRAP, 2017). In UK households, approximately one-third of the food purchased for consumption is thrown away (Evans, 2011), with the average annual households' waste containing 17% food waste (DEFRA, 2015). In Ghana, Chefs for Change Ghana Foundation (CFCG)

reported that about 45% of food goes uneaten (Ghana Web, 2017). The amount of food wasted, however, is not only the issue of concern in this stream of waste but also the impact it has economically, socially and environmentally (Tilman & Clark, 2014; Bajzelj et al., 2014). Graham-Rowe et al. (2014) reported that food waste heightens food prices globally, as a result, food become less attainable to the world's poorest, increasing the number of malnourished people and demonstrating the direct social impact of food waste.

The economic impact associated with food purchased that is not eaten and thrown away (Graham-Rowe et al., 2014) costs the average UK household £470 a year, increasing to £700 for a family with children (WRAP, 2017). Graham-Rowe et al. (2014) reported that, the most damaging impact of vast levels of food waste is the corresponding environmental effect. For example, production of food that is consequently wasted increases the pressure on diminishing forests that are inevitably altered for agricultural land. In addition, the disposal of food and drink to landfill adds to the avoidable release of gases such as methane (Graham-Rowe et al., 2014), along with other greenhouse gas emissions that contribute to climate change (Goebel et al., 2015). However, environmental impact associated with household food waste stems from the production and supply of the food wasted rather the disposal of food. About 4.2 tonnes of CO₂ eq. are avoided by preventing waste compared with 0.5 tonnes of CO₂ eq. avoided by treating waste (Quested, Parry, Easteal, & Swannell, 2011).

Ultimately, it is proven that minimizing food waste is important for achieving a sustainable food system that does not have serious economic, social and environmental repercussions (Goebel et al., 2015). Therefore, addressing the behaviours that create or

exacerbate food waste is important. In general, food waste behaviour is related to education level, sorting practices, convenience, attitudes and concern (Secondi, Principato, & Laureti, 2015; Bernstad, 2014). Qi and Roe (2016) reported awareness of food waste in the USA, for example, is 50% and that increasing awareness of the environmental impact of food waste would be a good next step.

According to WRAP (2008), food waste has been categorised into:

1. Avoidable waste - This type of waste is defined as “food and drink thrown away that was, at some point before disposal edible (for instance, slice of bread, apples)”.
2. Possibly avoidable waste – The possibly avoidable waste is defined as “food and drink that some people eat and others do not, or that can be eaten when food is prepared in one way but not the other (e.g. potato skin).
3. Unavoidable waste – It is defined as “waste arising from food and drinks preparation that is not, and has not been, edible under normal circumstances

2.2 Definitions of Food Waste

Food waste definitions are varied and lots of them have been applied and suggested.

The Food and Agriculture Organization (FAO) of the United Nations defines food waste as follows: “Food loss is defined as ‘the decrease in quantity or quality of food.’ Food waste is part of food loss and refers to discarding or alternative (non-food) use of food that is safe and nutritious for human consumption along the entire food supply chain, from primary production to end household consumer level” (FAO 2016).

Similarly, the U.S. Department of Agriculture’s Economic Research Service’s (ERS) Buzby, Farah-Wells and Hyman (2014) write:

“Food loss represents the amount of food after postharvest, that is available for human consumption but is not consumed for any reason. It includes cooking loss and natural shrinkage (for example, moisture loss); loss from mould, pests, or inadequate climate control; and food waste. Food waste is a component of food loss and occurs when an edible item goes unconsumed, as in food discarded by retailers due to colour or appearance, and plate waste by consumers” (Buzby et al., 2014).

The European Union project titled FUSIONS, which is defined as “a project about working towards a more resource efficient Europe by significantly reducing food waste” (FUSIONS, 2016) defines food waste as follows:

“Food waste is any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composed crops ploughed in/not harvested, anaerobic digestion, bioenergy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)” (FUSIONS, 2016).

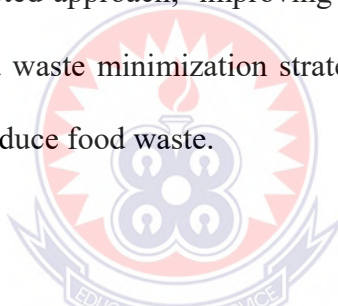
The U.S Environmental Protection Agency’s (EPA) food waste estimate is described as follows (U.S Environmental Protection Agency, 2016):

“The amount of food going to landfills from residences, commercial establishments (e.g., grocery stores and restaurants), institutional sources (e.g., school cafeterias), and industrial sources (e.g., factory lunchrooms)”.

Whereas some discourses separate food waste and food loss, others refer to both terms as the same and use them interchangeably. Food loss can be identified with the decrease of food that is edible at the initial stages of the food supply chain which include the post-

harvest stage, the food production stage and during food processing (Parfit, Barthel & Macnaughton, 2010). Food waste however can be linked to the reduction of food that is edible in the late stages of the food supply chain which usually occurs at the retail market and consumer level (Parfit et al., 2010). Food loss has more often than not been associated with decay of food prior to reaching the consumer and the market level primarily owing to problems during harvesting, processing, producing, transport and packaging of food (FAO, 2015).

Food waste can be seen as a process where food turns to waste, and consequently did not fulfil its intended purpose. Reducing food waste is, however, a complex-phenomenon, which requires a multifaceted-approach; improving food quality and acceptability, engaging consumers in food waste minimization strategies and employing appropriate-food-menus would help to reduce food waste.



2.3 Food Loss and Waste and the Sustainable Development Goals

Losing or wasting food is generally viewed as undesirable and something to be avoided. Reducing food loss and waste is seen as a way to lower production costs, improve food security and nutrition, and contribute towards environmental sustainability, notably by easing the pressure on natural resources and decreasing Green House Gas (GHG) emissions. In the context of the challenge of sustainably feeding a world population projected to reach almost 10 billion in 2050, minimizing food loss and waste and making the most of resources underpinning the food system are considered particularly important (FAO, 2019).

Food loss and waste has become a major global issue and is enshrined in SDG 12 (responsible consumption and production), which even sets a specific target related to the reduction of food loss and waste:

SDG Target 12.3 calls for halving per capita global food waste at retail and consumer levels and reducing food loss along production and supply chains, including post-harvest loss, by 2030. Due to expected impacts on household and business cost, as well as on food security, nutrition, natural resources and the environment, reducing food loss and waste could have wider implications for other SDGs related to the food system, such as SDG 2, which deals with ending hunger and achieving food security and improved nutrition. Possible environmental effects fall under SDG 6 (sustainable water management), SDG 11 (sustainable cities and communities), SDG 13 (climate change), SDG 14 (marine resources) and SDG 15 (terrestrial ecosystems, forests, land and biodiversity). There could also conceivably be knock-on effects on other SDGs: SDG 1 (ending poverty), SDG 8 (sustainable economic growth and decent employment) and SDG 10 (reducing inequalities).

At the same time, progress on other SDGs could have beneficial impacts in terms of reducing food loss and waste. These SDGs include: SDG 5 (gender equality), SDG 7 (affordable and clean energy), SDG 9 (infrastructure, industry and innovation) and SDG 17 (partnerships). However, the importance of these linkages is likely to vary greatly within and between countries and depends on the implementation of food loss and waste reductions without considering their likely magnitude and significance (FAO, 2019).

Decreasing food loss and waste seems a simple and reasonable objective. Clearly, it is objectionable to let food deteriorate because of negligence or poor handling or throw away food that could be consumed by humans (FAO, 2019).

2.4 Causes of Food Waste in Schools

According to Derqui and Fernandez (2017) and WRAP (2011) causes of food waste in school food service units could be categorised into: operational determinants, situational determinants and behavioural determinants.

2.4.1. Operational determinants

Operational determinants deal with management practices (Derqui & Fernandez, 2017; Liu et al., 2016; WRAP, 2011) that are specifically related to food. Inaccurate estimations of the number of people to be served could lead to food waste. Foods that are served in schools are usually prepared in large quantities or as buffet. In the case of institutions that do not have an ordering system, an estimation of the number of people to be served each day would have to be made. In several cases, inaccurate estimations of food were found to cause food waste. When new menu cycles are introduced, it could also mean that new estimations of the consumption of the food would have to be made. At the initial stages of the menu cycle, the popularity of food items might be quite unknown and there might be too much of a food item which turns out to be unpopular and is wasted. In this regard, WRAP (2011) asserted that regular changes in menu cycles can result in more food waste. Again, the cause of food surplus in schools could be what Falasconi, Vittuari, Politano & Segrè (2015) referred to as “physiological unserved food” which literally means excess food cooked to ensure customer satisfaction. For instance, in the case of food service providers that want to ensure some extra portions for their consumers/customers who might request for additional food or offer a variety of food on the buffet without running out on one item. Notwithstanding, a study by WRAP (2011) found that ‘not getting the meal option of choice’ was regarded as a factor that

contributes to plate waste because consumers may not appreciate the food and therefore not consume it.

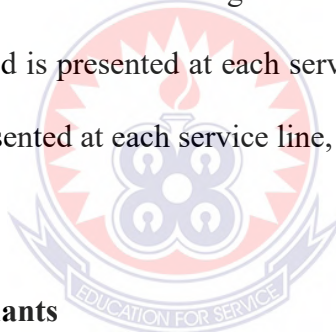
One other 'operational' factor that Falasconi et al. (2015) and WRAP (2011) mentioned was the lack of flexibility in the menus. They reported that procurement specifications and portion sizes, combinations and preparations of food are very rigid in some cases. Some authors found that, the manner in which some foods are paired are accountable for the increased food waste (Falasconi et al., 2015; Ishdorj et al., 2015; WRAP, 2011). Falasconi however observed that in some Italian schools, pizza and bread which are considered as alternative products were served together. In their observation, they also discovered the lack of flexibility and tools to modify the menu and ineffectiveness in the system. Researchers of WRAP (2011) again discovered that inadequate evaluation of food waste causes its increase. This might result because of inadequate feedback opportunities. In situations where there are feedback opportunities, the quantities of food waste were reduced.

Accordingly, researchers such as WRAP (2011) reported that not providing students with information on the daily menu option and nutrition and food safety guidelines (Cerutti, 2017; Papargyropoulou, 2016; WRAP 2011), unappetizing food (Falasconi et al., 2015), few options for reusing unserved foods (WRAP 2011) could lead to food waste.

2.4.2 Situational determinants

The structures and assets that mould the environment where the consumption of food is taken place is considered as components responsible for food waste under the situational determinants. These situational factors consequently relate to place or time and not

specifically to food (Derqui & Fernanadez, 2017; WRAP 2011). Situations that give rise to food waste in this category are undesirable canteen environment (WRAP 2011), inadequate facilities for storing food and practical challenges in tandem with the food consumption, for example unsuitable cutlery (WRAP 2011). In developed countries where buffet services are offered, serving queues and lay-out of the buffet additionally contribute to food waste. For instance a particular serving line can bring on lengthy queues, signifying that people spend a long time expecting their meals at some point of lunchtime, and due to that, they have to rush to complete their meals, in which not everyone succeeds, resulting in plate waste (Lazell 2016; Qusted et al., 2013, WRAP 2011). A study by Derqui and Fernandez (2017) revealed that schools that have multiple serving line at some point of buffet service generate more food waste from unserved food, due to the fact that food is presented at each serving line for the rest of the service time, and as many foods presented at each service line, the more waste is encountered.



2.4.3 Behavioural determinants

According to Derqui and Fernandez (2017) and WRAP (2011), the behaviour of individual consumers plays a vital part in food waste generation in food service institutions. Kitchens staff that prepares food for students at school can learn to adapt the supply of food to the request of the consumers or endeavour to bring about change in the behaviour of the consumer. The preferences of the consumers happen to be one obvious factor that causes food waste. Consumers can make food unpopular when they fail to appreciate the taste of the food (Lorenz et al., 2017; Liu et al., 2016; Lazell, 2016; Dinis, Martins & Rocha, 2013) or may not have a preference for the combinations of food on the plate. Aside the taste, appearance of the food plays a contributing factor to waste generation, in that, the food served on the plate can appear unattractive to some people

(WRAP 2011). Falasconi et al. (2015), suggested that students' dietary habits can be an effect of their dislike for certain foods. The inadequacy of attentiveness given to dietary habits was cited as one premier source of food waste in their study. For example, all the attempts to persuade children to consume foods that are healthy are impeded by the rejection of the food by the children since they are familiar with eating fast foods at home rather than freshly prepared healthy dishes (WRAP 2011). Other factors that contribute to food waste generation are as well the snacks that are sold at the schools' cafeteria, vending machines and the schools' stores. These foods generally have high levels of calories that act upon the energy balance and usually result in loss of appetite during meal time and consequently the rejection of the meal (Falasconi et al., 2015; Marlette, Templeton & Panemangalore, 2005). Another factor that influences food waste is time. Young children at school usually give priority to playing with friends than eating their meals at lunch. They rush through their meals in order to have more time to play. Accordingly, Smith and Cunningham-Sabo (2014) observed that placing recess before lunch time to a greater extent lessened the amount of plate waste students generated. Students do not hurriedly finish their meals in order to go and play with friends. Taking recess after lunch also seems to cause stomach discomfort and dizziness, which might be another reason for children to limit their food intake before recess (Smith & Cunningham-Sabo, 2014). Older children might prioritize money over recess, in that, when they have much money, they spend it on more food than they can eat resulting in waste. Students may also not be aware of their food waste behaviour. A study by Lazell (2016), Principato, Secondi and Pratesi (2015) and Quested et al. (2013) all suggested that students in general, are not aware of the amount the of waste they generate and are therefore not prone to change their behaviour.

2.5 Theory of Planned Behavior

The Theory of Planned Behaviour (TPB) was propounded by Ajzen (1991) which became an extension of the Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein and Ajzen, 1975). The theory proposed three conceptually independent determinants of intention. First amongst the antecedents is the attitude towards the behavior in question and thus, refers to the degree to which an individual has a favourable or unfavourable perception about the behavior.

The second antecedent is the subjective norm which refers to the perceived social pressure one feels to perform or not to perform the behaviour.

Perceived behavioural control is the third antecedent and it relates to the degree of perceived ease or difficulty in carrying out the behaviour and it is assumed to ponder on former experience together with expected hindrances and obstacles. In other words, it refers to the degree at which the individual is in control of the food waste behaviour (Ramos, 2018).

As a general rule, the more favourable the attitude and subjective norm together with respect to a behaviour and the greater the perceived behavioural control, the stronger should be an individual's intention to perform the behaviour under consideration. Attitude, subjective norm and perceived behavioural control and their respective importance in the prediction of intentions is anticipated to differ over behaviours and situations.

