The effectiveness of a recycling project on natural science learner's perceptions, attitudes and the understanding of scientific knowledge of recycling.

Dissertation

MED Environmental Education

By

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ABSTRACT

The last few decades have seen increased calls for integrated waste management practices which could lessen the impact of global warming and other environment degrading practices. As part of these efforts, recycling has become of great importance in society especially in relation to environment management. It has become an important means of reducing the increasing amounts of waste being sent to landfills. Schools have also been identified as a major contributor towards waste production. In this instance, schools have been shown to produce large quantities of solid waste. Consequently, school-based waste management practices such as recycling, which could be integrated into the curriculum are being adopted by various schools. The extent to which learners have a scientific understanding of recycling as a consequence of participating in related projects, however, has not been investigated, primarily in rural schools. Additionally, the impact of these projects on learners attitudes towards recycling in under-resourced schools is not well understood. In light of this therefore, the aim of the present study was to determine the effectiveness of a small scale recycling project on natural science learners' perception, attitudes and understanding of scientific knowledge of recycling. The study also explored the extent to which recycling-related content is integrated is integrated into natural sciences curriculum. The study followed a sequential mixed method approach. A total number of 150 Grade 7 learners participated in this quasi-experimental design study where 55 learners were randomly assigned into the control group and 95 into the experimental group. Data were collected using a semi-structured questionnaire. The Natural Sciences CAPS curriculum was analysed to determine the integration of recycling-related content. Results shown that some aspects of recycling content are integrated into the curriculum, even though gaps were identified. This content is integrated into other topics rather than as a standalone topic. It was also found that students generally understand the importance of recycling. However, this understanding is relatively low. There were no differences between students from both groups (the control group and experimental group). Additionally, participating in the recycling project did not lead to improved understanding of recycling among the students. Results also showed that learners in both groups had positive attitude towards recycling even though there was no significant difference between

experimental group students' attitudes prior and post the recycling project. However, students' attitudes in the control group improved significantly even though they did not participate in the recycling project. Similarly, students in both groups generally had positive perceptions towards recycling with learners in the control group reporting greater positive perception of recycling than learners in the control group post the recycling project. Based on these results, the author suggests suggest that efforts be made to explore strategies for improving learners undertstanding of recycling.

DECLARATION

Title: The effectiveness of a recycling project on natural science learner's perceptions, attitudes and the understanding of scientific knowledge of recycling.

I Busisiwe Patience Mkhonto, declare that this dissertation mentioned above my own work except as indicated in the references and acknowledgements. It is submitted in the fulfillment of the requirements for the degree of ***MAGISTER EDUCATIONIS*** in the University of South Africa, Pretoria. It has not been submitted before for any degree or examination in this or any other university.

Busisiwe P. Mkhonto 

Signed at Pretoria, South Africa on the 7th day of August 2019.

DEDICATION

This dissertation is dedicated to Mbazima Primary School for always keeping the researcher grounded in achieving this milestone, through the school's unwavering support from staff members and learners.

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1 CHAPTER 1

1.1 Introduction to the Chapter

The world today faces a myriad of environmental issues that are both global and specific to communities. As we face many challenges of serious environmental issues, science education has made a commitment to improving environmental topics, in particular recycling (National Research Council, 2013). With an increased focus on waste management and the limited integration of recycling related content in natural science in most countries worldwide, more research on the teaching and learning of this problem in science classroom is occurring (Svihla & Sinn, 2012). Even though recycling programs have been marketed for student for the past 25 years, there is still a need for even more encouragement to gain students support and influence attitudes and behaviours if the state of environment is to improve (Nixon, Saphores, & Shapiro, 2009). Recycling-related behaviour is a valid measure of scientific understanding because it is quantifiable, in that asking someone if he or she recycles will generally yield a “yes” or “no” response (Nixon, 2009). Good behaviours towards the environment like recycling can lead to changes in knowledge and attitudes (Sobel, 2008). Personality, attitudes, knowledge and skill contribute to scientific behaviour (Nisbet, Zelenski, & Murphy, 2009). The present study explored the integration of recycling in natural sciences and learners’ understanding of reclcying content. Their attitudes were also investigated.

1.2 Problem statement

A number of initiatuves have been undertaken to improve society’s practices and attitudes towards recycling. However, there remains a dearth of knowledge regarding the effectiveness of these initiatives on improving learners’ perceptions, attitudes and understanding of scientific knowledge of recycling, particualry in the South African context where waste management pracices in rural areas and under-resourced schools are not well designed, managed or monitored. This dearth of knowledge was identified in the present study as a research gap that the researcher attempted to address.

The researcher argues for the importance of critical thinking learners at a young age. Research has shown that natural resources are decreasing due to rapidly increasing population, industrialisation and the variation of the consumption habits each passing day (Alaydin, Demirel, Altin, & Altin, 2014). For efficient use of natural resources, reducing and recycling of waste should be considered (Alaydin., et al., 2014). Recycling is considered to be an effective method used to reduce wastes. Young generations are the target group for environmental education specifically recycling, because this education teaches them how to deal with their environmental issues and to make informed decisions about how they can take care of the environment (Alaydin, et al., 2014). These are some of the reasons why the present study proposed to explore the impact of a small recycling project on natural science learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

Recycling can be define as a way to treat things that have been use so that they can be used again or to convert (waste) in to reusable materials (Oxford Advanced Learner's Dictionary, 2008). Establishment of a recycling project can change the learner's knowledge, skills and behaviour towards recycling (Incekara & Tuna, 2011). Most of the school's garbage is sent to landfills especial in rural areas instead of being recycled the researcher believes that if learners can be given an opportunity to participate in recycling projects this kind of behaviour might change. With more and more schools producing more and more waste landfills are filling up faster than we can find new sites for them (Incekara & Tuna, 2011). Considering the above information the question is what do we do to prevent this from happening are we choosing to fold our hands and watch or we seek solutions to these problems that we are facing and engage our learners to recycling projects? Landfills themselves have been known to create new types of waste, such as toxic liquid called leachate, formed from decomposing garbage reacting with moisture in the landfill and this is one of the reasons why learners need to part in the recycling project so that they can they can play a role in decreasing the landfills that surrounded our communities (Lockwood, Mirsky, Titaro, & Coenye, 2004).

Discarding wastes that were once resources is also considered to be wasteful as these resources are no longer easily for reuse (Lockwood & Mirsky, 2004). Most studies agreed that recycling can be a better solution to such problems (Lockwood & Mirsky, 2004). Previous scholars suggest that recycling should be everybody's concern, from children to adults, rich or poor because it provides many environmental benefits, including less pollution, reduced landfills space, and conservation of natural resources (Schultz, 1998). Also it is an essential tool for training students and individuals to decrease or minimise the negative behaviours that cause the degradation of the environment (Aldrich, 2000).With the power to keep thousands of tons of reusable materials out of landfills, recycling project in school is a realistic way for students to make a difference (Nixon, 2008). Teachers should be trained to incorporate environmental issues into their curricular (Norisan, 2010). Recycling should first starts within the family and continues with school education and social life. Formal education must be considered in correlation with non-formal and informal education. Also it will be necessary to create a new curriculum of natural sciences and increasing activities about recycling (Paks, 2011).

In addition, better tools and mechanisms need to be explored and developed (Alaydin et al., 2014). In Nigeria students understood the importance of recycling in solving all the environmental problems for the past 23 years but the problem was to what extent do the students of Nigeria in both levels understand or perceive the environmental problems and management specifically recycling in Nigeria (Kabir, 2014). There were no terms that the student "never heard of" and there were no terms that the student "knows a lot". It was revealed that the average knowledge level of students was "heard of but could not explain" (Kabir, 2014). Like Nigeria and other countries, research result demonstrate that South African education system still experiences major problems in providing quality education for all learners regarding environmental education specifically recycling, due to mainly existing socio-economic problems (Erican, 2012). It was found that teacher guidance was crucial to the success of education for sustainability, especially in the context of significant social problems such as limited resources for learners (Erican, 2012).

Further findings also indicated that there is a room for improvement in primary schools with regard to basic skill needed for recycling (Erican, 2012). The findings from the study suggest that we need to involve learners in recycling as early as possible in order to provide them with the skill they need for recycling. The question is in what way are we going to involve learners in recycling as early as possible? In both countries there was a need to put more emphasis in schools, about recycling projects which will enable students to understand more about problems and management of the environment (Erican, 2012). In most developing countries i worldwide, the city government has the power to and control for the collection and disposal of the garbage or trash, yet the management system remains insufficient and exorbitant (Yaacob, 2015). One of the greatest challenges facing developing countries is the unhealthy disposal of solid waste which resulted from human activities of development and survival (Longe & Williams, 2006; Kofoworola, 2007). Some of the reasons why the current study is proposed is that the researcher believes that one of ways that can be used towards solving these problems is only if recycling is promoted by teaching more learners about recycling. Learners themselves must be involved in finding solutions to such problems that most countries are facing.

There is strong evidence which suggest that individual or group awareness and attitudes towards waste generation and management is critical in the effort to respond to the waste management challenges (Longe & Williams, 2006). It comes as no surprise that there existed an abundant literature on waste management attitudes and behaviours and on limited use of recycling (Agata & Agata, 2003; Kofoworola, 2007). The negative attitude towards recycling does not exclude the educational institution whose problem has aggravated by constant changes not just in curriculum content but also in subjects (Kowoforola, 2007). Consequently the present study aims to encourage the integration of more of recycling related content into grade seven natural sciences curriculum. Students routinely utilize lots of papers in their daily routines when it comes to tuition; there are uncertainity whether they execute reuse and recycling during their schooling time (Kowoforola, 2007). It is a certitude that recycling and reusing conduct has not yet become

a practice or method with recognised awareness of ecology to many students. Research reveals that there is a need for high involvement of students themselves safeguarding the recycling processes to be as productive and constructive as it should be (Kowoforola, 2007).

Without a multistorey volume of participation the earth is and will invariably be endangered as each paper goes un-recycled. Many schools has an enormous population of student that can be enlightened about how recycling can have positive impact. Schools have the potential energy to promote recycling (Ercan, 2011). Learners need to have a thorough understanding of scientific knowledge about recycling this will help them understand and evaluate the impact of society on the ecosystem (Grambro & Switzky, 1996 cited in Tsai, 2012; Ors, 2012). It is important to start educating the learners from a very young age about the importance and benefits of recycling (Hoskins, & Sharp, 2014). Therefore, recycling related content integration into natural science curriculum at schools for grade seven learners is essential. With recycling related content, learners can be grown to individuals that have sensitive, conscious and responsible about the environmental issues (Hoskin & Sharp, 2014). Learners need to get a sufficient environmental education that can enhance their understanding of scientific knowledge of recycling in schools (Nisbet, 2009).

However, environmental education cannot be limited to formal education; also it can be obtained with social life and relationships (Nisbet, 2009). Many schools in rural areas are suffering from one or more problems such as shortages of resources simply because schools do not have their small scale recycling projects and also they lack an understanding of scientific knowledge of recycling. Schools in rural areas are affected by overcrowding and that lead to shortages of resources and materials (Ratnapradipa, Brown, Middleton, & Wodika, 2011). However, some resources can be made by learners if schools participate in recycling. School waste is generated in four ways which includes the waste generated during break time, use of papers, the vandalism of school furniture and broken computers and gadgets from the administration offices (Tabanich & Fidell, 2012). Primary schools have no enough experience

about recycling projects because they have not been given opportunities to participate in such projects (Walton, 2011). Learners are not aware of their role towards recycling; particularly the use of paper is a prominent issue. An intergral and comprehensive attempt must be constructed to minimise the garbage or trash generated. Consequently it demand the coordination and full involvement of those who generate trash which involves teachers, learners and the ordinary people in the society (Sobel, 2008).

Instead of using textbook learners can be encouraged to use e-book also can be onother option of the method that can be used to support recycling in reducing waste in schools (Parkiwala, 2009). Learners can recycle assignment papers and question papers as a step towards paperless and to create more environmental friendly learning condition (Parkiwala, 2009). Scientific knowledge will be demonstrated by recognising the importance of recycling and the origins, implications and consequences of recycling (Moar, 2007). Most important recycling projects in student increases awareness of the connections between an individual's wellbeing and the environment's wellbeing (Larsen, 1995). It is therefore important for schools to acknowledge that student's behaviour can be influenced by attitudes and specific programs such as the effective recycling projects and its integration in the school curricula (Longe & Williams, 2006). Research indicates that we need to foster knowledge, attitudes and scientific understanding about recycling on our learners (Navarro, 2002).Tudor state that some studies try direct to stimulate increased public participation in recycling programs; others try to identify the social and psychological factors which encourage or hinder recycling but only a few that try to research about the effectiveness of recycling on learners (Tudor, 2001).

In both cases, research has concentrated upon pilot or experimental recycling and mostly in colleges and universities and occasionally in general community in cities not primary and secondary schools more especially in rural areas (Tudor & Dvornich, 2001). A common research approach is to offer people a reward (for example, money, prizes etc) for recycling (Moar, 2007). When the incentives are removed the participation rates generally returns to original conditions.

For that matter research has shown that the effects of rewards are short lived (Tudor & Dvornich, 2001). Research bears out that participation rises when recycling is institutionally supported by providing readily accessible and convenient recycling opportunities (Ercan, 2011). To develop this essential knowledge and to prepare learners to take role in recycling, institutions must encourage learners to voluntary participate in recycling projects and activities (Tudor & Dvornich, 2001). It is argued that informing learners about benefits of establishing recycling projects in local communities and schools would motivate learners to participate in such projects. Learners should be considered as active participants instead of passive learners (Reid & Nickel, 2008). Various studies indicate that even small scale collaborative practices play an important role in terms of improving learners' environmental and social competences (Malgorzata, 2003). This is why in the present study a small scale recycling project will be established to determine the effectiveness of a small scale recycling project on learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

Institutions are facing the responsibility of teaching learners about the importance of recycling and produce learners that have a better understanding of scientific knowledge of recycling. Learners need to know exactly what can be recycled (Moar, 2007). Schools also lack the funding to establish small scale recycling projects for examples money to buy recycling bins and promotional materials to promote recycling around the schools (Navarro, 2002). Teachers also do not have time to participate in in recycling projects due to rare findings of recycling related content in the natural science curriculum (Mrema, 2008). Research reveals that recycling is the most effective way to reduce wastes and is the most important method to minimisation of resource used. Recycling allows us to reduce the amount of natural resources that we extract and prevent the discard of resources into landfills (McKenzie-Mohr, 2011). Recycling has proven to be a more efficient use of resources than burning and burying. In other countries like Canada recycling projects has been implemented in various locations and schools (Mrema, 2008). The purpose of the proposed study is to find out how effective the recycling projects are in schools and increase awareness of the importance and effective ways of recycling. To be able to achieve this we need to educate the learners about the benefits and the importance of recycling and

ways they can take part and contribute to reducing the amount of waste generated (Mrema, 2008).

1.3 Research questions and aims

The research question frameing the present study asks: “What is the effectiveness of a small scale project on improving grade 7 learners’ perceptions, attitudes and understanding of scientific knowledge of recycling?”

Emanating from the above main question, the following subquestions were asked:

- To what extent is recycling integrated in the Natural Sciences curriculum?
- To what extent do grade 7 learners have a scientifically correct understanding of content knowledge related to recycling?
- What are grade 7 learners’ attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling?
- What is the relationship between learners’ content knowledge of recycling, attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling?

The aim of the study was to determine the effectiveness of a small scale project on improving grade 7 learners’ perceptions, attitudes and understanding of scientific knowledge of recycling. The study had the following objectives, to determine:

- The extent to which recycling is integrated in the Natural Sciences curriculum;
- the extent to which grade 7 learners have a scientifically correct understanding of content knowledge related to recycling;
- Grade 7 learners’ attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling; and,
- the relationship between learners’ content knowledge of recycling, attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling.

1.4 Rationale

The proposed study is essential because there is a huge necessity for learners to take part in the small scale recycling project in order to determine the effectiveness of a recycling project on natural science learner's perceptions, attitudes and understanding of scientific knowledge of recycling. Learners need to become involved in project like this so that they will have understanding of scientific knowledge and know about their place in the world and highlight the relationships they have with their local community and how future decisions influence the health of the Earth (Muller & Zeidler, 2010). In the proposed study the researcher will establish a small scale recycling project in which learners will participate; learner's participation will assist the researcher to determine their perceptions, attitudes and understanding of scientific knowledge of recycling. Also in the near future it can help learners become members of the society that are democratically minded and scientific literate citizens, learners need to have a fundamental understanding of the systems of the world, both living and non-living, along with the analytical skills needed to weigh scientific evidence policy choice. Integrating recycling related content in the science curriculum is supported by new national laws being developed to set forth guidelines to enhance environmental literacy and scientific literacy, by bridging the gap between what is learned in the classroom and what is experienced outside within communities on day to day basis (Environmental Literacy Council, 2002).

Integration of recycling related content may positively impact on learners in various ways; there has been an inadequacy of thorough education, and other ways of education might not be succesful in obtaining behavioural change (Nisbet et al., 2009). In order to multiply the fruitfulness of science education with regard to environmental topics in schools there is a need to integrate more of recycling related content in the curriculum so that it can be able to assist learners to answer questions such as what it is to properly understand in science about recycling,

what recycling requires, its hindrance, and how to defeat them (Nisbet et al., 2009). Sustainable development relies on fundamental shifts in the attitudes held by individual citizens towards the environment, and their use of natural resources (Barr, 2006). Modern society rely heavily upon non-renewable energy and materials, such as fossil fuels and mineral ore, we are draining the earth's "capital" instead of living off the "interest" and this is why science education recycling in particular should be integrated into daily cultural and socioeconomic character (Schultz, 1995).

Researchers find that learners seems to be knowldgeable and in favour of recycling (Bonnet & Williams, 1998). These perspective specifically affect to the recycling of paper, as there is a straight forward and logical relatedness between recycling paper and conservation (Bonnet & Williams, 1998). What was also discovered was that although children were aware of the materials that can be recycled, such as bottles, cans, and plastics they were unassertive about how recycling these materials assist the environment. Furthermore, they did not have a firm grip on the underlying purpose of recycling. However, the learners did show great levels of emotions and worries towards the environment (Bonnet & Williams, 1998). Although the schooling specifically about recycling are not as many as those including general environmental education, it has been demonstrated that recycling education programs have the potential to significantly expand knowledge, promote positive perspective, and increase best behaviours in learners (Bonnet & Williams, 1998).