Accordingly, in certain applications, attitudes alone may be seen to have a relevant impact on intentions, yet in others, attitudes and perceived behavioural control are

adequate to impact significantly on intentions and yet in others, all the predictors make independent contributions (Ajzen, 2002). TPB has been applied on similar research areas concerning individual's food waste intention and consequent behaviour (e.g. van der Werf, Seabrook, & Gilliland, 2019; Lorenz et al., 2017; Fang et al., 2017; Parizeau et al., 2015) which consequently show the relevance of utilizing the theory for this research purpose too.

2. 6 Relationship between Perceived Food Quality and Attitude towards Food Waste

One of the key factors that seems to trigger high volumes of food waste within households' level and the hospitality industry in general is the individual perception about food quality. Individual perception happens to be shaped by prior experiences with regards to certain circumstances or event. Hence, individuals' positive or negative experience with reference to a particular food will shape their perception on the wholesomeness of the food. According to Parasuraman, Zeithaml and Malhotra (2005), perceived quality depicts a consumer personal assessment about a product or service overall quality or dominance. However, what has to be noted is that a consumer perceived quality comes as a varied assessment criterion such as its physical properties, chemical structure, sensory qualities, microbiological and toxicological pollutants, shelf-life, packaging, and labelling (Molnar, 1995). Meaning, it is these attributes that will influence a consumer's perceived food quality. For instance, Göbel, Langen, Blumenthal, Teitscheid and Ritter (2015) posit that consumers tendency to always have fresh vegetables, fresh dairy and fresh bakeries accounts for significant part of the food waste within the hospitality.

Mijares, Alcivar and Palacios (2020) examined the relationship between food quality and food waste. This study used a survey design where adults who live in South Florida for 18 years or more are the primary providers of food for their households were recruited. Respondents were recruited outside of local grocery stores and required to fill out a quick food waste survey. Again, pictures of the respondents' grocery records were taken to evaluate their diet quality using the Grocery Purchase Quality Index 2016 (GPQI-2016). With the factors that influence the respondents food waste, 90% threw their foods away because they went bad with 80% throwing it away because it got past their manufacturing date. Again, it was established that the perceived quality of bread/rice had a significant negative relationship on food waste ($r = -2.60$; $p = 0.013$). Accordingly, consumer perception on food quality had a significant relationship on food waste. A lower diet quality score was related to higher amount of bread/rice wasted and with throwing away foods that has past it's use date.

Consistent result is produced in the study of Conrad et al. (2018) as their results reported a significant relationship between perceived food quality and food waste. Their study investigated the association between food waste, diet quality, nutrient waste, and multiple measures of sustainability. Information on proxies such as food intake, food waste, and application rates of agricultural modifications were obtained from various US government sources. Accordingly, Conrad et al. (2018) recommended that improving consumers knowledge on how to adequately prepare and keep perishable foods such as fruits and vegetables will be very important in improving perception on food quality.

A study done by Schiavone, Pistone, Finale, Guala and Attena (2020) assessed how patients' expectation on food quality provided to them at the hospital contributed to the amount of food wasted by the patients at the hospital. It again looked at the level of

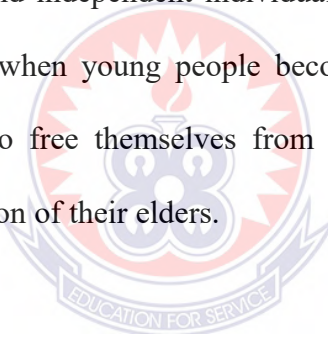
satisfaction the patients had towards the food served and the entire food service at the hospital. The study used a survey research design where questionnaires were distributed to inpatients within two hospitals that is; one in Campania, a region in the southern part of Italy, and the other in Piedmont, in the northern of Italy. In order for the study to ensure homogeneity within its sample across the two hospitals, the study collected its data from two similar units within the hospitals thus, the obstetrics and gynecology departments. In all 550 questionnaires were distributed to inpatients in obstetrics and gynecology wards (with each hospital getting a sample representation of 275). Both Univariate and multivariate analysis were used to analyse the study data. Apparently, results from the study suggest that the patients in the northern hospital were more enthused about the quality of food served them (i.e. 54.2% vs 36.0%) and entire foodservice (54.5% vs 38.2%) than patients from the southern hospital. Again, patients from the northern hospital had more positive expectations about the quality of food served (i.e. 69.5% vs 31.6%) than patients from the southern hospital. Moreover, when it came to the impact the patients expectation about the quality of food served had on their food waste attitude, it was realized that patients from the southern hospital who had low expectation about the quality of food provided them threw a significant part of their food away (i.e. 41.7% of their food were discarded) than patients from the northern hospital who had positive expectation about the quality of food provided (i.e. only 15.3% of their food were discarded). Schiavone et al. (2020) concluded that a consumer expectation about the quality of food provided to him or her tend to have a significant effect on the amount of food wasted by them.

2.7 Mediating Effect of Perceived Behavioural Control and Subjective Norm in the Relationship between Perceived Food Quality and Attitude towards Food Waste

As rightly argued by Mondéjar-Jiménez, Ferrari, Secondi and Principato (2016) the differences in individual food waste behaviour could be explained by other confounding factors. For instance, whereas personal demographic profile inclusion in the theory of planned behaviour has improved its predictability of individual food waste behaviour, other situational factors such as emotions and awareness have equally enhanced the predictability of theory of planned behaviour. For instance, Scholderer, Brunsø, Bredahl and Grunert (2004) observed that social relationships that emerge from family members and friends both at home and outside tend to shape people attitude towards food waste. For instance, during special celebrations such as Ramadan, many Muslims with the expectation to meet the requirements of the Muslim tradition are most likely to cook more food than required. Accordingly, the eating pattern that changes during times of Ramadan influence consumer attitude toward food waste. Likewise, in the study of Odabasi and Argan (2009) social norm mediated the relationship between perceived food quality and attitude towards food quality. Consistent result is produced in the study of Karim Ghani, Rusli, Biak and Idris (2013) as the inclusion of other variables such as perceived behavioural control and subjective norm mediated the relationship between perceived food quality and consumer attitude towards food waste. Specifically, in the study of Karim Ghani et al. (2013), these two variables predicted 13.7 per cent of the variance in the consumer attitude towards food waste.

Similarly, in the study of Graham-Rowe, Jessop and Sparks (2015), subjective norm and perceived behavioural control mediated the relationship between perceived food quality and consumer attitude towards food waste. Subjective norm and perceived behavioural

control predicted 8 per cent of the differences in the respondents' attitude towards food waste. Russell, Young, Unsworth and Robinson (2017) affirmed similar mediation effect between subjective norm and perceived behavioural control and consumer attitude towards food waste. Again, in the study of Tsai, Chen and Yang (2020), perceived behavioural control had a significant mediating effect on consumer attitude towards food waste. However, in the same study, subjective norm had no mediating effect on the respondents' attitude towards food waste, suggesting that the subjective norm which come from influence from important people such as family members, friends and colleagues did not in any way influence the respondents' attitude towards food waste. Tsai et al. (2020) attributed this insignificant relationship to the caliber of their sample that is, made up of young and independent individuals. According to Zhao, Grasmuck and Martin (2008), usually when young people become independent and work away from home, they are able to free themselves from their family's direction and free themselves from the imposition of their elders.



2.8 Relationship between Perceived Behavioural Control and Attitude towards

Food Waste

The increasing occurrence of food waste across the world has caused many environmentalists to suggest diverse ways to curb its occurrence (Priefer, Jorissen & Brautigam, 2016). Over time, much of these discussions have placed more emphasis on how the antecedents of theory of planned behaviour; perceived behavioural control, subjective norms and attitude accounts for food waste.

A study by Hasana, Harun and Hock, (2015) looked out for the main factors that affect a person's attitude towards plastic waste consumption. Results from their study showed that perceived behavioural control had a significant influence on the students' attitude

towards plastic waste consumption. Again, it was also established that there is statistically significant difference between genders with regards to their attitude towards plastic waste consumption.

In Denmark, Stancu, Haugaard and Lähteenmäki (2016) explored the connection between psycho-social factors, food-related routines, household perceived capabilities and socio-demographic characteristics on self-reported food waste. Specifically, the study sought to assess the respondents' attitude towards food waste, planning, shopping and reuse of remains, perceived capability to deal with household food-related activities, injunctive and moral norms, attitudes towards food waste, and perceived behavioural control. Using a web-based system, the study distributed its questionnaire to Danes residents who have their ages within the age bracket of 18-74 years. Results from the study showed that perceived behavioural control and habits associated with shopping and reuse of leftovers were the main predictors of the respondents' attitude towards food waste. Results from the study of Hasana et al. (2015) and Stancu et al. (2016) happen to be consistent with the conclusions of Russell et al. (2017) as their results revealed a significant relationship between perceived behavioural control ($\beta=0.37$, $p<.001$) and respondents' attitude towards food waste. Specifically, their study sought to investigate consumer food waste behaviour using a comprehensive model integrating the theory of planned behaviour (TPB), the theory of interpersonal behaviour, and the comprehensive model of environmental behaviour. Again, a study done by Tsai et al. (2020) in China investigated the factors that account for food waste among early adulthood consumers. The study used a web-based approach where links were sent to 400 university students from 48 universities. Per the study's structural equation modelling (SEM), results from the study showed that perceived behaviour control had the most significant influence on the consumers' attitude towards food waste. Results from the study of Stefan, van

Herpen, Tudoran and Lahteenmaki, (2013) came by the same conclusion as their results identified perceived behavioural control as one of the key determinants of actual consumers waste in Romania. Also, in seeking to identify the main psychological factors that determine consumers food waste attitude, Soorani and Ahmadvand (2019) study results identified perceived behaviour control as the most significant predictor of the respondent's food waste attitude. In their study perceived behavioural control recorded the highest beta-coefficient value among all the other psychological factors used in their study ($\beta=0.357$, $t=7.951$, $p<.0001$).

Also, a study done by van der Werf and Seabrook (2019) across countries sought to understand the predictors of food waste attitude and intention in households in London and Ontario. The study used the theory of planned behaviour to develop its survey instrument. When it came to the food waste patterns of the households, it was established that the participants ($n=1,263$) threw away avoidable food waste 4.77 times/week and 5.89 food portions/week. When it came to the factors that influenced their food waste attitude, results from the hierarchical regression analysis ($R^2=0.32$, $p<0.001$) revealed that perceived behavioural control ($p<0.001$) and personal attitudes ($p<0.01$) resulted into less food wasting behaviour with families with more children resulting into more food wasting behaviour.

However, it is not in every context that perceived behavioural control has reported a significant relationship on an individual food waste attitude. For instance, in the study of Stancu, Haugaard and Lahteenmaki (2016), perceived behavioural control posit no significant influence on a person attitude towards food waste. Similarly, in the study of Bhatti, Saleem, Zakariya and Ahmad (2019) perceived behavioural control reported no significant influence on consumers attitude towards food waste. Specifically, their study

explored the factors that influenced young consumers food waste behaviour in Pakistan. The study used the web-based system in the distribution of its questionnaire via email and other social media platforms such as Facebook and LinkedIn. Subsequently, the structural equation modelling technique was used in the data analysis. Even though, determinants such as environmental concern and time pressure influenced the respondents' attitude toward food waste yet the key psychological factors that is, perceived behavioural control posit no significant relationship on respondents' attitude towards food waste.

2.9 Relationship between Subjective Norm and Attitude towards Food Waste

According to the theory of planned behaviour, subjective norms come from the social forces from people who occupies high offices or holds higher authority in society or organization (Ajzen, 2001). Often, the perception these individuals or persons with such high social status show towards a certain condition in this case food waste tend to have a significant influence on a person's attitude towards food waste. For instance, in the study of Soorani and Ahmadvand (2019) which sought to investigate the determinants of consumer food wastage behaviour found social norm to have a significant positive relationship on consumer attitude to reduce food waste ($\beta=0.127$, $t=3.043$, $p<.0001$). Likewise, in the study of van der Werf and Seabrook (2019) subjective norm and personal norms all had a significant influence on the respondents attitude towards food waste. For instance, subjective norm and personal norm both reduced a person tendency to engage in food waste.

However, in the study of Ayob, Sheau-Ting and Jalil (2017), subjective norm had no significant effect on individual attitudes towards food waste. The psychological factors

that influence the respondents' attitude towards food waste was perceived behavioural control. Ayob et al. (2017) adopted the theory of planned behaviour to investigate how the theory's antecedents such as attitude, subjective norms and perceived behavioural control influenced the participants food wastage. The study used the structural equation modelling (SEM) in the analysis of its study data. Similarly, in the studies of Queded, Marsh, Stunell and Parry (2013) and Stefan et al. (2013), subjective norm reported no significant influence on consumers attitude towards food waste. Also, Wang-Chin, Chen and Yang (2020) study focus was to understand the factors that account for food waste among early Chinese adulthood consumers. The goal of the study was to identify the possible factors that could be used as a point of reference by schools, governments and the food chain industry to minimize food waste among Chinese adults. The study drew its data from undergraduates' students studying in universities within the Jiangsu province. Results from its structural equation modelling analysis identified subjective norm as the second ranked factor that influenced the respondent's food waste behaviour. Theoretically, some authors have linked the emerging insignificant relationship between subjective norm and consumer food waste behaviour to this reasonings. For instance, from the arguments of Queded, Parry, Eastal and Swannell (2011) since food waste behaviours are often times very difficult to be easily seen by other people, particularly, neighbours or friends than probably pro-environmental behaviour (e.g., reusing or transport behaviours), the social normative movers of food waste behaviour are most likely to have less effect in shaping a person's food waste behaviour. Graham-Rowe et al.(2014) shared similar view by arguing that food waste is a behaviour that is often solely visible to the creator, hence, the relevance of such person influence on another will often times be very difficult to result into any meaningful effect.

Accordingly, it comes as not very surprising that emerging studies are beginning to replace subjective norm with other variables such as injunctive norm and moral norms (see for example, Stancu et al., 2016). The injunctive norm looks at what one should do concerning food waste in general and food waste in reference to the environment, hence, a person's understanding on what ought to be done is deemed to have more consequential effect on their attitude on what someone expects them to do as in the case of subjective norm (Stefan et al., 2013).