Some studies indicate that teachers avoid stop themselves from educating multiple attitudes on environmental issues in primary schools, because it was grasp that primary school learners are too young to gain from it (Christenson, 2008). Teachers have become ignorant about recycling projects and this ignorance has led learners to losing their ability to protect the natural resources that we have for next generations to discover but instead they are working against them (Sale & Lee, 1997). In an examination of learners books concerning recycling it was found that different attitudes conerning recycling were scarcelly mentioned although many researches reveals that recycling is one of the most recommended methods to reduce waste (Christenson, 2008). Many

scholars argued that in order to minimise the use of natural resources and landfills, we need to change to education as a method to improve attitudes towards the recycling and it is often connected with learners' perception and attitudes as it is perceived to lead to the understanding of scientific knowledge of recycling (Navarro, 2002).

Currently, there are few recycling projects that have been implemented in various schools especially in rural areas (Smith et al., 1997). Recycling should be voluntary that is why natural science educators should make it a point that they use teaching of recycling related content as part of the efforts to educate, share information and create awareness to learners about the importance and benefits of recycling, as this may change learners perceptions and attitudes towards recycling and also this can improve learners understanding of scientific knowledge (Budak & Oguz, 2008). Natural science and technology educators need to work together in creating mechanisms to induce positive change of learners' perceptions and attitudes as they begin to participate in recycling projects to reduce their waste such as papers and scrap metals of broken furniture in the school (Clay, 2005). Teachers need to try and apply different practices that can contribute significantly to the success of integrating recycling related content in schools (Aldrich et al., 2000).

It is also important that learners are taught in a way that encourages multiple perspectives on natural science class and also promotes environmental topics in particular recycling in education (Christenson, 2008). Recycling is an interesting way for learners to get involved in and upgrade their school and local environment, and it is often promoted as extremely beneficial that is why it is important for learners to be motivated to consider all sides of issues relating to recycling and the environment, this should be included in science curriculum not only to uplift their overall understanding but also to provide route that foster critical thinking skills (Carrier, 2009). Recycling issues are multiple and varied, so it is imperative that learners in primary school can critical conteplate this issues from a different perspectives (Zelenzny, 1999). It is believed that through education, current and future waste generators will respect and conserve natural

resources by making informed waste prevention choices (Integrated Waste Management Board, 2007). Therefore, it is important to enable learners from primary school to see the need of them taking part in recycling projects in schools and contributing in helping their surroundings.

Typically primary school learners' perspectives can be already fixed by the time they reach high school, therefore it will is extremely important to integrate more of recycling related content in grade seven natural science curriculum so that it can help educate them about recycling (Zelenzny, 1999). By educating primary school learners about recycling, it expands the likelihood that they will grow and become mature adults while retaining pro-environmental attitudes that will motivate them to act in responsible attitudes towards the environment (Christenson, 2008). In a natural science and technology class teachers need to use recycling as a pathway to pro-environmentally behaviours (Nisbet et al., 2009). To be able to achieve this kind of behaviours we need to create opportunities and provide learners with ways they can take part and contribute to waste management specifically recycling (Zelenzy, 1999).

One of the advantages of integrating recycling related content in the curriculum, particularly in primary school level is that it lend itself to interdisciplinary connections (Simpson et al. 2002). Many teachers feel that there is not enough time for participating in recycling, however, if it integrated in the curriculum the time will be available (Bradley et al., 1999). There are many reasons why recycling related content is essential for primary school learners (Barr, 2007). If the learners do not get comprehensive education about recycling, then they may or may not be supplied with the information and skills necessary to one day decrease or reverse the impacts of the environmental problems that they will get (Barr, 2007).Recycling can reach a level of collective consciousness only if we begin at the fundamental level to teach our school children (Cherif, 1995). Also it can be used as an essential and natural mechanism that has been created to sustained life on Earth (Cherif, 1995). This can be supported by many studies that have been carried out on children and their knowledge and increasing awareness about the environment and what can be done to make it more sustainable (Cherif, 1995).

The information above shows that there is a need to encourage learners and people to recycle. Learners should learn that our landfills are mostly composed of phone books, magazines, and other recyclable materials indicative of how, at our present level of practice, we neglect proper recycling techniques (Rathje, 1991). Learners hold the future in their hands and the better educated they are about the effects of good resource management on our fragile bio-systems like land, water, and air the better they will be able to make the decisions as adult and protect the world around us (Simpson et al., 2002). Another reason why recycling related content should be integrated even more in natural science curriculum is because it has to supply our learners with the necessary information, in order to shape their behaviour towards the environment, change them into that of an environmentally responsible independent (Simpson et al., 2002).

Learners who participated in recycling projects prior to the college are more likely to participate in the community recycling projects (Navarro, 2002). They discussed the projects with their parents at home and they make suggestion to their parents on how to improve waste management practices in their home. Recycling knowledge of the students can also improve the knowledge of their parents (Malgorzata & Grodzinska, 2003). Knowledge seems to have a strong positive relationship with attitudes towards environment protection that is recycling and conservation etc (Heslop et al., 1981). According to him this is one of the reasons why it is important to integrating recycling related content in primary schools and engages learners while they are still young so that they can continue with this attitude as they grow up. The natural sciences curriculum needs to prepare learners to actively take part in a responsible action that sustain a good environment (Christenson, 2004). We need to find out how much knowledge learners have about recycling and provide recommendations on improving their knowledge so that they can implement this knowledge in daily lives and teach others to do so (Navarro, 2002).

1.5 Overview of the research method

The study followed mixed methods due to the fact that it will be helpful in responding to the question and sub-questions that the current study asks. The mixed method combines characteristics of both quantitative and qualitative approaches to research. Mixed method research is both a method and methodology for conducting research that involves collecting, analysing and integrating qualitative and quantitative research in a single study or a longitudinal program (Creswell, 2008). The different methods, data source, data collection strategy or instrument and sampling strategy will differ in the study as it is going to be determined by the questions that the researcher asks. It will differ from question to question or as per requirement of the aim and objectives of the study. The methods were selected in order to fulfil the aim and objectives of the study. This section will be discussed in detail in Chapter 3.

1.6 Approach to the study: the paradigms

Researchers suggest that science is dynamic and ever changing. In line with this in school of thought, Schuster, 2005 has reviewed some of Kuhn's work on scientific revolution, Kuhn's work indicates that science undergoes different stages, each characterised by what scientist do within a certain period in the life of science (Schuster, 2005). One of these is referred to as the normal period. In this period there is a stability and agreement about basic theory. Because of this agreement, scientists operating in this period tend to "embrace the theoretical frame work which is peculiar to one's science at a given point in time (Schuster, 2005). Kuhn defines this normal period as a paradigm- a theoretical framework that defines scientific work. A paradigm has three main characteristics: A set of laws and concepts under which a scientist operates; based on these are experimental and instrumental procedures which are used according to the set of laws; lastly the paradigm's metaphysics which are cultural assumptions followed within a paradigm (Schuster, 2005). Table 1.1; provide a way through which one can categorise his research within the paradigms. Here, it is suggested that the ontology, epistemology and the methods used by researchers can be used to define the paradigm in which they are working (table 1.1).

Table 1.1

The four categories of paradigms (Adapted from Healy & Perry, 2000)

	Paradigms			
Element	**Positivism**	**Critical theory**	**Constructivism**	**Realism**
Ontology	Reality is real and apprehensible	Multiple reality shaped by social, economic, ethnic, political, cultural and gender values crystallised overtime	Multiple local and specific constructed realities	Reality is real but only imperfectly and probabilistically apprehensive
Epistemology	Objectivists: findings are true	Subjectivists: value mediated findings	Subjectivists; created findings	Modified objectivists: findings probably true
Common methodologies	Experiments and surveys: verification of hypothesis. Chiefly quantitative methods	Dialogic/dialectical researcher is transformative intellectual who changes the social world within which respondents live	Hermeneutical/dialectical: researcher is passionate respondent within the world being investigated	Case studies/ convergent interviewing: triangulation, interpretation of research issues by qualitative and some quantitative methods such as structural equation modelling

1. The current researcher proceed towards the present study with such an open mind that findings of the present study will "probably be true" since the reality is real but only imperfectly and probabilistically apprehensible- a realist ontology and epistemology (Table1.1; Healy & Perry, 2000). In following the aims of the present study, the current scholar will follow inclusive way of the realistic paradigm. Realism neither support or usupport with other paradigms, but it utilises the constituent of different paradigms (Kraus, 2005). Because of this pliability realism has won popularity among scholars who have termed it Critical

Realism, Positivism and Neopost Positivism (Kraus, 2005; Denzin & Lincolin, 1994; Guba & Lincolin, 1994; Hunt, 1991).

Like constructivism, realism take a multiple concepts approach about a single reality (Healy & Perry, 2000). Realism acknowledges the differences in the values of each individually including the researcher, therefore, realism get that research can be complete objective or subjective because there will always be distinction between reality and what human recognise as reality (Kraus, 2005). Therefore, at any time, the reality of a researcher conditioned by his environment may not be the reality at the ground conditioned by socio-environmental factors. Realism further suggest that to grasp reality of any commuinity, it is important to understand the social actors involved in value generation of that particular society (Kraus, 2005).

The primary aim of realism oriented research, like the one proposed here, is to uncover both observable and non-observable phenomena within social structure (Kraus, 2005). This demand the usage of both theoretical and empirical means to gather knowledge. Furthermore, realist scholars usually use both qualitative and quantitative strategies (Healy & Perry, 2000). Therefore, scholars will usually describe, name and identify phenomena while acknowledging that their work may be real yet fallible (Krause, 2005). The current study emphasises that we need to encourage society to recycle starting from primary school learners to the old aged people. In order to do this, we need to educate the population about the benefits of recycling and how recycling is actually done. And to always bear in mind that kids hold the future in their hands and the better we educate , the better able they will make good decision as adults and protect the world around us.

2. CHAPTER 2: LITERETURE REVIEW AND THEORETICAL FRAME WORK

2.1 Introduction to the Chapter

Research regarding the effectiveness of a recycling project on natural sciences learner's perceptions, attitudes and understanding of scientific knowledge of recycling, is relatively copius in the present catalogue of literature it is however, clear that after an exploration of material that there is a gap when it comes to studies relating to primary school learners, especially their perceptions, knowledge, understanding and attitudes towards recycling. recycling attitude and behaviour tend to be the centre of most on general populations with only a little number predominantly in colleges when looking at the student demographic in colleges. The concern was pollution since it is one biggest challege that has never been completely dealt with until now. although it has been discussed and debated over the past years these continuous behaviours are becoming more dangerous to humans as well as the environment. As the solemnity of the circumstance started to capture world's attention, strategies such as recycling has been put forward (Ahmand et al., 2015). All-important as it is, the authority falls on poeple attitudes to apply recycling in their day to day basis. Among the matter debated there is paper usage which is definitely very important in human life particularly learners.

2.2 The Effectiveness of a Recycling Project

Previous studies have revealed that it is of crucial important that learners are educated about recycling and the role that they can play in recycling project (Lungsod, 2016). Learners need to be encouraged to take part in recycling. According to Lungsod (2016) there are three explanations for people not engaging in an activity: People do not know about the activity or its

benefits; People who know about the activity may perceive that there are significant barriers associated with engaging in it; While people may feel that there are no significant barriers to carrying out the activity, they may perceive that it is easier and more beneficial to continue with their present behaviour, such as putting recyclables in the garbage. This is why education is crucial in the attempt to overcome these barriers to recycling by increasing the students' knowledge about how to carry out the activity, making it more convenient for them to do the activity and providing more information about the activity so that the students can see the benefits of recycling and increase their participation (Lungsod, 2016). Educating about recycling has probable been there for centuries in some shape, and through the course of its evolution it has been connected with a many of concept such as re-use, reduce and recycle.

According to his studies recycling projects attempt to erupt a society that is scientific literate, the society that understands how individuals and society relate to and impact the natural world. In order to make such project succesful, it is imperative to understand all of the factors that accord to the growth of behaviours that are environmentally responsible. Both awareness and perspectives contribute significantly to behaviour, so it is necessary for a recycling project to encompass knowledge, awareness, perceptions and attitudes (Lungsod, 2016). Since one of the primary aim of education is to shape human attitudes, Hungerford and Volk, 2013 similarly argue that increasing realisation about recycling and re-using makes human beings more motivated to act on them. Parallel to Lungsod, they acknowledge the connection between knowledge, attitudes, and behaviour (Lungsod, 2016). He said the goal of developing recycling projects in schools is to supply our learners with knowledge, in order to change their attitudes and shape their behaviour into that of a responsible citizen.

Scholars find a foreseeable connection between positive attitudes towards recycling, political involvement, and convicts' rights (Rada, Ragazzi, Schiavon, 2016). His study propose that there may be connections between positive attitudes towards recycling, emotions of personal conduct for the garbage management, and large social concern. He analysed the task of social context in the connections between each human attitudes about recycling and recycling perceptions. The

study find that human with access to structured projects have much greater levels of recycling than those without this access, and each human attitude towards recycling affected recycling peerception only if the person had access to a recycling project. The study reveals that the most important determinant of recycling attitudes is access to a structured, school project that makes recycling easy and appropriate (Rada et al., 2016). This study also found that even individuals with no worries for the natural resource had a greater level of recycling, showing the importance of social context on this attitude. They found that social context alone was enough to fabricate the desired attitudes, while positive recycling attitudes simply increase the effect of context on recycling each person attitudes and personal resources did not result in recycling except where there was a recycling project available (Rada et al., 2016).

To promote an ambiance in which humans are motivated to participate in recycling activities, learners must be educated to be responsible citizens. If in the course of education we fail to promote recycling and its values and attitudes, we send the message that recycling is not important (Rada et al., 2016). Recycling project seek to defeat this by preparing learners to be actively involved in responsible attitudes that sustain a clean environment (Lungsod, 2016). According to his studies such projects supply human beings with an understanding of the major bargage management problems of today's world. Furthermore, by providing information, recycling projects bestow them with the skills needed to improve these problems; promoting an understanding of, and worry for, the interdependence of human and nature; supply every human with the chance to protect and uplift the environment through the establishment of knowledge, skills, and attitudes; and make new patterns of attitudes towards natural resources, in individuals and society. It should be a continuous process that is lifelong, examine the issues from multiple points of view, promote cooperation as a necessity, and focus on recycling in its entirety (Lungsod, 2016).

Another study also reveals that recycling projects motivate learners to establish strong values to direct their actions and assist them cherish the natural world, through an understanding of it. Learners need to see themselves as an interdependence part of the world, and recycling projects

must be an interdependence part of the curriculum (Aria, 2014).The concept of recycling projects is as complex as the natural resources that learners are being taught about. However, regardless of the multifaceted they have the important aim of making human more knowledgeable of the risk of losing them if we do not recycle. The end objective of recycling projects is to change people behaviours, in order to enlarge sustainability; however, management of garbage is the first step towards achieving this aim. control of solid waste is a greater priority issue for many bodies in many countries (Aria, 2014). Human bodies have three basic solutions to the waste problem: they can put the waste underground, set them on fire, or recycle it (Aria, 2016). In his studies he suggest that recycling is the better and he suggested that recycling projects to be established in many institutions, communities and areas as their agenda for the future.

Another study found that recycling at homecan if it gains public support, but there was no universally fruitful strategy for ecoutranging that participation (Wilson et al., 2013). goal for recycling may differ among socioeconomic groups, demographic groups, regions, or neighbourhoods. Including the private business sector provided technical and financial reinforcement as well as the welfare of a public-private association. Recycling includes a multifaceted chain of attitudes, and the complete process involves human play multiple roles. consumers, transporters, Producers , collectors, and re-processors are all included in the process of recycling. far approaches for changing human understanding and attitudes for healthier environmental protection are only feasible for great scale application if enlarge numbers of humans actively care enough to apply them. This makes it critical to determine circumstances that will encourage the support and caring from all parties in the process the key to solve environmental challenges will be to encouraged humans who are knows the environmental callenges and who place a high priority on solving these problems to do something on their concerns (Wilson et al., 2013).

Some studies reveals that solid waste control are expensive, whether the materials are buried on landfilled, incinerated (Erhabo, 2016). Discarding them, either through tipping-fee costs landfilling or incineration, transfer station, and incurs collection, (Miller, 2004). Recycling and

incineration offer advantages over landfilling in that these strategies can offset some of the costs with income from items or materials sales (Daniels, 2013). Incineration can provide an income from sales of energy but the amount of energy recuperate is less than the energy neded to manufacture the items that are burned. Recycling paper can reserve more energy as can be recuperated by incinerating it, although this differ with the kind of paper. For high density polyethylene plastic, recycling reserve more and much energy as incineration (Young, 2014). Recycling can be an economic alternative to solid waste disposal. Result in Young revealed that recycled paper can cost more, in some way because the mills suppliying paper with recycled content are very litt and less efficient. Recycling has non-cash benefits, in addition to avoided disposal costs and revenue from sales of materials (Erhabo, 2016).

Recycled products gravitate to be less energy rigorous and tend to have less impact on the environment than products made with new materials. manufacturing paper from recycled materials can save up to 74% of the energy needed to manufacture virgin paper (Daniels, 2013). Recycled paper making utilises 58% less water than virgin paper making, and supply 74% lower air pollution and 35% lower water pollution (Lewis, P., 2014). Private recycling programs not only upgrade processing collection, and overall recuperate, they also provides jobs pprtunities and promote economic growth. Recycling also increases natural resources (Don et al., 2016). Recycling protects the remaining resources of the specific item being collected and can also conserve energy and lessen pollution associated with manufacturing that objects (Don et al., 2016). The study, found that 57% of South Americans said they avoided products for environmental reasons on a regular basis; Recycling demands large-scale cooperation, public and private education, and managing in order to be succesful as a partial solution to America's garbage disposal problems (Aria, 2014).

The study propose that people must be teached about the necessity to recycle and in how to do it properly also that there must be encouragement for recycling among the instiutions in the society (Solid Waste/Recycling Information Exchange, 2013), and recycling must be appropriate for people to involved in. The need to make strong markets for recycled items is a big challenge

found that municipalities rated “finding markets for recyclables” as the most salient challenge in recycling projects, more salient than lack of people involvement, lack of money assistance, and lack of knowledge on recycling options. If there are no markets for the items, the result of the recycling projects will be a organised by material, not a reduction in the amount of trash going to the landfill. However, firms were starting to dinsticnt themselves on the basis of recycling concern. Marketers can expand sales by showing green consumers how to take part on the solution, and launching high quality recycled content outcome ((Erhabo, 2016).

Another study reveals that education is imperative to recycling projects success (Radnezldad et al., 2017). It also reveals that education increases involvement of learners in recycling projects and uplift the quality of the sorting of materials, which enhance the marketability of the recycling object. The municipality or contractor must put money aside specifically for a strong education program to enlarge the quality of the classifying of materials. This will keep the people involve knowlegeable concerning the specifications for variety of materials and will give them feedback on their performance. One of the way to teach the people is to examine the local waste stream and publicise the results, and show the people how their current garbage and trash disposal activities affect safety, health, and welfare of current and future generations. Resisitance to recycling always exists, so education comes to be the solution to public acceptance and involvement in an integrated trash control system (Radnezldad et al., 2017).