2.10 Conceptual Framework: The Theory of Planned Behaviour

The theory of planned behaviour is applied to health and food related behaviours and it links one's beliefs and behaviour (Kim, Njite & Hancer, 2013; Stancu et al. 2016). The concept of this work is adapted from the constructs of the theory of planned behaviour, thus, attitude, subjective norms and perceived behavioural control. The TPB further proposes that the strength of each of the antecedent merges into a part of the person's intention to exhibit a certain behaviour. A person's attitude is formed by his or her favourable or unfavourable judgement about a given behaviour and it is actually a mindset. In connection with food waste, attitude is about whether people assume if it is a critical issue that deserves to be reduced. A consumer's attitude of eating everything up on a plate is either acceptable or not acceptable. Thus, in a case of food waste, the important issue then has to do with whether people accept if it is a significant issue. Research has proven that consumers feel "bad" and are worried about discarding food and this gives an indication that consumers have a negative attitude towards that behaviour (Abeliotis et al., 2014; Evans, 2012; Watson & Meah, 2012).

Subjective norms refer to the belief about whether most people approve or disapprove consumers behaviour, thus, the social pressure one feels to complete (or not complete) a given behaviour (van der Werf et al., 2019). That is, how people behave can possibly be influenced by society's expected behaviour (Graham-Rowe et al., 2015; Bernstad, 2014). Perceived behavioural control explains a person's perception of how difficult or easy it is for him or her to perform the behaviour in question. Individual's perceived behavioural control or their belief in their capacity to act in a certain way may influence food wasting intention and consequent behaviour. The availability of resources and opportunities to a person to an extent predict behavioural achievement. The impact of perceived behavioural control on one's intention can relate to situations such as the conflict between food provisioning and fussy eaters, unexpected meals outside the dining hall and large portion served (Evans 2012; Williams, Wikström, Otterbring, Löfgren & Gustafsson, 2012).

Consumers' perception of food quality impacts food waste. Sadilek (2019) suggests that consumers have different perspective from which food quality is assessed. Sensorial attributes such as taste, flavour, colour, texture and overall acceptability would influence food choice and consequently impact food waste. with the improvement in the quality of meals, consumers are likely to consume more and less waste is generated. Food is likely to be discarded when the quality is substandard, especially with regards to the sensorial attributes (Evans, 2011).

By the close review of prior research, this framework postulates a greater potential to understand students' food waste and consequent behaviour in their dining halls. The framework finds important components that could possibly influence students' attitude towards waste food. Consequently, it is expected that students' attitude towards food waste could be ascertained by these integral factors like, attitude, subjective norms,

perceived behavioral norms, perception of food quality and socio-demographic factors.

Accordingly, the main concepts this study seeks to inquire is represented in Figure 1

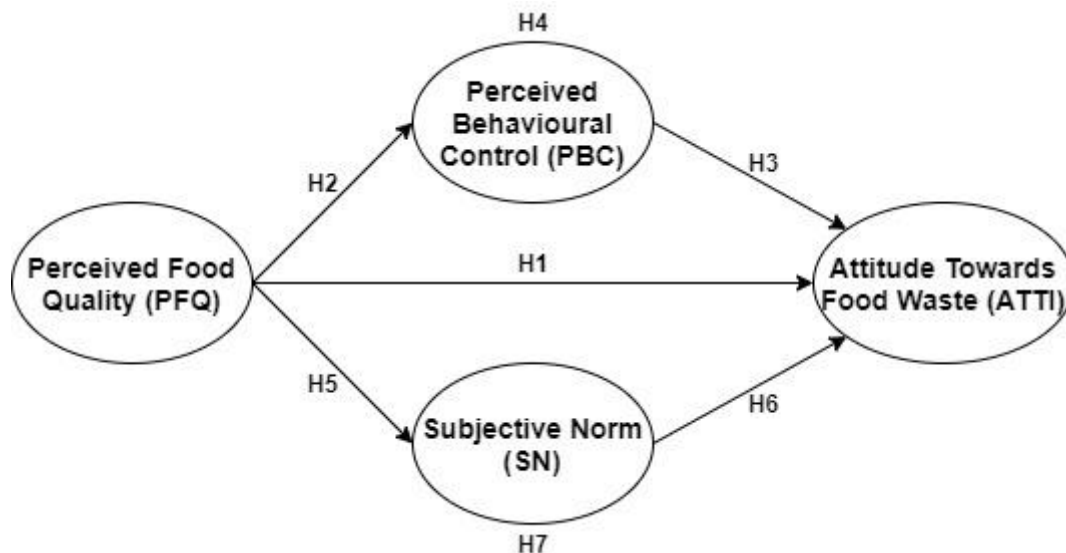


Figure 2.1: Adapted from the theory of planned behavior. Source: Icek Ajzen (1991, p. 182)

2.11 Influence of Socio-demographic Factors on Food Waste

van der Werf et al. (2019) asserted that socio-demographic factors are key determinants of food wasting behaviour. van Geffen et al. (2016) points to several socio-demographic factors which seem to shape consumer behaviors and their engagement in preventing food waste. Socio-demographic factors related to food waste may include age, gender and income. These appear to be the most common and influential.

2.11.1 Age

The age of a person happens to be a strong determinant of food waste generation. Accordingly, Quested et al., (2013) and Melbye et al., (2016) reported that children waste more food as compared to adults. A person's age has a great influence on the quantities of food being wasted as well as their attitude towards waste. Elderly consumers appear to have more positive attitude towards food waste and are found to

waste less food compared with younger consumers. (Eurobarometer, 2014). This may have come about as a result of the social and cultural background, thus the upbringing of these consumers, as elderly consumers have experienced periods of food scarcity whereas young children have not. Individual upbringing can be linked to the consumer perception and habits towards food management (Aschemann-Witzel et al., 2015). Moreover, elderly consumers may generate less waste as they are more skillful in the prevention of food waste. (Quested & Luzecka, 2014). Age also accounts for the many responsibilities in the household, such as grocery shopping and meal preparation. Again, elderly persons appear to be more food-literate from formal and informal food management and cooking education acquired through their upbringing (Quested et al., 2013).

2.11.2 Gender

The amount of food being wasted could also be influenced by the gender of the consumer. Studies by Visschers, Nadine, Wickli and Siegrist (2016) and Secondi, Principato and Laureti (2015) show that males waste more food than females. However, Koivupuro et al., (2012) reported the opposite, thus, females wasting more food than males. In addition to this, Graham-Rowe et al. (2015) was of the view that females have more positive intentions to reduce fruits and vegetables waste; and are more mindful of food waste (Secondi et al., 2015). Nonetheless, as food waste ensues from a household which is a group of persons who partake in food management tasks, it is obscure to determine who is accountable for any type of waste generated.

2.11.3 Income

The results on the effect of income on food waste levels are unclear. Some studies indicate that lower income is related to more food waste (Cox & Downing, 2007; Stancu

et al., 2016), but the opposite has also been reported (Stefan et al., 2013). Additionally, there are studies who found no relation between food waste and income (Koivupuro et al., 2012; Williams et al., 2012). Further, some preliminary findings suggest that lower wages or higher food prices are related to less food waste (Britton et al., 2014). WRAP (2011) asserted that when students are short on money, they rather spend it on a cheap snack than a full meal, resulting in waste of unserved food. A research by Lazell (2016) also revealed that when money is seemingly abundant, for example when students just received their stipend, they are tempted to spend more on food than they can eat, resulting in more plate waste.

2.12 Impacts of Food Waste on the Environment

Whenever food is wasted, all the resources (energy, water, manpower, etc.) that were used to provide the food item is also wasted. As a result of these terrible externalities, food that is wasted in the final stage of the chain, thus, intake, has a particularly higher environmental impact than losses of food earlier in the chain (Papargyropoulou et al., 2014; WRAP, 2011). Again, when food is disposed, its environmental impact continues. Biomass solid waste covers a great amount of area on landfills and whilst the organic material decays, it releases greenhouse gases like methane. Methane has 25 times the global warming potential of CO₂. The more time it lays, the higher the amount of emissions. More so, the decaying process of the organic material makes reuse or recycling more difficult as the quality of the product goes down as time passes (Papargyropoulou et al., 2014). Aside the environmental effects of landfilling biomass waste, it additionally threatens public health as there is the hazard of infection of water bodies and attracting ailment vectors (Vergara & Tchobanoglous, 2012; Buzby & Hyman, 2012). Once more, food waste cause excessive economic cost due to all the

wasted resources “to produce, store, transport and otherwise manage something that doesn’t in the long run meet its meant reason of feeding human beings”, plus the land required to landfill it (Buzby & Hyman, 2012). Food waste in the retail and consumption stage constitute a significant burden on the resources of towns and all efforts must be geared toward its reduction in order to alleviate the stress put on the city’s resources.

2.13 Reducing Food Waste Lessens the Environmental Impact

Judging from an environmental viewpoint, food production is resource-intensive and has a considerable environmental effect. Whenever food is wasted, it includes the poor use of resources and the terrible environmental effects. A report by FAO (2019) forecast that between 2012 and 2050, there would be an increase in call for agricultural products by 35-50 percent exerting even extra strain on the world’s resources due to a growing population and rising incomes. This requires an urgent attention for food waste to be reduced. Independently of the environmental goal, decreasing food waste will always enhance useful resource use efficiency due to the fact that more food reaches the consumer for a given degree of resources used (or, conversely, fewer resources may be used to make sure a given degree of food reaches the consumer) (FAO, 2019). Such reductions usually lower GHG emissions according to unit of food consumed. Within the context of a developing, wealthier population, the usage of resources more efficiently and decreasing GHGs emitted consistent with unit of food consumed may be paramount in meeting growing demand sustainably.

However, improved efficiency does no longer necessarily lessen the total resources used or GHGs emitted. The overall environmental impact may be the end result of price modifications related to the reduction of food waste, which will determine, indirectly, its

effect on natural resource use and GHG emissions. For instance, if the extra supply springing up from fewer losses has the effect of lowering prices for a product, then consumers may call for extra of the product. This will generally tend to counterbalance the positive environmental impact of the improved efficiency of the food system related to the reduction in food waste (FAO, 2019).

2.14 Food Waste Management in Schools

Food waste management practices are key sustainability challenges for the food service industry. Most of the initiatives in the reduction of food waste tend to focus on influencing people's behaviour in the cooking process, consumption and waste management (Lundie & Peters, 2005) or increasing their consciousness of more healthy diets, that are additionally associated with decreasing waste (Tagtow, Nguyen, Johnson-Bailey & Schap, 2015). According to FAO (2013), prevention of food waste reduces the usage of the natural resources involved in food production. Most importantly, reducing food wastage lessens the threatening ecological and socioeconomic impacts, related to food wastage disposal. A study conducted by Verona Municipality in Italy and Last-Minute Market (LMM), a subsidiary of University of Bologna in food waste reduction in schools revealed the recovery and distribution of unserved meals, perfectly fit for consumption, to low income brackets of the populace. The LLM model was not absolutely based on the prevention of food waste but also on the recovery of discarded fit for human consumption meals. The recovery model designed and implemented by the LLM was based on the precept of proximity (Segrè 2010; Segrè, Falasconi & Morganti, 2010). This means that a donor (the school canteen) and a beneficiary (a body or association helping vulnerable people) need to be located in the same neighbourhood or in the near vicinity. The aim is to lessen the distance and the length of delivery. This

precept is important to boom the safety of an operation carrying a high contamination risk owing to the health and hygiene components. In this respect, the municipality of Verona and LMM, with the help of the local health authorities, applied a set of suitable measures to enable the safety of the products. Schools were selected consistent with their vicinity, with the intention to set up a constrained area of operation and hence facilitate recovery activities.

Lagorio, Pinto and Golini (2018) asserted that, literature on food waste in school canteens is quite limited, however, some studies have addressed this problem from diverse perspective in the past, demonstrating different solutions for the reduction of food waste. Among them, Li et al., (2016) suggests the transformation of food into energy through biofuels or biogas. However, this solution can be applied when there is no other possibility to use the food for human consumption. When the food leftovers from school canteens can be reused, its transformation into energy can be considered a less attractive option.

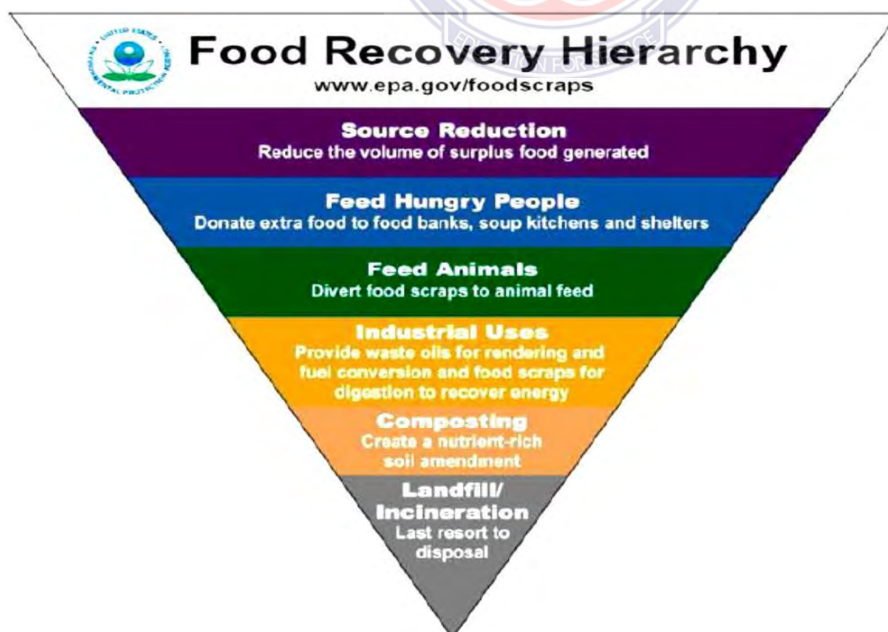


Figure 2. 1: Food Recovery Hierarchy (Source: Adapted from United States Environmental Protection Agency, 2014)

Other studies by Jungbluth, Keller & König (2016) and Toth, Koller, Illès & Bittsànszky, (2017) analysed the supply chain operations of companies dealing with canteen's management. They found out that consumers are not the only final producers of food waste; during the preparation and storage, a great quantity of food could be wasted, as a result of insufficient staff training. Therefore, with a greater attention to food preparation and preservation strategies, food waste can be reduced by 10% (Toth et al., 2017). Even the earlier stages of food process (i.e. selection of raw materials and suppliers, preparation and storage) may additionally impact the quality of food, the selection of the menus by consumers and consequently the amount of waste (Jungbluth et al., 2016). Several studies propose varieties of solutions: reducing the portion size of the serving, and a greater attention to the composition and presentation of menus and dishes from the point of view of content and appearance (Martins, Cunha, Rodrigues, & Rocha, 2014; Rodriguez, Oliveira, Lopes, & Dias-Ferreira, 2015).

Silvennoinen, Heikkilä, Katajajuuri & Reinikainen, (2015) performed a study on different Swedish companies operating in the catering sector and provisioning canteen service in schools. Their study, in addition to the previously described solutions, suggests to reduce the self-service and buffet solutions, and to give a greater attention to the education of school children towards a healthier diet. On this last point, Byker et al. (2014) analysed the meal leftovers in an American school cafeteria. Their study shows that after the introduction of a new regulation for canteens which require the presence of a greater amount of healthy foods, the food waste has increased. Therefore, it is necessary to teach students the importance of a healthy diet. In Italy, the municipality of Brusapoto school canteens, have very strict regulations on both the amount of the portions to serve and on the menu compositions in school canteens (Lagorio et al., 2018).

These regulations were created with the intention of providing adequate, proper and sustainable meals (with a particular attention on serving seasonal and locally produced food). Falasconi et al., (2015), in their quest to reduce food waste proposed the reduction of snacks consumed during recreation, whereas Bonomi, Moggi and Ricciardi (2016) propose the re-use of cooked-but-not-served food to help indigent families with the involvement of a set of stakeholders operating in the field, thus, students along with their families, teachers, public authorities, Non-Governmental Organizations and operators of canteens.

In table 1, the main suggested solutions for food waste reduction in school canteen are summarized.

Table 2.1 – Main Food Waste Reduction Strategy in School Canteens

Authors	Suggested Food Waste Reduction Strategy
Toth et al., (2017)	<ul style="list-style-type: none"> • Increase training of catering staff
Bonomi et al., (2016)	<ul style="list-style-type: none"> • Re-use unsold and/or unused food for charity • Stakeholders network including school, municipality and supermarket
Jungbluth et al. (2016)	<ul style="list-style-type: none"> • Applied measures to improve all the canteen operations and supply chain
Silvennoinen et al. (2015)	<ul style="list-style-type: none"> • Greater attention on menu composition • Minimizing buffet service • Reduce portions size • Greater attention on menu composition • Educational aspect
Falasconi et al. (2015)	<ul style="list-style-type: none"> • Less packaged sweet and salty snacks • Greater attention on menu composition • Less rigidity of the procurement specifications • Training catering staff to better presenting food
Byker et al. (2014)	<ul style="list-style-type: none"> • Reduce portions size • Encouraging nourishing food choices
Martins et al. (2014)	<ul style="list-style-type: none"> • Reduce portions size • Training catering staff to better presenting food
Rodriguez-Tadeo et al. (2014)	<ul style="list-style-type: none"> • Reduce portions size • Training catering staff to better presenting food

2.15 Reducing Food Waste in Schools

Most people do not approve discarding edible food, especially when others do not know where their next meal is coming from; and it has a serious environmental consequence

(greenhouse gas emission), and the water and fertilizer usage goes into growing food that will not nourish no one (Bloom, 2018), and also wastes money. Schools are a big part of the problem. The United States Department of Agriculture's (USDAs) National School lunch program serves 30 million kids every school day (Bloom, 2018), a point of justifiable pride, however the program also wastes about 5 million worth of edible food every school day. This amounts to 1.2 billion dollars in losses per school year (Bloom, 2018).

Students in Senior High Schools in Ghana do not have a choice in the type of meals they get. In theory, having choices reduce waste, but students in Senior High Schools in Ghana are only served with just one or two food items, that some will not eat or others not finishing their plate.

One basic reason for caring about wasted food in school during meal times is in a way nutritional in nature, surprisingly, some food wasted comes from healthy food items. A study by Harvard School of Public Health reveals 60% of fresh vegetables and fruits are being thrown away (Harvard School of Public Health, 2014). By reducing the amount of food wasted and increasing the amount consumed, the beneficial outcome would improve nutritional intake. This is particularly important for those vulnerable undernourished students where school food service is primary in nature (Williamson, 2019).

According to Folliard, Hardy and Benson (2019), there are several ways by which food waste can be managed in schools, ranging from planning the meals to serving the food. At the planning stage, menu planners may scrutinize food items and have a review of

food items that students like or dislike and probably withdraw the food items that students do not like and replace them with new food items for them to try. At the point of purchasing food items, enough food should be purchased and over purchasing should be avoided. More of food surplus in storage should not be ordered until it is needed.

Received food items should be stored at appropriate temperature for it to keep long instead of discarding them when not utilized. At the point of storage, food should be correctly stored to enable it to stay fresh and quality at its peak. Food in storage rooms, freezers and coolers temperatures should be monitored to make sure food is stored within the appropriate temperature to minimize its wastage. At the point of production, making sure that cooks are given training on knife skills help to reduce food wastage of fresh fruits and vegetables. One other strategy to reduce wastage during production is to ensure that cooks pay close attention to the cooking of foods in order not for them to be burned or end up been prepared with a lower quality that student will not eat and are likely to be discarded. During the serving process, schools can implement what Folliard et al. (2019) describe as “offer versus serve” so that students can select food items that they want rather than been compelled to take only one meal which is available for all. When students are allowed to select the kind of food they eat, they are less likely to produce more waste (Folliard et al., 2019). The amount of time allotted to students meal time for them to sit and eat their meals is key to food waste reduction. Studies have proven that, students need to have not less than twenty minutes to literally sit and consume their meals, surely not a twenty-minutes duration for meal period (Folliard et al., 2019). When students are given enough time to be seated and have a meal, they consume more of their food, rather than feeling rushed. Meal times, in our culture are traditionally a social time, therefore granting students enough time to consume their food and to socialize is eminent (Folliard et al., 2019).

The catering industries in school setup is an ideal threshold for interventions since a huge number of consumers is been served here in a single location resulting in a large concentrated food waste stream. Any food reduction in this kind of agency has an immediate great impact on the footprint regarding food waste (Derqui & Fernandez, 2017; Wilkie, Graunke & Cornejo, 2015). More so, if it is rightly done, the benefit will not be narrowed down to schools alone. New generations are educated here and giving them a good example in school could have a trickle-down effect in the whole future society.



CHAPTER THREE

METHODOLOGY

3.1 Research Design

A descriptive research of the survey design was used in this study. Descriptive survey deals with the collection of data to answer questions or test hypotheses concerning the present status of the subject being studied. Descriptive survey can either be sample or census survey. In a sample survey, information is collected on a population and some generalization is made about the entire population. On the other hand, a census survey is where an attempt is made to acquire data from each and every member of the population under study.

The researcher employed the base line sample survey for the study because of its suitability. This enabled the researcher to describe certain aspects of the population by sampling individuals to complete a set of questionnaires. As the subjects of the sample have the same characteristics as the population. A generalization was made about the whole population based on the responses of the sample drawn from the population.

3.2 Population for the Study

A target population is any indefinable total set of elements about which the researcher wishes to make inferences (Collis & Hussey, 2009). In order to achieve the objectives of this research, the research population was chosen to include all Senior High Schools students and matrons in the Kumasi Metropolis. This population was suitable as it consists of individuals who are directly involved in food consumption and its wastage. In all, there are thirteen (13) Senior High Schools in the Kumasi Metropolis, five (5) single sex school and eight (8) mixed schools.

3.3 Sampling and Sample Techniques

The study used a multi-stage cluster sampling technique in selecting the study participants. According to Alvi (2016), multi-stage cluster sampling becomes very useful sampling approach to use particularly when a study has a large population scattered across different clusters in this case boys' schools, girls' schools and mixed sex school. As indicated in the study population, the Kumasi Metropolis has a total of thirteen (13) Senior High Schools in the Kumasi Metropolis, with three of these schools as girls' school, two as boys' schools and eight as mixed-sex schools. Hence, with these different clusters within the population, it becomes unfeasible to use a simple random sample to select the participating schools since it may not yield into a good representation of the exact Senior High Schools within the Kumasi Metropolis. Accordingly, the population were divided into three groups namely; girls' school, boys' school and mixed sex school. Accordingly, schools within these categories were put into separate containers and randomly shuffled to select one school from each category (i.e. girls' school, boys' school and mixed sex school). From this exercise, Opoku Ware school was selected from the boys' school category, Kumasi Girls School was selected from the girls' school category and Osei Kyeretwie Senior High was selected from the mixed sex school category. At the time of the study, there were only form two students at school due to the Covid-19 pandemic hence, the student's population entirely came solely from form two students. Opoku Ware had a form two boarding population of 1603, Osei Kyeretwie Senior High had a form two boarding students' population of 1166 and lastly Kumasi Girls School had a form two boarding students' population of 925. However, to determine the sample size for each of these schools, the study used the Krejcie and Morgan (1970) sampling size determination table. Based on the sampling table for the

study, Opoku Ware with a population of 1603 had a corresponding sample size of 310, Osei Kyeretwie Senior High with a population of 1166 had a corresponding sample size of 291 and finally Kumasi Girls School with a boarding population of 925 had a corresponding sample size of 274. Afterwards, in each of these schools the identified sample size were randomly selected from the schools' form two students.

Table 3.1: Description of Population Size and Sample Size

Cluster of Sample of Customers along the different schools	Population size	Sample size
Opoku Ware school for boys' school	1603	310
Kumasi Girls Senior High for girls' school category	925	274
Osei Kyeretwie Senior High for mixed school category	1166	291
Total	3694	875

3.4 Instrument for Data Collection

A mixed method approach was employed for this study. According to Honorene (2017), a mixed method approach combines different aspects of research methods and thus increase the validity and the credibility of the data set and information used. Questionnaire, interview as well as an observation checklist were used to collect the data. Using multiple methods help facilitate deeper understanding and help to overcome the weakness or intrinsic biases and the problems that come from a single method (Honorene, 2017).

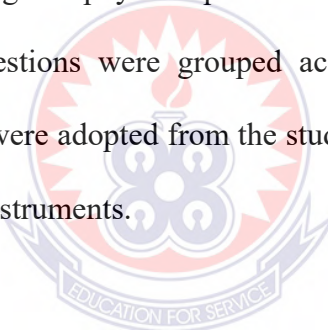
3.4.1 Observation

An observation schedule was designed that lists the factors for observation (see appendix). Observation was carried out on physical aspects and on processes. The food preparation process was observed to understand what, how and why food management practices are carried out in the kitchen. After all students were served, an observation of

the kitchen and serving pans were also inspected, to know the amount and type of unserved foods and plate leftovers. The state of the dining hall, the serving process, eating process, students and plates were observed to pick out the factors and reasons for contributing to plate waste. Finally, observation of food waste containers was done to get an idea of the amount and types of food wasted.

3.4.2 Questionnaire

Data for the questionnaire was collected via structured questions consisting of close ended questions. Questionnaires were used as the data collection instrument due to its ability to collect data of high quality within the shortest possible time with minimum costs as well as not requiring the physical presence of the researcher (Robertson and McCloskey, 2002). The questions were grouped according to the constructs. Some aspects of the questionnaire were adopted from the study of van der Werf et al. (2019) to ensure the reliability of the instruments.



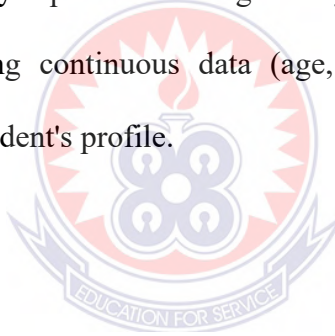
3.4.3 Interview

Structured interview that consisted a set of questions carefully worded and arranged for participants in the interview. Face to face and telephone were both used for the data collection for the interview. The interviews conducted were recorded upon agreement by the respondent for transcription. That in a way allowed every information provided by the interviewees to be captured. The shortest lasted for twenty- two minutes and the longest lasted for twenty-nine minutes. The interviewees were asked for permission before the interviews were conducted and were assured of confidentiality. No financial or other incentives were provided for participation. The questions were organised around

one theme that is information relating to food waste management practices of second cycle schools.

3.5 Data Analysis

The data was analysed using Structural Equation Modeling (SEM) approach in Amos (v.25) to test the relationships among the constructs in the proposed model. SEM-approach in Amos (v.25) was seen as most suitable because of the predictive focus of the objective of the study (Malkanthie, 2015). Again, SEM- approach in Amos (v.25) due to its distribution-free assumption which was suitable for the study objectives. The responses collected from the three categories of schools (mixed, boys' and girls'), the dominant data type is mostly represented categorically for the various responses while the rest were spread among continuous data (age, gender and stipend) and other information about the respondent's profile.



3.6 Ethical Consideration

Easterby-Smith et al., (2018) suggest that researchers should all the time protect the interest of the research subject and their integrity guaranteed. Research ethics as stated by Bryman and Bell (2007) is the protection of the participants' privacy and anonymity, while being transparent about how the data will be utilized by the researcher. The respondents and participants were informed and provided with information concerning the purpose of the research and what their answers would be used for (only for the purpose of the research). The respondents and participants were informed that their names would be classified and that their age and gender would only be required.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Demographic Data

From the respondents selected, 302 were males while 276 were females. About 95% of the respondents were aged 13-20 years, with only 5% whose age was over 20 years. There were two tracks (intakes) of students, the green and the gold. This study had 361 green track students and 217 gold track students. Most of the students sampled received less than GH¢150 per semester, and the majority of the students (259 students) also received their allowances on monthly basis.

Table 4.1: Demographics of Students

Demographics	Frequency (N)	Percentages (%)
Gender	578	100.0
Male	302	52.2
Female	276	47.8
Age	578	100.0
13-15 years	90	15.6
16-19 years	459	79.4
Above 20 years	29	5.0
Track	578	100.0
Green	361	62.4
Gold	217	37.5
Stipend (GH¢)	578	100.0
20-50	144	24.9
51-100	247	42.8
101-150	129	22.3
151-200	35	6.0
201-300	13	2.3
Above 300	10	1.7
Frequency of Receiving Stipend	578	100.0
Weekly	90	15.6
Two weeks	133	22.0
Three weeks	96	16.6
Monthly	259	44.8

Source: Field Survey (2020)

4.2 Descriptive Analysis of the Study

Table 4.2 shows that students in Senior High Schools in the Kumasi Metropolis generally know that whenever food is wasted, it is also a waste of the money used to procure the food item ($M = 6.053$, $SD = 1.267$). The students believe that ($M = 5.424$, $SD = 1.632$) discarding food while other people somewhere in the world might need it is a bad practice, and they worry ($M = 5.374$, $SD = 1.612$) when uneaten food ends up in the waste bin. The students also regard plate leftover as wrongful attitude ($M = 4.754$, $SD = 1.863$). Some of them feel embarrassed when they have to finish meals completely which most of students do not appreciate ($M = 4.553$, $SD = 1.541$).

The students perceive that they cannot do anything about the food they waste ($M = 4.954$, $SD = 1.7451$) and find it somewhat difficult to ensure that meals served them are completely eaten ($M = 4.500$, $SD = 1.955$). A fair number of the student who do not finish their meals entirely is not for the fact that they are not hungry ($M = 3.6484$, $SD = 2.136$) but could be due to other factors other than hunger.