Interventions to enlarge parttaking in Recycling Programs examined research from the past 25 years on interventions and their measurable effects in encouranging recycling perceptions and attitudes. They characterised researches as precursor strategies that transpired before the recycling attiudes, and results strategies that transpired after the target attitudes and perceptions. They found that several efective interventions showed promise for expanding recycling behaviour and attitudes, but very few of the interventions sustained those attitudes after the end of the intervention. The apparent fruitful of interventions to enlarge recycling was influenced by the researchers' choices of dependent variables, with strongest effects on behaviour from studies that measured the percentage of subjects involvement in recycling. Poor

effects were reported when the dependent variable was the volume or weight of materials recycled. In some cases no effects were found using the measure of volume or weight despite an increase in individuals participating. Stronger effects of interventions were reported by investigators who relied on self-reports rather than directly measuring recycling behaviour (Wilson et al., 2013).

Studies have found that incentives, work well to enlarge recycling behaviours (Johansson, 2016). Combination of transipired prompts to enlarge participation in public recycling project, including using a “neighborhood leader” program and distribution of brochures explaining the recycling program. The study found that utilising a neighbourhood block leader to motivate neighbours to recycle increased recycling in high numbers. The use of written information did result in an increase in participation in the study, but was less effective than using neighbourhood leaders. The researcher also propose that gaining a commitment from people to recycle enlarge the frequency of their involvement, as well as the weight of the material they recycled, and that the stronger the commitment to recycling, the higher the degree of recycling attitudes by both frequency and weight (Johansson, 2016). It was found that people who had made a maximum commitment to recycle continued to do so, even after the end of the period of their commitment, in contrast to those who made only lower commitment to recycling, and whose level of recycling lessened after the end of the commitment (Johansson, 2016).

He also found the satisfactions gained from taking part in recycling activities involved feeling great about avoiding wasteful practices and participating in activities that can make a difference in the distant future (Johansson, 2016). The researcher concludes that conservation can be perceived as contributing to one's sense of satisfaction and those efforts to promote waste reduction and recycling behaviour should focus on non-incetives motives People are motivated to take part in recycling for a variety of reasons. He also compared the efficacy of combinations of different appeals to recycle (fear and satisfaction) and different sources of appeals (advertising, publicity, personal) (Johansson, 2016). He found that positive appeals yielded the most favourable levels of beliefs and attitudes towards recycling, but that the largest increase in

recycling behaviour came in response to a negatively framed message from a personal acquaintance (Johansson, 2016).

Akkor examined the effects of public commitment and group feedback on recycling attitudes using both single and combined interventions with a curbside recycling project (Akkor, 2017). In order to administer the interventions to a large community, commitment was seek through the postal service, and feedback was posted through a public newspaper. He found that an intervention combining both public commitment and group results can significantly increase recycling attitudes (Akkor, 2017). He compared the effects of supplying only information, providing a regular weekly pickup schedule, providing incenties payment by weight of materials collected, and providing lottery tickets for a monetary prize on newspaper recycling rates. He found that the lottery was the most effective in increasing the number of households participating in a newspaper recycling project, with an 11% increase, but that offering money and incentives had a negative effect on the cost-effectiveness of the project (Akkor, 2017).

In akkor study, he also compared the effects of using brochures distributed door-to-door and newspaper advertisements to increase peoples involvement in a recycling program, and found that the brochures were more effective. His conclusion were that the procedures that facilitated the highest levels of involvement were not always cost effective, but that a combination of these procedures into a comprehensive project resulted in a cost effective way to maintain high levels of participation. Some scholars also reported that a combination of information and prizes was more effective in increasing levels of role players in a paper recycling project than the combination of information and conveniently-located bins (Cheng, 2014). The benefits of recycling are generally long term and societal rather than immediate and personal, the strategies to increase recycling must differ from traditional marketing efforts. The enjoyment of recycling a generally last for a long term and societal rather than immediate and personal, the strategies to increase recycling must differ from traditional marketing efforts. Cheng stated that it is more imperative to integrate promotion, incentives and education as part of the project than to try to pick any single approach to increasing recycling behaviour, and that the use of appropriate media

channels will be very much important to reach many house hold out there in the country (Cheng, 2014).

Recycling Studies examines a project in rural New York State that sought to bring recycling and composting to dwellers of mobile home communities (Gerlet, 2013). The project in Tompkins County New York set out to reach those home owners in townships and town where recycling programs do not possess the support found in the traditional residential neighbourhood. Kat McCarthy, trash reduction and recycling specialist with Tompkins County garbage, and Chip Ray, president of Jim Ray Homes the owner of two of the pilot locations for the project, "agrees that the biggest challenge with the composting and recycling project has been teaching the homeowners" (Gerlat, 2013). The distribution of free recycling containers to owners; as well as showing residents how they will save money by participating in the recycling project, have been key factors in the project's effectiveness. Ray stated it is better if all of them wanted to make recycling as easy as possible so people can use it" (Gerlat, 2013).

The program rotates around what McCarthy (1994) calls 'the Four C's'; Comfort, Cleanliness, Making a Contribution and Convenience. He also pointed out that the use of residents liaison at each site has been a positive motivation to roleplaying. Home owners felt that "It was nice to have a fellow neighbour that you can talk to. They might feel more comfortable complaining to that individual or they understand where that particular individuall's coming from." (Gerlat, 2013). The success at the first two locations has been so encouraging that Tompkins County was looking to add more locations. Miller (2013) explains how much of the recycling data available today comes from 40 years of privately owned proprietary database information about the amounts of waste individuals in the United States generate, recycle and throw away. This data, which the municipality relies on, was based largely on estimates and a bit of hard data. "Almost half of the waste stream was estimated while the rest was based on yearly production and import-export data that was reported to the federal government" (Miller, 2013).

The alternative to the data the municipality utilises comes from collections of individual state recycling and trash disposal data. The second strategy consistently demonstrates that Americans are producing a much higher amount of trash with lower rates of recycling when compared to the former data set. The primary reason for this Miller says was that each state has its own definition of Municipal Solid Waste. This was also apparent by the fact that nearby states will have much different waste generation rates. Miller states “data shows that North Dakotans produces one third more garbage per individual than South Dakotans” (Miller, 2013). Miller points out that one of the constant rumours heard at recycling meetings was “we need better analysed data so we can plan well” (Miller, 2013). However, not a single person has started a uniform method of data collection or a means of examining accuracy. The author believes that this journal underlines the need for further recycling data research.

Recycling attitudes articles, in response to the reduce landfill volume in much of European states and changing landfill regulations in the United Kingdom in particular, set out to investigates the recycling attitudes of the temporary student populace in Oxford England (Robertson & Wallington, 2013). They researchers pointed out that much of the recycling attitude research is focused on fixed populace and largely avoid the university demographic. “As a large but temporary group, who donate significantly in populace terms to town areas. The environmental attitudes and behaviors of university students need to be examined further in order to understand how to expand the fruitfulness of recycling and waste reduction schemes” (Robertson & Wallington, 2013). An investigation of the population of Oxford shows that students at the university make up to 28% of the total percentage. Sustainable development relies on fundamental shifts in the attitudes held by each and dweller towards the environment, and their uutility of natural resources (Barr, 2016).

In order to achieve sustainable development, humans need to find a way to co-exist with the environment and reduce the pressures we are currently inflicting on our natural resources. Modern industrial societies rely heavily upon non-renewable energy and materials, such as fossil fuels and mineral ores. We are draining the Earth's “capital” instead of living off the “interest”

and this is why recycling should be integrated into the daily cultural and socioeconomic character of society (Cherif, 2015). In order to limit the amount of waste being sent to landfills, we need to use less material and recover more. In October 2007, the garbage beneath the rolling hills of the old Sackville landfill in Nova Scotia, which was shut down at the end of 6, is now producing enough methane gas to provide electricity to 2000 area homes continuously for the next 15 years. Although this may be beneficial to the area homes, several problems can arise as a result of the methane gas. There is some possibility that the landfill gas will travel underground, accumulate in enclosed structures and ignite on both landfill property and private property (U.S. EPA, 2006).

However, the biggest health and environmental concern would be the release of landfill gas into the atmosphere, contributing to global warming. Furthermore, over the course of its 20-year life, the Sackville landfill was the dumping ground for more than four million tons of un-separated garbage (Moar, 2015). The garbage at the landfill caused odour problems that were so serious that more than 20 homes had to be purchased by the City so residents could relocate. Landfills are the main destination for Canadian solid waste sent for disposal by a wide margin, approximately 90-95%. In 1998 alone, nearly 21 million tons of waste was disposed of in 767 publicly and privately operated landfills. In the same year, close to 9 million tons of waste was diverted from disposal through recycling, composting or reuse project (Crittenden, 2013). We need to continue to encourage people to recycle.

In order to do this, we need to educate the population about the benefits of recycling and how recycling is actually done. Students should learn that our landfills are mostly composed of phone books, magazines, and other recyclable materials, which is indicative of how, at our present level of practice, we neglect proper recycling techniques (Barr, 2015). Kids hold the future in their hands and the better educated they are about the effects of good resource management on our fragile bio-systems like land, water, and air, the better able they will be to make environmental decisions as adults and protect the world around us. Additionally, environmental attitudes of young people appear to be crucial as they ultimately play a direct role in providing knowledge based solutions to incoming environmental problems (Barr, 2015). Furthermore, school recycling

project, although addressed to students can also influence upon the recycling knowledge, attitude and behaviour of adults (parents, teachers and local community members) through the process of intergenerational influence (Crittenden, 2013). Another study also showed that the recycling participation of the students can improve the knowledge of their parents (Barr, 2015).

According to the parent's reports, the majority of students (70%) had discussed the project with their parents, and just over one third of them (34%) had made suggestion to their parents regarding the ways in which they could improve their waste management practices at home. A study by Crittenden showed that knowledge seems to have a strong positive relationship with attitudes towards environmental protection recycling and conservation (Flordeliza, 2016). Furthermore, people who have knowledge on recycling or knowledge on how to take actions on those issues are more likely to engage in recycling projects than those who do not possess this knowledge. Another study done by Clay indicated that recycling behaviour is relatively stable in different settings and increasing recycling in one setting would correspond to an increase in other settings. In his research he was comparing university students who recycled at home and at the university, and showed that those who did not recycle at home also chose not to recycle in the university (Clay, 2013).

It has been suggested that recycling is critical and is most effective on younger children who do not have well-established habits (Smith et al., 1997). Recycling can reach a level of collective consciousness only if we begin at the fundamental level - teaching our schoolchildren that it is an essential and natural mechanism that has created and sustained life on Earth (Cherif, 2015). This can be further supported by many studies that have been carried out on children and their knowledge about environmental issues that have proven that education is a key ingredient to improving this knowledge and increasing awareness about the environment and what can be done to make it more sustainable. A recent study carried out at Illinois State University examined students' attitudes and behaviours towards residence hall recycling. An important finding was that students who participated in recycling efforts prior to college were more likely to participate in the residence hall recycling project (Flordeliza, 2016). This shows the importance of

encouraging good environmental habits into students when they are still young so they can continue with this pro-environmental attitude as they grow up.

Another study carried out in Cincinnati tried to analyse the impacts of two versions of a paper recycling educational program on the attitudes, knowledge, and perceptions of third to sixth graders (Serife, 2017). This study showed that there was high level of knowledge and pro-recycling behaviour and attitudes after the small recycling project was administered, and that a more hands-on experience during the project such as a visit to a landfill caused more pro-recycling attitudes and behaviours changes compared to a simple classroom presentation. Furthermore, the study observed differences in grade level with 5^{th} and 6^{th} graders having greater knowledge about recycling than 3^{rd} and 4^{th} graders (Serife, 2017). However, another study carried out in the US in 1998 opposes this finding and the hypothesis by concluding that their study found no significant grade level differences among students on their recycling attitudes and recycling behaviour (Zelenzy, 1998).

This study examined students' recycling attitudes and behaviours and the stability of those attitudes and behaviours after the implementation of a school recycling project. One of the results from this study was that there were significant gender differences in the students, where girls reported significantly stronger environmental attitudes and behaviour than boys on most environmental measures (Serife, 2017). This study is consistent with a research done by Don (Don, 2016). The study examined gender differences in recycling and attitudes and behaviours in primary and secondary school children. The study found that compared to boys, girls reported significantly stronger recycling behaviours and greater participation in recycling project (Serife, 2017). A research study done by Aghaabedi showed that the relationship between peer recycling and recycling activity are very strong. Furthermore, results showed that over 60% of those students recycling that frequently recycle have friends who frequently recycle as well (Aghaabedi, 2016).

An article found in the New York Times a couple of years ago said the crux of the recycling problem is two-fold: First, there is a fundamental lack of public education concerning exactly what can and what cannot be recycled (Barr, 2015). The second problem is that there are not enough recycling receptacles around so people end up throwing their recyclables in the trash bin instead of the recycling bin. Many of the studies done in schools about recycling knowledge, attitudes, and behaviours in students concluded that education is very important in increasing awareness about the importance of recycling with specific emphasis for students to have hands-on experience as this is considered very beneficial (Barr, 2015). Recycling projects are fundamentally important, widely discussed, frequently measured, and poorly understood (Heberlein, 2014). Research into recycling has usually taken two basic approaches: personal and situational. Research taking a personal approach attempts to identify who recycles. What are the characteristics of individuals that cause them to recycle? Research taking a situational approach has attempted to identify when people recycle. What conditions facilitate recycling, and what type of interventions can increase recycling? (Schultz, 1995 ; cited in Hebelein, 2014).

Schultz further goes and states that research investigating the type of person who recycles is broken down into four classes: environmental attitudes, knowledge about recycling, demographic variables, and personality variables (Schultz, 1995). The study focuses on some aspects within three of these classes, namely environmental attitudes, knowledge about recycling, demographic variable. Results from the questionnaires shows that students are generally aware of the importance of recycling, many of whom said that they learnt from school or both school and at home. Others also said they learnt from other locations such as summer camps, scouts, presentations, and posters (Hebelein, 2014) .Results also revealed that more girls recycle than boys in both grades 8 and 1 this finding was not consistent with a study done by Clay where the results from his study on recycling behaviour in university students found that male students were more likely to recycle than females both at home and at the university (Clay, 2015).

Additionally, on average more boys than girls reported either not using the recycling bins at all or just sometimes using them. Females are socialised to be more expressive, compassionate,

nurturing, and helpful in care-giving roles, whereas men are more independent and competitive (Cheng, 2014). Therefore, because more females compared to males are socialised to value the need of others, women exhibit more helping attitudes (Aldrich et al., 2000). Furthermore, the findings indicate that boys in grade 8 recycle more than the boys in grade 11 and the same goes for the girls. This finding indicates that students in the lower grade level generally recycle more than those in the higher grade level. Those frequently recycling will participate on a regular basis and will have much better diversion rates of waste from landfills. Obviously, the number of people who participate in recycling is crucial to achieving good diversion rates but how well they do so and how effectively they participate is also an important parameter (Thomas, 2013). All the students were generally aware of which basic materials were recyclable. These are the materials that they readily use and recycle on their school campus, such as paper, milk cartons, pop cans, and bottles. These are the categories that returned the highest response rates. Schultz et al. (1995) identifies the five most commonly recycled materials as being newspaper, glass, aluminum (cans), plastics and cardboard/paper, in that order (cited in Clay, 2015).

A much greater proportion of boys indicated that they simply use the closest receptacle even though it may not be a recycling bin. There were a greater proportion of both girls and boys who stated that they sometimes use the recycling bins than those who responded that they always use the bins. The two main reasons indicated by the students for the non-utilisation of the recycling bins are that the bins were too far away and also they did not always know what garbage can and cannot be recycled. Research has shown that increasing the ease of recycling is one of the most effective methods of increasing participation (Chung, 1996 cited in Williams, H., 2013). So reducing these barriers to recycling in the schools should be a priority if we hope to see more students recycling. Interestingly, although many students said that the recycling bins had clear and understandable instructions on them, a large percentage of the students still responded that better instructions on the bins will make them recycle more as well as having more bins around the school (Williams, 2013). Most of the recycling facilities in the schools were very simple and straight forward such that they have a bin for paper, plastic and glass bottles, and garbage. The lack of complexity was important as it may lead to an increase in recycling participation. The fact

that the students are encouraged to recycle a small number of recyclables can be very beneficial (Williams, 2013).

A study by the European Recovery and Recycling Association (ERRA) into recycling scheme effectiveness found that by targeting smaller numbers of significant recyclables diversion rates were increased and costs were substantially reduced). Some studies stress the importance of educating students on the importance and availability of recycling, and how to recycle effectively. This could mean that those students who said that they sometimes recycle will start recycling more frequently due to the availability of more information, and could also encourage those who don't recycle at all to begin recycling (ERRA, 2013). As we are dealing with young students, this recycling information needs to be clear and concise. It is quite been an issue of debate for a long time now that challenges arising from the environment adaptation efforts of people to their own benefits, may or may not cause rising of bigger challenges in the future (Allen, 2013).

The Earth may face with great calamity unless national and international leaders pay the required attention to environmental problems and plan for the present and future term and encourage populace to adopt such plans, aslong as humans behave according to their old habits and continue to utilise fossil fuels and petrochemicals which are created of such fuels and pesticides as much as they want; as long as people do not make new and more forests in place of those which were already desmolish; they consider environment as priority in technical developments, as long as global warming continues and ozone hole continues to develop (Gunduz, 2004 , Allen, 2013). There were few and intense articles aiming to preserve the balance and to provide sustainability of nature. Education is the only place where it is necessary educate learners about the eenvironment in order to assist learners to understand the environmental problems and make meaningful contribution to the solutions of problems. In other words, recycling projects in education are essential for providing information and awareness to society on environment, to create meaningful change of attitudes in positive and sensitive directive and recuperate what had been lost before. Thus, it may be possible to make an environmentally friendly society and

to save money and time while solutions to the problems (Uzun & Saglam, 2006 cited in Allen, 2013).

A research has found that content and concepts regarding recycling should be integrated widely in the curriculum (Ugulu, 2011). Years back, in accordance with environmental issues became one of top stories of whole world, has become to be each an every person and social need. The goal of all efforts to protect and conserve environment, to prevent environmental such as pollution and to grow environment is to make sustainable, comfortable and healthy environment for the society (Ugulu, 2016). In order to reach positive results in efforts for rsearch done in the area of environment, learners should be in to consideration. It is very much important to give education to young people to assist them describe related concepts; gain necessary information on the subject recycling and to assis them give correct decision within the scope of this information (Ugulu, 2016). Many studies on recycling, environmental issues prove that, level of knowledge on learners on this subject is not adequate, learners are far from describing environmental concepts properly and they do not recognise environmental issues correctly (Ak, 2008; Altın, 2001; Bahar, 2000; Erol, 2005; Ugulu et al., 2008; Ugulu, 2011; Ugulu & Erkol, 2013; Yılmaz et al., 2002). Recycling is a process in which people not only benefits information, awareness and skills, but also they get the ability to be determined on taking actions in order to find solutions to problems (Ugulu, 2016).