With regards to the temperature at which food is served, students were not satisfied ($M = 2.938$, $SD = 1.805$), with the cleanliness of the tables on which foods are served not also appreciated by them ($M = 3.222$, $SD = 1.730$). Students largely do not appreciate the sensorial attributes of the meals served at the dining halls of the schools. Thus, most of them do not like the taste ($M = 3.328$, $SD = 1.841$) and the flavour ($M = 3.394$, $SD = 1.842$) of the of the meals served.

Table 4.2 Descriptive Analysis

Variables	Mean	Std. Dev.
Perceived Food Quality	3.349	1.438
I like the appearance of foods served	3.691	1.976
I like the texture of food served	3.520	1.952
I like the flavour of foods served	3.394	1.842
I like the taste of foods served	3.328	1.841
I am satisfied with the cleanliness of the table on which food is served	3.222	1.730
The temperature at which food is served is excellent	2.938	1.805
Perceived Behavioural Control	4.333	1.571
I have the feeling that I cannot do anything about the food wasted in the dining hall	4.959	1.745
I find it difficult to make sure that all my food served is eaten completely	4.500	1.955
I find it difficult to finish my food because I don't get enough time to eat all of my food	4.190	2.276
I find it difficult to eat all my food because I don't usually feel hungry during meal time	3.684	2.136
Subjective Norms	4.427	1.239
It would be embarrassing to me if I finish all the food served to me that a lot people do not like	4.553	1.541
A lot of my friends disagree when I try to reduce food waste at the dining hall	4.402	1.399
People who are important to me find my attempts to reduce the amount of food wasted unnecessary	4.379	1.518
I don't eat food completely because my colleagues don't also eat all their food	4.374	1.448
Attitude Towards Food Waste	5.401	1.117
Money is wasted whenever food is wasted	6.051	1.267
It is not a good practice to discard food while other people in the world are in need of it	5.424	1.632
I am worried when uneaten food is thrown into the waste bin	5.374	1.612
It is wrongful to have a plate left over	4.754	1.863

4.3 Reliability and Validity Analysis

Before the main analysis which was done using Structural Equation Modeling (SEM) approach in Amos (v.25), reliability and validity of the data were first assessed. Reliability and validity issues are critical concerns in research. This study therefore undertook some measures to ensure the final results presented were based reliable and valid data, as well as sound methodology. As part of SEM, it is expected that the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are

presented to ensure the soundness of the path estimates. Discriminant validity was also checked.

4.3.1 Exploratory Factor Analysis (EFA)

Table 4.3 presents the EFA results, which was run in SPSS (v.23). There were 4 main constructs for the study, which were perceived quality of food (PQF), perceived behavioural control (PBC), subjective norm (SN), and attitude towards food waste (ATTI). The EFA helps to determine if these measurement items correctly load under the respective observed variables. A minimum factor loading of 0.5 was expected, and measurement items were also expected to load under their respective latent variables. Measurement items which failed to meet these criteria were deleted. Originally, attitude had 7 measurement items, but 4 were retained. Perceived food quality had 9 measurement items, but 6 were retained. Perceived behavioural control and subjective norm however, had all their respective 4 measurement items retained.

The total variance extracted (TVE) is expected to be at least 50%, and from Table 4.3, it was realized that the TVE for this study was 71.26%, which was very high. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy, and a minimum of 0.6 is expected. This study however scored 0.824. The Bartlett's Test of Sphericity is expected to be statistically significant, to indicate there exist adequate correlations among the variables to warrant EFA. Results for this was statistically significant ($\chi^2 = 2115.289$; Sig. = 0.000), indicating EFA was appropriately conducted. The correlation Determinant is expected to be not equal to zero (0), as an indication of positive definiteness. The Determinant for this EFA was 0.002 (greater than 0), indicating there was positive definiteness in the data used for the estimation.

Table 4.3: Exploratory Factor Analysis (EFA)

Measurement Items	Components			
	1	2	3	4
QUAL1	.665			
QUAL2	.809			
QUAL3	.813			
QUAL4	.790			
QUAL5	.690			
QUAL6	.724			
PERC1		.809		
PERC2		.809		
PERC3		.734		
PERC4		.634		
SUBJ1			.825	
SUBJ2			.846	
SUBJ3			.816	
SUBJ4			.780	
ATT1				.671
ATT2				.727
ATT3				.721
ATT4				.702
Total Variance Explained				71.26%
Kaiser-Meyer-Olkin Measure of Sampling Adequacy				.824
Bartlett's Test of Sphericity	Approx. Chi-Square			2115.289
	Df			153
	Sig.			.000
a. Determinant				.002

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Source: Field Survey (2020)

4.3.2 Confirmatory Factor Analysis (CFA)

As part of the validity and reliability checks, this study conducted Confirmatory Factor Analysis (CFA) in Amos (v.23), using maximum likelihood to assess how well the data fits the model (results presented in Table 4.3). During the CFA analysis, measurement items which loaded poorly (less than 0.5) were deleted from the final analysis. To further check for reliability (internal consistency) of the measurement items, Cronbach's Alpha (CA) analysis was run using the retained measurement items. To achieve internal consistency, the alpha score is expected to be at least 0.7, which was achieved for all constructs in this study (Table 4.3). Convergence validity was also assessed by checking

the Average Variance Extracted (AVE) for the constructs. To achieve convergence validity, AVE score should be at least 0.5, and Composite reliability (CR) should also be at least 0.7 (Fornell & Larcker, 1981). From the results presented, the least AVE was 0.568 (PBC) and the least CR was 0.839 (PBC), implying that convergence validity was achieved for this study. Based on Hair, Black, Babin and Anderson's (2010) recommended fit indices criteria, it was concluded that the CFA model for the constructs appropriately fit the data. CMIN/DF is supposed to be less than 3, CFI is all expected to be greater than 0.9, while RMSEA and SRMR are also expected to be less than 0.08. P-Close is also expected to be statistically insignificant at 5%. These were all achieved as presented in Table 4.3. Figure 4.1 presents the CFA in a diagrammatic form.

Table 4.3: Confirmatory Factor Analysis

Model Fit Indices: $CMIN = 170.729$; $DF = 121$; $CMIN/DF = 1.411$; $CFI = .975$; $TLI = .969$; $RMR = .032$; $RMSEA = .037$; $PClose = .959$	Std. Factor Loading
Perceived Food Quality (PFQ): $CA=0.866$; $CR=0.904$; $AVE=0.612$	
I like the taste of foods served (QUAL1)	0.736
I like the appearance of foods served (QUAL2)	0.844
I like the texture of food served (QUAL3)	0.842
I like the flavour of foods served (QUAL4)	0.722
The temperature at which food is served is excellent (QUAL5)	0.733
I am satisfied with the cleanliness of the table on which food is served (QUAL6)	0.805
Perceived Behavioural Control (PBC): $CA=0.843$; $CR=0.839$; $AVE=0.568$	
I find it difficult to eat all my food because I don't usually feel hungry during meal time (PERC1)	0.776
I find it difficult to finish my food because I don't get enough time to eat all of my food (PERC2)	0.763
I find it difficult to make sure that all my food served is eaten completely (PERC3)	0.640
I have the feeling that I cannot do anything about the food wasted in the dining hall (PERC4)	0.823
Subjective Norms (SN): $CA=0.849$; $CR=0.856$; $AVE=0.601$	
I don't eat food completely because my colleagues don't also eat all their food (SUBL1)	0.639
A lot of my friends disagree when I try to reduce food waste at the dining hall (SUBJ2)	0.763
People who are important to me find my attempts to reduce the amount of food wasted unnecessary (SUBJ3)	0.865
It would be embarrassing to me if I finish all the food served to me that a lot people do not like (SUBJ4)	0.815
Attitude Towards Food Waste (ATTI): $CA=0.872$; $CR=0.844$; $AVE=0.576$	
It is wrongful to have a plate left over (ATT1)	0.773
It is not a good practice to discard food while other people in the world are in need	0.663

of it (ATT2)

I am worried when uneaten food is thrown into the waste bin (ATT3)

0.808

Money is wasted whenever food is wasted (ATT4)

0.784

Source: Field Survey (2020)

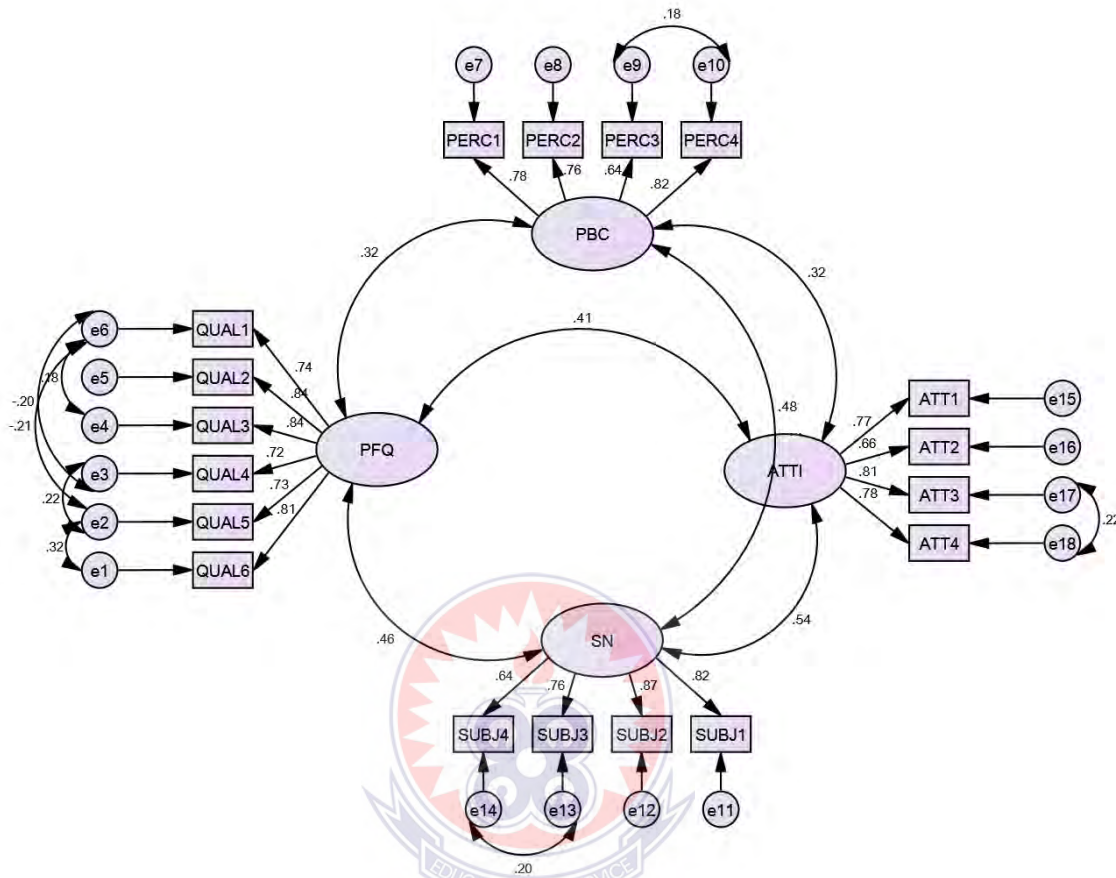


Figure 4.1: Diagrammatic Presentation of Confirmatory Factor Analysis

Source: Field Survey (2020)

4.3.3 Discriminant Validity

Discriminant validity was assessed by comparing the squared-root of the AVEs ($\sqrt{\text{AVEs}}$) with the inter-correlation scores. To achieve discriminant validity, the least $\sqrt{\text{AVE}}$ should be greater than the largest correlation score (Bamfo *et al.*, 2018). From the analysis, the least $\sqrt{\text{AVE}}$ was 0.754, which was greater than the largest correlation score of 0.542 (Table 4.4). This indicates the study achieved discriminant validity.

Table 4.4: Discriminant Validity

Variables	PFQ	PBC	SN	ATTI
PFQ	<u>0.782</u>			
PBC	0.323**	<u>0.754</u>		
SN	0.455**	0.483**	<u>0.775</u>	
ATTI	0.407**	0.321**	0.542**	<u>0.760</u>

** ~ *P-value significant at 1% (0.01)*

√AVE are bold and underlined

Source: Field Survey (2020)

4.4 Path Estimates

4.4.1 Direct Effect of Perceived Food Quality on Attitude Towards Food Waste

Structural Equation Modelling (SEM) was run in Amos (v.23) to assess the various paths hypothesized in the study. Age, stipend, frequency of receiving stipend (REG), and track (as control variables) had a negative effect on student's attitude towards food waste (ATTI). However, only stipend received had a significant effect on students' attitude towards food waste. The negative coefficient implies that students who received more stipend (GH¢) had less favorable attitude towards food waste, while students who received less stipend had more positive attitude towards food waste. This was quite expected, as students with more stipend (money) could afford to buy foods outside the dining hall, so they did not care much when food was wasted. Gender had a significant positive effect on students' attitude towards food waste. Gender was coded 0=female and 1=male. The positive coefficient therefore implies that male students had more favourable attitude towards food waste, compared to female students.

Results on the hypothesized paths indicate that perceived food quality (PFQ) had a significant positive effect on attitude towards food waste ($\beta = 0.509$; C. R. = 5.222). Meaning students who perceived the dining hall meals as of high quality, have a more

favourable attitude towards food waste, and vice versa. Perceived behavioural control (PBC) had a significant positive effect on students' attitude towards food waste ($\beta = 0.418$; C.R. = 4.274). Implying that high level of perceived behavioural control leads to more positive attitude towards food waste, and vice versa. Similarly, subjective norm (SN) also had a significant positive effect on attitude towards food waste ($\beta = 0.429$; C.R. = 5.151). That is, high level of subjective norm leads to more positive attitude towards food waste, and vice versa. Students' perceived food quality also had a significant positive effect on perceived behavioural control ($\beta = 0.318$; C.R. = 5.286) and subjective norm ($\beta = 0.462$; C.R. = 6.259). High perceived food quality therefore increases perceived behavioural control and subjective norms of students, and vice versa. Just like the CFA, the structural model as presented in Table 4.5 also met the various fit indices as proposed by Hair et al. (2010). Figure 4.2 presents the structural model for the study.