Researchers state that students' attitudes, perception and approaches in recycling on the one hand and on the other hand these researches provide examining the results of the changes made on education programs at different level of education. The main aim of recycling projects is to bring sensitivity to homans on environmental problems and to grow a critical perceptions in interaction with science and leaving clean and healthy environment to future generations (Ugulu, I., 2016)). With recycling projects, science is also aimed that humans can describe their own position in ecological balance, construct ideas about how to live in peace with planet and to get necessary skills for effective and responsible contribution (Ugulu, 2016). Irresponsible behaviours are the main causes of many problems. It is doubtless, that one of the real dimensions that affect

these behaviours is the attitude (Bradley et al., 1999 cited in Ugulu, 2016). One can mention few effects in the formation of attitudes. People are under the effect of formal education primary schools high schools and universities and informal education societies. For provision of positive attitude growth of students in favour of preserving natural resources, environmental issues should be taken on serious problem basis (Ugulu, 2016).

Learners are motivated to see the trash as a problem, to collect information about recycling, to manage, control and analyse the natural resources and to grow skills about the ability to decide on issues that concerns types of waste management. More over, it is clearly defined that issue like reading news papers about recycling, creating games on the environmental issues, giving education on art, create outdoor learning, present playgrounds properly and making models have great importance (Ugulu, 2016). High level of importance should be given by the mass media on recycling, so that many people will gain informationand awareness about the importance of recycling. It is only possible if mass media would not only come up with issues such as shortages of natural resource but analyse issues deeply; seek to find solutions (Ugulu, 2016). Attitude scale applied in this study about recycling, will provide knowledge about the effects of recycling projects on learners.

2.3 Perceptions towards Recycling

Presently, the world population is very high and the necesity for each and every individual to create healthy environmentally sustainable preferences is critical (Lamour, 2016) We are exhausting our natural resources and producing more garbage at a per capita rate not transpired in human history. As we are adding more people and economy continue to grow, humans are searching for ways that can help people to survive on less water, less energy consuption and less trash. Furthermore, the concern about global warming that we are facing today has began since the 1960s as scientists started to track the enlargement of temperature. For example, greenhouse gases such as carbon dioxide, methane, and nitrous

oxide are released into the air when fossil fuels are burnt (such as, by cars, power plants), and waste materials deminish in landfills. Consequently, the trapped energy will create warmer ocean waters, giving to more storms and melting permafrost, tundra and ice caps. As a result, the sea levels around the world are rising, and temperature changes are contributing to shorter, warmer winters and longer, hotter summers. This would contribute to health risks (for example, asthma) that are associated with pollution. In fact, cases of asthma have increased once air pollution and climate changed. In order to reduce this risk, it is best to avoid air pollution by recycling. Understanding college students' perception of recycling is paramount as today's students will soon be driving our economy and taking on the responsibility of maintaining a sustainable society (Lamour, 2016).

In another study, a survey of university students attending two districts universities in the United States to capture their present level of experience, expectations, and perceptions with regard to different aspects of recycling using a questionnaire containing structured questions about recycling information and awareness levels, green product purchase behaviour, attitude-behaviour relationship, and education was conducted (Lamouri, 2016). The results shows that useful insights into the students' views on these topics and the demographic data gathered were analysed even more to spot any distinctions due to educational background, academic standing, and gender. The study's findings support the growing importance of motivating recycling among university learners and provide a benchmark against which to determine the effectiveness of future efforts to upgrade recycling attitudes and foster sustainable behaviours (Lamouri, 2016).On the basis of this study, the results can be summarised as follows: although many university pupils thought they know a lot about and are familiar with the concept of recycling, they are not fully confident in their level of knowledge in this concept or topic. This findings may be attributed to a lack of formal education on recycling; Many of the students believe that recycling projects has the potential to influence their knowledge, perceptions and attitude towards the sustainability (Lamouri, 2016).

concerning the integration of a recycling rrelated content on the primary school and high school science curriculum, opinions were divided. This findings may suggest that instead of integrating a normal recycling content in the core science curriculum, a seminar or short-term certificate program may be a viable choice. Many university students do consider recycling when they purchase products. However, the attitude- behaviour dilemma was activated when they have to spend extra money on the purchase. Many learners have experience on utilizing energy saving products and they understand the importance of doing so. However, when they use water in their daily routine, high number of the learners are less concerned about natural resources (Lamouri, 2016).This findings is inline with the previously mentioned attitude-behaviour dilemma. Concerning their satisfication levels with the dormitory recycling, the puils point of view was again divided. Those were not in favour of the recycling of paper specifically criticise the idea, which was directly related to sustainability applicable issue. There was a gender difference in the learners' awareness, information and knowledge of recycling, with girls appearing to be more aware and knowledgeable. The gender difference also appears when the learners buy products, but in contrast to Finding boys usually to consider the environment more when purchasing products (Lamouri, 2016).

Knowledge background in this matter was not a strong factor for recycling except for two regions: knowledge level and the integration of a recycling content in the primary and high school science curriculum. learners seem to be relatively less confident about their recycling knowledge. Concerning the of intergration of a recycling content in the science curriculum, learners were more likely to say it is a better opinion to do. The learners with a good academic standing expressed a greater common knowledge with recycling and other related concepts and also usualy to consider sustainability more when buying products. Furthermore, they were even more willing to spending a little extra to buy green products (Lamouri, 2016). There was no proof found to suggest that academic standing was cooperated with any of the other sustainability concepts covered in the survey. Although changes cannot occur overnight, the results of this study show that there are many options that the City of Laramie can take to increase its recycling rates (Lamouri, 2016). Citizen involvement is fundamental to this process. By fostering a sense of

community purpose among Laramie residents, their views and attitudes about recycling can be focused towards sustainable community development and environmental conservation. Recycling, in its essence, is about old things becoming new (Lamouri, 2016).

It was about possibilities to reuse materials and it was about safeguarding the natural resources. When community residents and government officials see the potential returns on investment in recycling, people tend to respond positively to the benefits both to themselves and their communities (Lamouri, 2016). By actively increasing and promoting its recycling program, the City of Laramie can reap many benefits recycling can provide. Given the results of this study, the next task for the city is to develop creative ways to engage its residents in the recycling program. This process can be aided by working with local community groups, artists, businesses, school programs, and youth groups to integrate recycling themes into their events, and to gather feedback directly about recycling initiatives in Laramie. Being a university town, Laramie has a great potential to expand its educational efforts across the city (Lamouri, 2016).These efforts should be used to remind people of how recycling benefits them and their communities, and as such helping them become more knowledgeable about recycling methods and procedures.

Consequently, people will better be able to see the positive results of their actions, and will be more likely to continue those actions. Keeping people inspired, motivated, educated, and informed is essential to a successful long-term recycling program. After evaluating the three major policy evaluation criteria (ie, administrative feasibility, political feasibility, and economic feasibility), it can be concluded that Laramie needs to be deliberate in generating additional funds for implementing the proposed educational and incentive policies to meet its long-term recycling goals to reach a 40% diversion rate by 2030. The study can further be implicated to all of the growing university towns, where recycling can become more effective and efficient through public outreach and education. Solid waste recycling can be a resource for income generation, energy production, and the construction of recreational objects through an integrated recycling program. The future direction of this kind of program should be considered by small towns and cities in local policy and planning through recycling education, public awareness and

participation, and the sustainable, environmentally friendly developmental goals of reduce, reuse, and recycle (Lamouri, 2016).

A study by Ferrcog (2016) was designed to recognise potential recyclers by assessing demographics, perception of recycling programs, perception of program policies and problems, and environmental attitudes (Ferrcog, 2016). She found recyclers were a bit older, and had more formal education, and had a higher percentage of residents than those who do not recycle. Residents who take part in recycling were more knowledgeable about recycling, and their main source of information was the newspapers and magazines. Recyclers perceived a greater necesity to recycle to address the garbage problem than those who do not recycle (Ferrcog, 2016). Vining and Ebreo (2006) examined the differences between those who recycle and those who do not recycle with respect to their knowledge, motives, and demographic characteristics. They found no differences between those who recycle and who do not recyclers with respect to gender, household size, occupation or education. They did find that recyclers were a bit older and non-recyclers were young and had slightly higher incomes. Non-recyclers and recyclers were no different in the strength of their belief that preserving the natural resources was an important reason to recycle (Ferrcog, 2016).

The researchers also found that people who recycle are better informed about which materials can be recycled, know where to recycle these materials, and are better informed about the benefits of recycling than those who do not recycle, but it was not clear whether this was the cause or an effect of recycling behaviour. Those who do not recycle were more concerned with financial gifts to recycle, moneytory rewards for recycling, and convenience. The degree of perceived nuisance differs notable between those who recycle and who do not recycling since sorting, storing, and transporting of recyclable materials all take time and energy (Ferrcog, 2016). Another study examined factors promoting or deterring household recycling behaviour, and found little support for demographic variables as predictors of recycling, except for salary, home residents, and living in a single home owner, none of which were causal variables (Carbone, 2016). No distinctive in recycling behaviour were found for age, education, and number of

dwellers in the household. Those who recycle were more knowledgeable about environmental conservation than do not recycle, but they found that pro-environmental attitudes were not a predictor of recycling behaviour (Carbone, 2016).