Table 4.5: Path Summary

Path	Std. Estimate	C.R.
GENDER → ATTI	0.193	1.997*
AGE → ATTI	-0.021	-1.053
STIP → ATTI	-0.202	-2.393*
REG → ATTI	-0.091	-1.299
TRACK → ATTI	-0.068	-1.201
PFQ → ATTI	0.509	5.222**
PBC → ATTI	0.418	4.274**
SN → ATTI	0.429	5.151**
PFQ → PBC	0.318	5.286**
PFQ → SN	0.462	6.259**

Model Fit Indices: $CMIN = 460.905$; $DF = 217$; $CMIN/DF = 2.124$; $CFI = .929$; $TLI = .921$; $RMR = .034$; $RMSEA = .061$; $PClose = .079$

** ~ P-value significant at 1% (0.01)

* ~ P-value significant at 5% (0.05)

Source: Field Survey (2020)

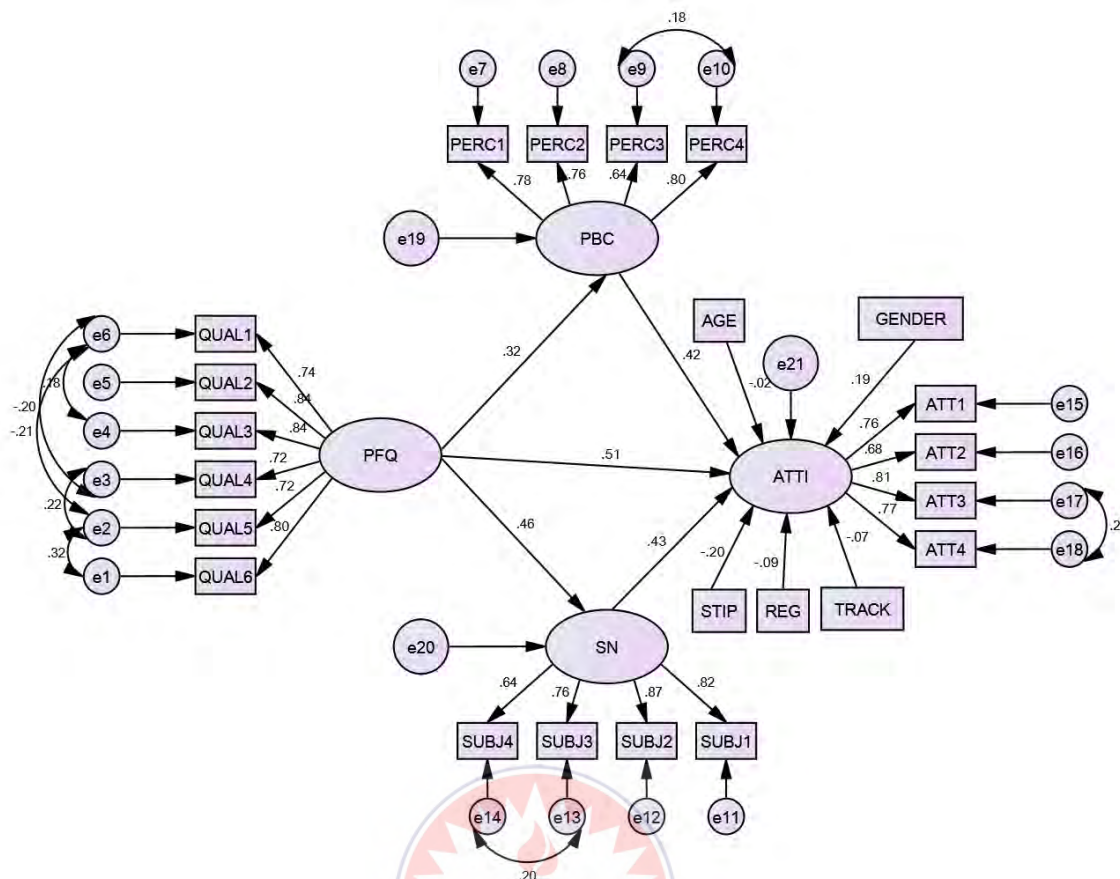


Figure 4.2: Structural Paths
Source: Field Survey (2020)

4.4.2 Mediating Effect

The study also assessed the mediating effects of perceived behavioural control and subjective norm in the relationship between perceived food quality and attitude towards food waste. Table 4.6 presents the direct and indirect (mediating) effects. The indirect effect of perceived food quality on attitude towards food waste, through perceived behavioural control, was 0.133. This coefficient was statistically significant, using the Sobel’s test approach. This implies that, the effect of perceived food quality on students’ attitude towards food waste was not just direct, but partially mediated through perceived behavioural control. In other words, perceived behavioural control partially explains the effect on perceived food quality on attitude towards food waste.

The study also assessed the potential of subjective norm in explaining the effect of perceived food quality on students' attitude towards food waste. Results from Table 4.6 indicate that the indirect effect of perceived food quality through subjective norm was 0.198, which was statistically significant (using the Sobel's test). That is, the effect of perceived food quality on attitude towards food waste was not only direct, but partially mediate through subjective norms. That is, subjective norm significantly explained the effect on perceived foods quality on attitude towards food waste among second cycle students in Ghana.

Table 4.6: Mediating Effect

Paths	Direct Effect		Indirect Paths				Indirect Effect (<i>a*b</i>)	Sobel's Test
			<i>A</i>		<i>B</i>			
	Est.	C.R.	Est.	C.R.	Est.	C.R.		
PFQ → PBC → ATTI	0.509	5.222**	0.318	5.286**	0.418	4.274**	0.133	3.324**
PFQ → SN → ATTI	0.509	5.222**	0.462	6.259**	0.429	5.151**	0.198	3.977**

***Sig. at 1%*

Source: Field Survey (2020)

4.7 Results from Interview

4.7.1 Preparation of Food to Lessen Food Waste

When respondents were asked ways in which food is prepared in order not to have so much unserved food leftover, all respondents indicated that they know the number of tables to serve and as a result they adapt the quantity of food to be served to the students' population. With this experience, they able to make accurate estimation of the number of students to be served every day. One respondent added that her school uses measuring containers to measure the exact quantities of food stuffs needed for cooking. Another

respondent added that the school's stores department dispatches food according to the student's population therefore less or no unserved food is encountered.

4.7.2 Practices that Consider Foods Student Waste

All respondents indicated that they consider particular foods students do not like (for example Groundnut soup and Kenkey, Beans stew and qari) and reduce their quantities during its preparation.

One respondent added "the kitchen staff knows particular food student eat less, as a result, the stores department releases less quantity of those raw or uncooked food for cooking".

4.7.3 Days that the Amount of Food Prepared is Reduced

All respondents indicated that they have days such as visiting days, early days of school reopening and during interschool's sports competition (only lunch meals) where the quantity of food prepared is reduced. For early days of school reopening, dining hall masters or housemasters and mistresses provide them with the number of students who have reported for food to be cooked for them. One respondent indicated that quantity of food reduced on visiting days are dependent on their own discretion".

4.7.4 Food Portioned to Reduce Waste

Responses from the participants indicated that serving pans were used to measure enough food for the number of students at table. Table heads use ladles to portion food at the table so each student gets just enough food. When probed further if students complain of portion being too much, one respondent said "students do not usually complain of too much portion except days that significant number of students do not

appreciate the food served. On such days, there would be more unserved meals which other students would take more than they can eat”. Further enquiry into how food is portion per head, one respondent replied “we take into consideration the worth of between 1 cedi and 1 cedi 50 pesewas kenkey and with that, we portion the kenkey per head. With this “portion strategy” in mind we also portion our kenkey”.

4.7.5 Students Food Preference

All respondents indicated that student preferences are not really considered, adding that the current government has in place a fixed menu cycle for the students and that is what they go by. One respondent however indicated that “students’ preference may only be considered when we ran out of stock on certain foods”.

4.7.6 Changes in Menu Cycle

One respondent indicated that changes in menu help reduce waste, in that, when certain foods are in season, for instance, if plantain is in season, fried plantain is served with beans stew and gari and that encourages the student to eat more and less waste is generated. One other respondent replied to the question by stating that “when other food crops are in season, for example when kontomire is out of season and cabbage is in abundance, the menu can be adjusted to suit the food crop in season (e.g. cabbage replaces kontomire in a stew) and that encourage the students to eat more at that time of change unless some students simply do not like those new foods”.

4.7.7 Number of People at the Table

Two respondents indicated they have a required number of students to sit at a table (e.g. 10 students) however, some students may not sit up to the number required and those

students could serve themselves more portions per head which may result in waste. They added that if all students report at the table, less food waste is generated.

One respondent indicated that on days that more students do not report at the dining hall, dining hall master ensure student sit up to the number at table to reduce the amount of plate left over.

4.7.8 Time Allotted for Eating Meal

One respondent indicated that time allotted for eating meals is thirty minutes. However, students would have to walk from classroom to the dining hall and finish meals within that same time. Those who report late might not be able to finish their meals and since food is not supposed to leave the dining hall, it may result in wastage. One respondent also said that “students may only rush through their meals during exams time and that may result in food wastage, if not for this reason, time allotted for meals is enough for students to finish their meals. Another respondent said “the time for meals is enough for students to eat their meals but if adjusted a little, it would help every student to have ample time to finish their meals”.

4.7.9 Presence of Competitive Food Sources

One respondent indicated that food vendors are not allowed in the school. Only light foods such as snacks are sold in the school and that has persuaded the student to eat the meals served at the dining hall. One other respondent indicated that the presence of food vendors prevents students who can afford to buy food to waste food at the dining hall. One respondent said that “some students would not even come to the dining hall because they have access to food vendors”. When probed further as to whether dining was

compulsory or not, the respondent replied “dining used to be compulsory but this rule is a bit relaxed now”.

One respondent also indicated that both the presence of food vendors and foods in students’ chop boxes do not help the reduction of food waste in the dining hall. The respondent added that when food vendors were not allowed in the school early on, student patronized the dining meals in a greater number and that lessened the amount of food waste but now food vendors come over even on weekends which affects food waste reduction.

4.7.10 Supervisory Role of Dining Hall Masters

All respondents indicated that dining hall masters and teachers on duty ensure that the required number of students are seated on a table. They added that the dining hall masters tell students “no food leaves the dining hall” and that encourages student to eat more. One respondent said that “dining hall masters and teachers move round and teach some students the correct usage of cutlery and encourage them not to waste food”. Another respondent also said “days that students’ attendance is poor in the dining hall, students who want more food are served with additional food”.

4.7.11 Handling of Unserved Foods

One respondent indicated that days that they have unserved foods, it is given to the dining hall prefects. When probed further, if unserved food is used for any leftover dish, she replied “pan leftover food is not used for preparing any dish in the school. Students will protest against it if they get to know. If we have too much unserved food and nobody wants it, it is been discarded”.

Two respondents however, indicated that unserved foods are given back to student who want more food to eat and if they still have excess it is given out as donation to the town folks who they refer to as “sope boys”.

4.7.12 Treatment of Plate Leftover

All respondents indicated that plate leftovers are given out to feed animals. One respondent out of three “said days that food waste collectors do not come, it is discarded”. Another respondent added that the “pantry men” sort out the plate waste and take out the whole portions (for example, kenkey) and “nearly perfect food” and give it out to the “sope boys”.

4.7.13 Educational Programs on Food Waste

All respondents indicated there is no formal program to educate students on food waste. However, one respondent said the kitchen staff only register their displeasure on days that the students generate a lot of food waste and encourage them to reduce it.

One other respondent however indicated that there was one time that students were showed a video on how to comport themselves at the dining hall and how to use cutlery set correctly.

4.8 Observation Results

There were several periods of observation that were carried out in the course of this study. The observation was broadly divided into two phases. The first phase of the observation in the schools were done in the kitchens and dining halls before the commencement of this research to familiarize with the organization, layout, and norms of the setting. Latter observations were conducted to better understand how students

internalize and replicate food waste norms. The observation was not confined exclusively to the kitchens and dining halls alone, but more broadly took place wherever students gathered to share a half hour of the day's meal time including the food vendors place. All the dining halls were large high-ceilinged rooms with concrete floors. Long tables and benches were provided for students to sit during meal times

All the meals that were served at the dining hall of the schools were prepared by the cooks in the kitchen and supervised by the matrons. Ingredients for cooking the food were obtained from the stores department. The matrons reported the experiences of the kitchen staff could explain that the amount of food cooked are better fit for the number of students consuming it. In all the schools, the foods were served in pans

Bins were checked to see the types of food wasted, it was observed that, beans stew and gari, kenkey with groundnut soup/okro stew, palava sauce with boiled rice were most wasted. Bread, waakye and fruits were least wasted. The amount of waste varied slightly between the selected schools. The girls' and mixed schools had slightly higher food waste than the boys' school. It was also observed that some food items that could be saved and eaten later, example, bread and kenkey were sneaked out of the dining hall by the students.

It was observed in two schools that students enter the dining hall in turns, there were different times for break. Although the dining hall looks spacious, however, it couldn't contain the student's population at a time and they had to enter the dining hall in batches for meals. That notwithstanding, all students start and end meals at the same time. Meals in service bowls with serving spoons were placed on the tables before students entered

the dining halls, Students numbered between 10 and 12 sat around one table and were served by the table head. In some cases, less than 10 students sat at one table, serving themselves more food per head. Tables were well arranged to make movement easier for the students. All the students were entitled to same portion of food. However, some students took more or less of certain foods. At the end of the meals it was observed that some students could not finish their meals, when asked, various reasons were given which include too much portion, not having enough time to finish their meals and students dislike for the meals served. Some students also arrived late for meals. The students who arrived late did not get enough to time finish their meals and that also ended up as waste. Some students reported their teachers for the next lesson would not tolerate lateness and are always in hurry to finish meals resulting in plate waste that would be avoided when more time is scheduled for break.

During the break time, some students were also spotted at the food vender's place. Some students reported to appreciate alternative foods from the vendors more than the food served at the dining hall. If students patronize food from the vendors, there is a good chance that some amount of food is left unserved and ends up as waste.

Supervisors were found to be present at every meal time. Dining hall masters together with teachers on duty were found with the students at the dining hall performing supervisory roles. They ensured that students sit to the required number at a table. Supervisors reported it is possible for students to come for second helping but just a handful of students were observed asking for second help. Supervisors announced to students that food should not leave the dining hall and told them to finish their meals but students had plate leftovers for almost all the foods served. Plate leftovers were put back

in serving bowls which was taken to the pantry and others disposed. Observations like these informed development of questions asked during the interview with the matrons and the questionnaire with students.



CHAPTER FIVE

DISCUSSION OF RESULTS

5.0 Introduction

This chapter discusses the results that were obtained from the field study. Again, the implications of the study as to how it aligns with the study objectives as well as relate with earlier studies have been presented in this chapter.

5.1 Relationship between Respondents Demographic Profile and Attitude towards Food Waste

Results from the study suggest that age, stipend, frequency of receiving stipend (REG), and track (as control variables) had an inverse effect on student's attitude towards food waste (ATTI). Specifically, stipend recorded a significant negative effect on students' attitude towards food waste. This suggests that as the students' stipend increases, their penchant to engage in food waste increases in the same direction as they now have what it takes to purchase more food than what they actually need. The contrary holds for respondents who receive low stipends as having lower stipends will eventually dissuade a person from engaging in more purchase of food. This was quite expected, as students with more stipend (money) could afford to buy foods from the food vendors, so they will not necessarily care whether they are able finish their meals at the dining halls or not. Again, the negative relationship between age and attitude towards food waste suggest that as a person age increases their attitude towards food waste decreases in the same direction. This significant inverse relationship can be due to several reasonings. For instance, as one grows in age their appetite decreases hence, reducing the quantity of food they can eat per meal. Likewise, as a person age increases, they begin to realize the essence of moderation and consequently only seek to consume the quantity of food they

feel they can consume at a time. Same cannot be said about a youth who will have more appetite and again have the exuberance to take more than what they can actually consume. Also, when it came to the respondents' gender, male students had more favourable attitude towards food waste, compared to female counterparts indicating that a person gender had a significant influence on their attitude toward food waste.

Results from this study affirm the earlier conclusions of Hasana et al. (2015) as in their study a person's gender had a significant influence on their attitude towards food waste. Likewise, result from the study confirm with the findings of Koivupuro et al. (2012) as persons with higher income had high penchant of engaging in food waste than persons with lower level of income. Again, results from this study is consistent with the earlier observations of Stefan et al. (2013) and Brook Lyndhurst (2007) as in their study age reported an inverse relationship with an individual attitude towards food waste.

5.2 Relationship between Perceived Food Quality and Attitude towards Food Waste

With this objective, results from the study revealed that perceived food quality (PFQ) had a significant positive effect on a respondent attitude towards food waste ($\beta = 0.509$; C.R. = 5.222). Meaning students who perceived the dining hall meals as of high quality, have a more favourable attitude towards food waste, and vice versa. In order words, students' perception of the meal quality provided at the dining hall will predict their attitude as to whether they will waste the food been served or not. However, what has to be noted is that an individual's perception happens to be defined by their prior experiences with regards to a certain circumstances or event. Hence, a person with either a positive or negative experience with reference to a particular food been served at the dining hall will determine their perceived quality of that particular meal. Accordingly, results from this study align with the recent conclusion of Mijares et al. (2020) as their

study posited a significant relationship between perceived food quality and respondent attitude towards food waste. Again, results from this study corroborate the conclusion of Conrad et al. (2018) as their results reported a significant relationship between perceived food quality and an individual attitude towards food waste. Similarly, the results established in this study align with the observation of Schiavone et al. (2020) as in their study it was realized that consumers who had low expectation about the quality of food provided them threw a significant part of their food away (i.e. 41.7% of their food were discarded) than customers who had positive expectation about the quality of food provided (i.e. only 15.3% of their food were discarded). Accordingly, a consumer expectation about the quality of food provided them tend to have a significant influence on the amount of food wasted.

As argued by Parasuraman et al. (2005) the perceived quality of a food depicts a consumer personal assessment about a food overall quality or dominance. Hence, when a consumer personal assessment which often times emanates from their previous experience espouse a positive feeling, it influences the consumer judgment to perceive the food provided as of high quality. The contrary holds when their previous experiences about the food resonate a negative feeling. Generally, it is this perception about the food quality that shapes an individual attitude to either consume all the food provided or throw a significant part of it away.

5.3 Relationship between Behavioural Factors (subjective norms, perceived behavioral control) and Students Attitude towards Food Waste

Under this objective, perceived behavioural control (PBC) reported a significant positive effect on students' attitude towards food waste ($\beta = 0.418$; C. R. = 4.274). This implies

that high level of perceived behavioural control leads to more positive attitude towards food waste, and vice versa. Conceptually, perceived behavioural control describes the extent of ease or difficulty with which a consumer in this context, student regard food waste (Ramos, 2018). Generally, students who may perceive food waste as a less difficult task to do or a pleasant thing to do are more likely to have negative attitude towards food waste than students who may regard the act as a very difficult task to do or less pleasant to do. Accordingly, a student perceive behavioural control will directly shape a student attitude towards food waste. As demonstrated in this study, PBC posited a significant positive relationship on the respondents' attitude towards food waste suggesting that in this context, most of the respondents' regard food waste as a pleasant act to do and again saw it as an act that came with no stress or exhaustion. On this score, results from the study concur with the works of Tsai et al. (2020) and Stancu et al. (2016) as their results established a significant relationship between PBC and the respondents attitude towards food waste. Results from this study also confirm with the results of van der Werf and Seabrook (2019) as their work posited a significant relationship between PBC and respondents attitude towards food waste.

Even though, some authors hold the view that since food waste behaviour are often times very difficult to be easily seen by other people particularly, neighbours or friends than probably pro-environmental behaviour (e.g., reusing or transport behaviours), the social normative movers of food waste behaviour are most likely to have less effect in shaping a person food waste behaviour (Quested et al., 2011). Hence, Graham-Rowe et al. (2014), Quested et al. (2013) and Stefan et al. (2013), argued that food waste is behaviour that is often solely visible to the creator, hence, the relevance of such persons influence on another will often times be very difficult to result into any meaningful

effect. Notwithstanding this skepticism about the influence of subjective norm in influencing an individual attitude towards food waste, in this study, subjective norm (SN) recorded a significant positive effect on the respondents' attitude towards food waste ($\beta = 0.429$; C.R. = 5.151). That is, high level of subjective norm leads to more negative attitude towards food waste, and vice versa.

The significant relationship established between subjective norm and the students' attitude towards food waste could be possibly linked to the context with which this study was undertaken that is, a boarding school. Generally, in boarding schools, meals are served in a dining hall and eat together by all the students in the dining hall. Hence, students see the actions and attitude of their seniors and school prefects with regards to food waste. This direct viewing of their seniors and school prefect's food waste acts and attitude will directly shape the rest of the students' food waste behaviour. Hence, it comes as not very surprising that subjective norm recorded a significant positive relationship on the students' attitude towards food waste. Results from this study affirm the conclusion of Wang-Chin et al. (2020) as in their study, subjective norm had a significant influence on the respondents' attitude towards food waste. Also, result from this study is consistent with the results of van der Werf and Seabrook (2019) as subjective norm reported a significant influence on the respondents attitude towards food waste. However, results from this study could not affirm the conclusions of Quedest et al. (2013) and Stefan et al. (2013) as in their study, subjective norm reported no significant influence on consumers attitude towards food waste. Again, the respondents perceived food quality also had a significant positive effect on perceived behavioural control ($\beta = 0.318$; C.R. = 5.286) and subjective norm ($\beta = 0.462$; C.R. = 6.259). Meaning, the respondents' perception about the quality of meal provided to them at the

dining hall influenced their PBC (i.e. the extent of ease or difficulty with which a consumer perceives food waste) as well as influenced the subjective norm and these two behavioural determinants had an influence on their food waste attitudes (i.e. the influences that came from their school prefects and seniors). This result is in line with the earlier works of Hasana et al. (2015), Stancu et al. (2016) and Rusell et al. (2017) as their results observed a significant positive effect between perceived food quality, perceived behaviour control and subjective norm.

5.4 Mediating Effect of Perceived Behavioural Control and Subjective Norm in the Relationship between Perceived Food Quality and Attitude towards Food Waste

Results under this objective revealed that the indirect effect of perceived food quality on the students' attitude towards food waste, through perceived behavioural control, was 0.133. This coefficient was statistically significant, using the Sobel's test approach. This hints that, the effect of perceived food quality on students' attitude towards food waste was not just direct, but partially mediated through perceived behavioural control. In other words, perceived behavioural control partially explains the effect on perceived food quality on attitude towards food waste.

Also, when it comes to the mediating effect subjective norm had on the relationship between perceived food quality and student attitude towards food waste, it was established that the indirect effect of perceived food quality through subjective norm was 0.198, which was statistically significant (using the Sobel's test). That is, the effect of perceived food quality on attitude towards food waste was not only direct, but partially mediated through subjective norms. That is, subjective norm significantly explained the

effect on perceived foods quality on attitude towards food waste among second cycle students in Ghana.

As argued by Mondéjar-Jiménez et al. (2016) the differences in individual food waste behaviour is partially or fully explained by other confounding factors. For instance, Scholderer et al. (2004) argued that the social relationships that emerge from family members and friends both at home and outside home tend to shape people attitude towards food waste. Similarly, in this study, perceived behavioural control and subjective norm mediated the relationship between perceived food quality and students' attitude towards food waste. Again, results from this study affirm the study of Odabasi and Argan (2009) as per their results, social norm mediated the relationship between perceived food quality and respondents' attitude towards food quality. Results in this study is once again consistent with that of Karim Ghani et al. (2013) as their inclusion of other variables such as perceived behavioural control and subjective norm in their variables were found to have partial mediation effect on the relationship between perceived food quality and consumer attitude towards food waste.

5.5 Discussion of Interview Results

The results from the interview from the various schools support findings from other studies which have dealt with food waste management practices. For instance, the same view on how food is prepared to lessen waste is shared in the study of Derqui and Fernandez (2017), which reported that, accurate estimation of the number of people to be served reduces food waste. This means that, if foods are prepared to cater for the exact student populace, there would be little or no unserved foods which will help reduce food waste.

Responses from participants on how food is portioned is corroborated by Martins et al. (2014) and Rodriguez et al., (2015), which suggest that food portions should be reduced and great attention should be given to the presentation and appearance of the menus.

Results on students' food preference does not support the studies of Falasconi et al. (2015) and WRAP (2011), that suggested that lack of flexibility and not getting a meal option of choice contributes to plate leftover because consumers may end up not eating the food. This implies that when students are offered variety in their choice of meals, and their food preference considered, they are likely to eat more and waste less.

The result that changes in menu cycle in the schools' dining halls help reduce waste, for instance when plantain is in season, ripen ones are fried and added to beans stew and gari is in line with Lagorio et al. (2018) and Falasconi et al. (2015), which report that the preparation of meals should be based on seasonal and locally produced foods. Foods in season are cheap and at their best, when they are included in meal preparation, they bring variety and add more nutrients since they are fresh.

On the responses of time allotted for eating meals at the dining halls, results concord with the conclusions drawn in the studies of Lazell (2016), Quested et al. (2013), WRAP, (2011) and Folliard et al. (2019), which reported that students should be given enough time to be seated to consume and finish their meals, however, students who arrive late at the dining halls may have to rush through their meals which may result in plate leftovers. On the results of the presence of competitive food sources, it confirms the studies of Falasconi et al. (2015) and Marlette et al. (2005), which reported that selling of foods at school premises where dining meals are provided contributes to food waste. It is notable

that, students who can afford food from vendors at the schools' cafeteria already buy foods and consume them ahead of time or during breaktime leading to waste of food at the dining halls. In the views of Falasconi et al. (2015) and Marlette (2005), snacks and other meals sold usually have high caloric content that affects the energy balance and loss of appetite at mealtimes, leading to the rejection of the meal.

Result that unserved and plate leftovers foods are given to town folks as donation is in line with the studies of Segre (2010) and Segre et al. (2010) that is aimed at recovering and distributing unserved meals that are perfectly fit for consumption to low income bracket of the populace. Segre (2010) and Segre et al. (2010) believe that the beneficiary of the food is needed to be located in the neighbourhood for the safety of the food, as long distance and duration might cause food contamination.



CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides the summary of the main findings of the study. It also details out the conclusions drawn from the study results as well as recommendations made from the study outcomes.

6.2 Summary of Findings of the Study

The key summary of the study findings has been organized in line with the objectives of the study. Accordingly, the summary of the main findings has been presented under this section.

6.2.1 Relationship between Respondents Demographic Profile and Attitude towards Food Waste

This section investigated the relationship between respondents' personal characteristics and their attitude towards food waste. Apparently, under the demographics, it was established that a respondent age, stipend, frequency of receiving stipend (REG), and track (whether in gold or green stream) had an inverse effect on student's attitude towards food waste (ATTI). Moreover, stipend recorded a significant negative effect on students' attitude towards food waste. This suggests that as a person stipend increases, their penchant to engage in food waste increase in the same direction as they now have what it takes to purchase more food than required. Also, when it came to the respondents' gender, male students had more favourable attitude towards food waste, compared to female students indicating that a person gender had a significant influence

on their attitude toward food waste. Again, age of the respondents had an inverse relationship on the respondents' attitude towards food waste.

6.2.2 Relationship between Perceived Food Quality and Attitude towards Food Waste

The first objective of the study sought to investigate the relationship between perceived food quality and students' attitude towards food waste. With this objective, results from the study revealed that perceived food quality (PFQ) had a significant positive effect on a respondent attitude towards food waste ($\beta = 0.509$; C. R. = 5.222). Meaning students who perceived the dining hall meals as of high quality, have a more favourable attitude towards food waste, and vice versa.

6.2.3 Relationship between Behavioral Factors (subjective norms, perceived behavioral control) and Students Attitude towards Food Waste

Under this objective, perceived behavioural control (PBC) reported a significant positive effect on students' attitude towards food waste ($\beta = 0.418$; C. R. = 4.274). Likewise, subjective norm (SN) recorded a significant positive effect on attitude towards food waste ($\beta = 0.429$; C. R. = 5.151). That is, high level of subjective norm leads to more negative attitude towards food waste, and vice versa. Again, the respondents perceived food quality also had a significant positive effect on perceived behavioural control ($\beta = 0.318$; C. R. = 5.286) and subjective norm ($\beta = 0.462$; C. R. = 6.259). Meaning, the respondents' perception about the quality of meal provided to them at the dining hall influenced their PBC (i.e. the extent of ease or difficulty with which a consumer attaches to food waste) as well as shaped their subjective norms (i.e. the influences that come from their school prefects and seniors).

6.2.4 Mediating Effect of Perceived Behavioural Control and Subjective Norm in the Relationship between Perceived Food Quality and Attitude towards Food Waste

This objective of the study sought to investigate the mediating effect of perceived behavioural control and subjective norms in the relationship between perceived food quality and students' attitude towards food waste. With this objective, results from the study revealed that perceived behavioural control has a partial mediation effect in the relationship between perceived food quality and students' attitude towards food waste. On the same length, subjective norms had a partial mediation effect on the relationship between perceived food quality and students' attitude towards food waste.

6.2.5 Food Waste Management Practices on Food Waste in Senior High Schools

Preparation of food for students at the dining halls take into consideration the student population in order to reduce unserved foods. The stores department releases less of any raw food item to the kitchen staff which students do not like. On visiting and early days of school reopening, the quantities of food prepared for students are reduced. Students preferences for food are not necessarily considered in meal preparation, however, when certain foods are in season, they are included in meal preparation. Dining hall supervisors ensure that students do not waste food by making sure that the required number of students sit at the table for meals. The presence of food vendors is a disturbing factor for food waste reduction. Schools in the sample, do not have any educational programs on food waste and must endeavour to inculcate it in the schools' programme of activities in order to minimize food waste.

6.3 Conclusions

Results from the study suggest that the students' attitudes towards food waste are shaped by both personal factors such as age, gender, stipend and regularity of stipend received and behavioural factors. Particularly, in the case of age, it recorded a significant inverse relationship on the students' attitude towards food waste. Meaning, as a person's age increases, their attitude or penchant to engage in food waste reduces in the same direction. Also, on stipends, it posited a significant relationship on the students' attitude towards food waste. This implies that as a person's stipend increases, their penchant to engage in food waste increase in the same direction as they now have what it takes to purchase more food from food vendors leading to the rejection of dining hall meals. The contrary holds to respondents who receive low stipends as having lower stipends will dissuade a person's attitude to engage in food waste. Also, on gender, male students had more favourable attitude towards food waste, compared to their female counterparts indicating that a person's gender had a significant influence on his or her attitude toward food waste.

Moreover, on the behavioural factors, perceived behavioural control (PBC), subjective norm and perceived food quality reported a positive effect on students' attitude towards food waste. Again, it was established that the relationship between perceived food quality and students' attitude towards food waste was partially mediated by perceived behavioural control and subjective norm.

6.4 Recommendations

Based on the findings of the study the following recommendations are made:

It was established that the respondents perceived food quality of the foods served them at the dining hall influence their attitude towards food waste. As demonstrated earlier, student's perception about food quality are shaped by earlier encounters. Accordingly, to minimize food waste, the schools, spearheaded by their respective matrons should seek feedback from their students on the meals they have had perception on with regards to its sensorial attributes. Such insight could enable the schools to improve on the quality of food and consequently shape the student's perception on the foods served them. The matrons can improve the quality of food served by improving the sensory attributes (taste, colour, texture, appearance) of the food. Matrons should minimize monotony of food served by periodically introducing new dishes and also keeping the dining hall clean and attractive.

Also, subjective norms that took the form of pressures from colleagues, seniors and school prefects had a significant influence on the students' attitude towards food waste. Meaning, the kind of examples the colleagues, seniors and school prefects exhibited when it comes to food waste shaped the students' attitude towards food waste. On this point, it is recommended to the schools to train their schools prefects and seniors on the need to avoid food waste and lead by example since their deeds are widely viewed by their subordinates and juniors and in effect have a significant influence on their attitude towards food waste.

Again, it was realized that perceived behavioural control which tends to mimic the behavioural characteristics of the easiness or difficulty with which a student regards food

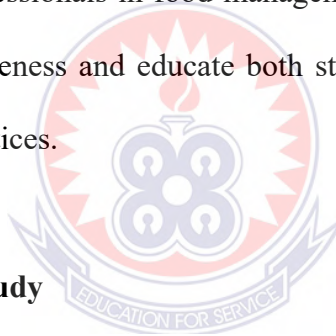
waste had a significant influence on the students' attitude towards food waste. This suggests that, for the understudied schools to minimize food waste among their students, school authorities should make the practice of food waste very difficult for their students by sanctioning students that favour food waste. This can be achieved by reducing their subsequent meal size for consequently engaging in food waste. When students realize that their acts of food waste will lead to sanctions, they are likely to minimize its occurrence or even cease engaging in it entirely.

More so, it was established that stipends received by the students had a significant inverse relationship on the students' attitude towards food waste. This suggests that as students' stipend increases, their penchant to engage in food waste increase in the same direction as they now have what it takes to purchase more food. Hence, students with more stipend (money) could afford to buy foods outside the dining hall, so they did not care much when food was wasted. On this point, through the assistance of the PTA, the heads of the schools and teachers should explain to parents on how the amount of money given to their children for their upkeeps entice them to engage in food waste. Accordingly, the schools should dissuade parents from giving more than necessary to their children in terms of their upkeep since by giving them limited money could force them to patronize the meals at the dining halls.

Furthermore, plate leftovers by students were reported to be partly contributed by limited time for students to finish served foods in the dining hall. The thirty minutes allotted for dinning is often reduced by the longer distance from walking from classrooms to dining halls. Besides, it takes time for all students to be seated and for food to be shared at each table among the required number. These interval activities reduce the actual time for

eating. This study therefore recommends the allotting of adequate time for dining by taking into consideration all form of time wastage.

Finally, the perception of food quality, subjective norm, perceived behavioural control of the students were reported to influence their attitude towards food waste. This clearly implies that there is a need for behavioural change through education and food waste awareness. However, the interview revealed that there is no formal program to educate students on food waste. The kitchen staff only occasionally register their displeasure to students to minimize waste when too much food waste is generated. This study therefore recommends occasional educational programmes for students on food waste management practices. Professionals in food management can be invited to the schools to create high level of awareness and educate both students and cooking staff on food waste and management practices.



6.5 Contributions of the Study

This study reported the perception of students' food quality, subjective norms and perceived behavioural control as having an influence on the attitudes of the students of Senior High Schools. This finding confirms the assertion of the theory of planned behaviour that underpinned this study. The theory of planned behaviour propounded by Ajzen (1991) as an extension of the Theory of Reasoned Action (TRA) postulates three conceptually independent determinants of intention including attitude, subjective norm, and perceived behavioral control. This study further confirmed the general rule postulated by the theorist of the planned behaviour that the behaviours of individuals are influenced by the constructs of the theory to perform the considered behaviour like students' attitude towards waste food.

Beside the theory confirmation, the negative perception of food quality among students in Senior High Schools which often times result in plate leftovers is confirmed by this study. This study further reported the attitudes of students towards food to be associated with socio-demographic factors like stipend. These findings are consistent with further studies that used the theory of planned behaviour and extended the predictors of behavioural intention to include perceived food quality and socio-demographic factors (e.g., Graham-Rowe et al., 2014; van Geffen et al., 2016) Aschemann-Witzel et al., 2015; Secondi et al., 2015; van der Werf et al., 2019; Lorenz et al., 2017).

6.6 Suggested Areas for Further Studies

The course or programme of study of students is hypothetical perceived to partially inform students about food waste and food management practices. General Science and Home Economics programmes are perceived to better inform students about food waste management than other courses. Thus, future studies can examine possible moderating role of programme of study in the linkage between behavioural determinants and food waste intention of students. Besides, this study can also be replicated in many different canteen settings encountering challenges of food waste behaviour like the restaurants, hospitals and many other organizations in Ghana. Thus, future studies can look at food waste intention of consumers and the determinant factors in these sectors. Again, future research can be conducted in quantifying the production of food waste in Senior High Schools. More so, the institutional catering industry is an ideal starting point for interventions, because a high number of students are served at a single location, resulting in a large concentrated food waste stream. A reduction in food waste in this sector therefore has a great effect on the urban footprint regarding food waste, if done right, the effect will not only be limited to the school. New generations are educated here and

giving them a good example in school could have a trickle-down effect in the whole future society. Therefore, future research can look at interventions to mitigate food waste in Senior High Schools.



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APPENDIX I

UNIVERSITY OF EDUCATION, WINNEBA DEPARTMENT OF HOSPITALITY AND TOURISM EDUCATION

QUESTIONNAIRE FOR STUDENTS

This questionnaire seeks to collect information for a graduate research work on the topic: Assessing food waste in the dining halls of second cycle schools in the Kumasi Metropolis. It is solely for academic purposes. Your answers will be completely confidential. Please answer all questions as honestly as you can by ticking (✓) appropriately.

QUESTIONS PER CONSTRUCT

SOCIO-DEMOGRAPHIC DATA

1. Gender: a) male [] b) female []
2. Indicate your age: a) 13 – 15 [] b) 16 – 19 [] c) 20 and above []
3. Please indicate your track if on a double track system: a) Green [] b) Gold []
4. How much are you given as stipend (chop money)?
a) 20 – 50 Cedis [] b) 60 – 100 Cedis [] c) 110 – 150 Cedis []
d) 150 – 200 Cedis [] e) 210 – 300 Cedis [] f) Above 300 Cedis []
5. How regular do you get your stipend (chop money)?
a) Weekly [] b) Every other two weeks []
c) Every other three weeks [] d) Every other month []

Please tick (✓) only once using the scale below:

Likert Scale: 1- Extremely Disagree (ED), 2- Disagree (D), 3- Fairly Disagree (FD), 4- Undecided (U), 5- Fairly Agree (FA), 6- Agree (A), 7- Extremely Agree (EA)

SN	STATEMENT	ED	D	FD	U	FA	A	EA
		1	2	3	4	5	6	7
	Attitude							
6	It is wrongful to have a plate left over							
7	It is not a good practice to discard food while other people in the world are in need of it							
8	I am worried when uneaten food is thrown into the waste bin							
9	Money is wasted whenever food is wasted							
	Subjective norms							
10	I don't eat food completely because my colleagues don't also eat all their food.							
11	A lot of my friends disagree when I try to reduce food waste at the dining hall.							
12	People who are important to me find my attempts to reduce the amount of food wasted unnecessary							
13	It would be embarrassing to me if I finish all the food served to me that a lot people do not like							
	Perceived behavioural control							
15	I find it difficult to eat all my food because I don't usually feel hungry during meal time.							
16	I find it difficult to finish my food because I don't get enough time to eat all of my food.							
17	I find it difficult to make sure that all my food served is eaten completely							
18	I have the feeling that I cannot do anything about the food wasted in the dining hall							
	Perceived food quality							
20	I like the taste of foods served							

SN	STATEMENT	ED	D	FD	U	FA	A	EA
		1	2	3	4	5	6	7
21	I like the colour of foods served							
	I like the texture of food served							
22	I like the flavour of foods served							
23	I like the appearance of foods served							
24	The temperature at which food is served is excellent							
25	I am satisfied with the cleanliness of the table on which food is served							

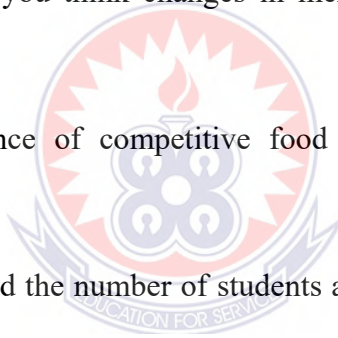
Thank you



APPENDIX II

INTERVIEW GUIDE ON FOOD WASTE MANAGEMENT FOR MATRONS

1. How has the preparation of food helped to lessen food waste in your school?
2. What practices are evident in your school that take into consideration some particular foods students waste too much?
3. Do you have particular days that the amount of food being prepared is reduced?
If yes, how do you go about it?
4. How is food portion for students in order not for them to waste?
5. To what extent do you consider students food preferences with the aim of reducing food waste?
6. In your opinion, do you think changes in menu cycle could help reduce food waste?
7. How has the presence of competitive food sources affected students' food wasting behavior?
8. In your opinion, could the number of students at a table contribute to food waste or its reduction?
9. How has the time allotted for eating meals affected food waste?
10. How has the supervisory role of the dining hall master helped to reduce food waste?
11. How is unserved food handled in your school?
12. How is plate left over treated in your school?
13. Do you have programs in the school that educate students on food waste? If yes, how is it implemented



APPENDIX III

Observation Schedule

1. Date:
2. Name of Institution
3. Start time of observation
4. End time of observation

A. Preparation and cooking

Location	Object	Topic	#	Methodology
Kitchen	Food	Menu	5	Types of food prepared (eg Beans stew and gari, Groundnut soup with kenkey, Jollof rice etc.)
	Kitchen	Food preparation	6	Process in meal preparation eg measuring of ingredients measure to reduce waste
	Bins	Food waste	7	Type of food wasted eg kenkey, boiled rice, stews and soups

B. Serving and Consumption

Location	Object	Topic	#	Methodology
Dining hall	Break	Break time	8	Start time of break
			9	End time of break
		Serving time	10	Arrangement of tables
			11	Number of students at a table
	Plate	Portion size	12	Same portion size? Or different sizes

				when wanted.
		Plate waste	13	When leaving: Food left or not
		Eating time	14	Same time students Start eating
	Supervisor	Dining hall supervision	15	Supervisor(s) present?
			16	Supervisor checks on finishing food?
		Waste management communication	17	Check for information signs showing how to handle food waste



APPENDIX V

PANS OF COLLECTED FOOD WASTE FROM THE DINING HALLS OF SHS IN KUMASI METROPOLIS



Plate 1



Plate 2



Plate 3



Plate 4

APPENDIX VI

PANS OF COLLECTED FOOD WASTE FROM THE DINING OF SHS



Plate 5

APPENDIX VII

PLATE LEFTOVERS FROM THE DINING HALLS OF SHS IN KUMASI METROPOLIS



Plate 6



Plate 7



Plate 8

GHANA EDUCATION SERVICE

Tel. No.: 24571/33621/28308

Fax: 051-24571

In case of reply the number and
date of this letter should be quoted

Our Ref.: 11/21/24

Your Ref.:



REPUBLIC OF GHANA

Metro Education Office
P. O. Box 1918
Kumasi – Ashanti
Ghana, W/Africa

Date: 12th March, 2020

THE HEADMASTERS/MISTRESS CONCERNED
SENIOR HIGH/TECHNICAL SCHOOLS
KUMASI METROPOLITAN DIRECTORATE

INTRODUCTORY LETTER

CHARLOTTE CAITOE

200028521

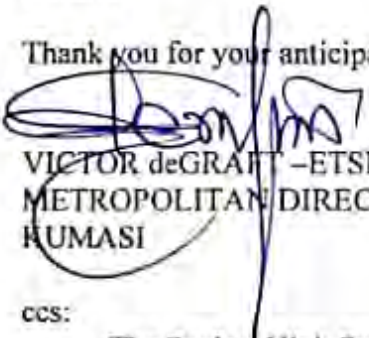
The bearer of this letter is an MPhil final year student in the University of Education, Winneba, Kumasi Campus, offering a programme in Catering and Hospitality Education.

Her research work is titled "ASSESSING STUDENT'S FOOD WASTING BEHAVIOR IN THE DINING HALLS OF SECOND CYCLE SCHOOLS IN KUMASI METROPOLIS".

Approval is therefore given to her to conduct her research in the selected Senior High Schools.

I further request that you accord her all the needed support for the success of her research.

Thank you for your anticipated attention and consideration.


VICTOR deGRAFT –ETSISON(MR)
METROPOLITAN DIRECTOR OF EDUCATION
KUMASI

ccs:

The Senior High School Coordinator, Metro Educ. Office-Kumasi
Charlotte Caitoe – University of Education, Winneba -Kumasi

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Table 1: Table for Determining Sample Size for a Finite Population

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note — N is population size. S is sample size.

Source: Krejcie & Morgan, 1970