Many people wereparticipating in activities such as utilizing less heat and air conditioning, at night they were turning off lights and they were independent of curbside recycling of household trash. These findings suggested that those projects to enlarge recycling. There was a need to address recycling specifically, rather than addressing more general environmental consciousness. It was found that having friends and family members who recycle was a caution in individuals' recycling behaviour. This shows that social influence can be also utilise to enlarge recycling. Recycling on primary and high school premises were some of the first attempt on this research. Another study on recycling perceptions came out of studies on college campuses in the early 1970s. More recent research has also been done as recycling has become an important issue on campuses as well in local communities. The campus studies were designed primarily as moneytory rewards most utilises raffles and feedback to increase recycling behaviour (Carbone, 2016).

A study of rewards shows that lotteries construct significantly more perceptions and attitude change among high schoollearners than it did with simple cash payments (Michael, 2015). In michael study, learners received a lottery ticket for each day that they unload recyclable materials at the school recycling centre. Recycling behaviour in most learners was presented even more when rewarded by lottery tickets than for individuals receiving other individual or group awards in the intervention. Michael also found that individuals winning the lotteries exhibited the most attitude change about recycling. He also studied the perceived importance of recycling and its perceived inconvenience among primary learners. They found that the more people believed that recycling was not good, the less important they believed it to be, and inconvenience was strongly related to lack of recycling participation. They concluded that successful programs will need to address perceptions of the inconvenience of recycling, which has a strong influence on participation (Michael, 2015).

creating recycling to be more interesting does not address belief change with respect to recycling concerns, but is rather directed to specific perceptons and behaviours. Primary school learners in this study displayed to be more concerned with convenience than the long-run importance of recycling activities. Michael reported that a package project, combining an occassion, a lottery and a competition, was much more effective in enlarging beverage receptacle recycling in school premises than it was with a baseline condition that merely provided the occasions and a suitable recycling bin (Michael, 2015). He also found that both raffles and competions with monetory rewards were effective, relative to a baseline condition, in increasing part taking in a paper recycling project on a high school campus. Geller et al. concluded from this 1975 study that the most problematic feature of designing recycling projects in schools is to prompt and ecourage the necessary personnel to grow, keep, assess and clarify the projects (Michael, 2015).

Torneta create an experiment to label the sustainability of increased roleplayers in recycling on a primary school learners (Torneta, 2016). He developed a raffle for role players who returned paper for recycling, which uplift the quantity of paper recycled over the time frame. Then they gradually enlarge the quantity of paper needed to get a raffle ticket during the intervention. The total quantity of paper recycled remained steady during this intervention, as the increased requirement to get a lottery ticket did not display an additional enlargement of paper recycled. The level of recycling went down after the intervention has ended. The author suggest that a promoting method like to trading stamps, where recyclers can claim the raffle ticket immediately for an object of small value, or get their tickets to claim for an object of high value the following visit. This could results in an increase the number of role players. In the study he assessed effects of group dedication, individual dedication, and token promotions on recycling perception of primary schoollearners (Torneta, 2016).

The learners in the entire experimental conditions recycled from three to five times more paper than the controls during the intervention, but only individually dedicated subjects continued to recycle remarkable more paper than the controls after the treatments were stopped. They

compared the effects of a group dedication to recycling with both individual dedication and group incetives (ie, discount coupons given to all hall residents if 60% of the group participated) and found that the grat effect was from individuals, both in frequency of participation and in pounds of paper recycled over the four-week intervention (Torneta, 2016). Ugulu in his studies also investigated the effects of posted feedback on paper recycling on a college campus (Ugulu, 2016). He found that information alone was not enough to encourage widespread participation in recycling projects. They hypothesised that this may be because individuals receive little information about the results of their recycling participation. When they posted feedback on the amount of paper recycled, they found an immediate and substantial increase of recycled paper during feedback period. Based on the research, he concludes that providing individuals with feedback is an effective way to maintain recycling behaviour.

They stress the utilisation of few channels of information to provide results to the all the group of participants. The specific cues posted above recycling and garbage bins increased recycling behaviour among educators, staff, and learners in the school. The effectiveness of the cues was related to the proximity of the sign to the receptacle (Ugulu, 2016). A high percentage of learners in this study said either that they were knowledgeable about environmental implications of waste disposal, almost ala the learners reported that their family recycled more often when they were young, and 70% of the learners said they either return their beveranges bottles and cans for deposit or give them to someone else to return. However, 71% said they do not regularly recycle or e-use their non-returnable bottles and cans. learners who participated on the recycling project were asked to rate the importance of few potential reasons for recycling. conserving natural resources and decreasing pollution were rated most important, followed by reducing litter and saving landfill space. The most important reason for not recycling was the lack of recycling bins (Ugulu, 2016).

Some researchers make and assess the effictiveness of perceptions interventions in order to change recycling related believes, others examined who was most likely to take part in recycling prograject and under which conditions. Therefore, those researchers may assist in

provision of a broader understanding of factors related to recycling believes including recycling attitudes (Xul, 2017). The higher education setting includes many people who acts in ways that are unexpected upon one another. In the end, it was a powerful determinant of re-inforcement; learners tend to study together, play together, work together, and eat together. In fact, some learners were particularly authoritative among their friends (Xul, 2017). learners for example, were sensitive to the physical school surroundings. When the learners realises how dormitories dispose of trash, they get the message; it was part of the school hidden curriculum. The school campus presents an ideal area to study how social context influence the recycling behaviours and perceptions.

learners have always played an important role in the activities managing to the growth and developement of environmental awareness on recycling. Some studies have been carried out to understand the attitudes and recycling attitudes of learners. Further more, the fact that students was the ones who manage and consume future resources was effectively encouranging studies related to learners. It is possible to deduce two different results from these studies. First, although the recycling attitudes of the learners were very developed, their recycling perceptions were affected by the economic concerns. Second, developed environmental awareness on recycling of the learners reflect their recycling attitudes in the same level (Xul, 2017). high school learners represent a populace with the intellectual potentially to assimilate the concept of sustainability and, therefore, learners need to comprehend it so that they could become better stewards in the near future (Xul, 2017).

In fact, having knowledge alone is insufficient in the present's society but the important thing is to apply their knowledge to find solutions to problems. In fact with the knowledge thye have gained, an educated individually carry the responsibility to ensure the knowledge is well used by society. This indicated the important role of the schools in providing and imparting a comprehensive recycling knowledge and information to learners especially inculcating the recycling attitudes and perceptions in their day to day life in campus and residential colleges. Understanding primary and high schools' perceptions, attitudes and behaviours related to social

issues is critical in order to reduce the considerable estrangement of young people from public life (Xul, 2017). He argued that public apathy is the norm among high school learners. Providing knowledge that can assist to inform a more sustainable future also directly aligns with the public and social purposes of higher education (Xul, 2017). He articulated, "As society goes, so goes the schools; but also, as the schools goes, so goes society", which suggests the school's obligation to attentively heed the national public dialogue and highlights the university's critical role in directing change.

If learners can be empowered as residents in the context of university then they will likely become empowered residents in the larger society. Primary school and high school graduates are residents of a global community and they were expected to be articulate, skilled in principles and understanding sustainability once they take over (Filzah Md Isa et al., 2014). Primary school and high school are places to educate members of society, including future leaders, by increasing public knowledgeable on environmental issues and to increase their perception on recycling perception. The question arises as to why this study focuses on undergraduate business students? Business is a social profession and previous studies showed that a business degree has a better market value. Business managers who apply sustainable principles in their business practices will be able to spot and indicate more profits. Therefore, if a student are exposed to examples of good practices and supported with sufficient recycling knowledge techniques and principles, including the benefit to recycle they will not ignore the agenda/policy once they become managers or entrepreneurs (Filzah Md Isa et al., 2014).

And today's case learners are the future managers and business leaders. As future managers and business leaders, business learners need to be educated and be exposed to environmental problems to enable them to transform ideas and strategies and blend them into cohesive green strategy. Previous researches on recycling programs in a schools showed that they have remakable increased learners energy efficiency, reduced its trash, and bolstered the university's sustainability image. However, a related recycling research finding by Olson, Arvai and Thorp, 2013 demonstrated that learners presented complete understanding of

materials which could be recycled on the school premises, new specific collection stations for recyclables were established, and were aware of recycling opportunities at the school recycling facility (Filzah Md Isa et al., 2014).The research adopted a non-probability sampling using the convenience sampling since the information collected from the samples are conveniently available. Samples of undergraduate business students from the faculty of Business/College of Business from University of Malaya (UM), University of Putra Malaysia (UPM) and university Utara Malaysia (UUM) were identified (Filzah Md Isa et al., 2014).

The present day youth (in this case, the students) will be the ones who will take the responsibility to manage the resources of their country in the future (Müderrisoðlu & Altanlar, 2013). Hence, several studies were carried out to understand there cycling attitudes and perceptions of the students. The socio-demographic factors such as and educational level and their impact on perceptions were studied in the past (Müderrisoðlu & Altanlar, 2013). These studies have shown that, students from rural areas, girls, and younger students have more sophisticated recycling knowledge than those from urban areas, boys and older ones, respectively. The study observed some changes in the recycling attitudes and behaviours of the students based on their educational background. Students who had better education in science were more aware of recycling activities than those with less or without education. Scientific literacy is often linked with students' sensitivity, awareness and understandings of changing environmental issues. Hence, increased and responsible actions are the result of education given to students (Bradley et al., 1997; Moseley, 2000; Magntorn & Hellden, 2007; Woodworth et al., 2011 cited in Müderrisoðlu & Altanlar, 2013).

The place of residence can also influence student perceptions significantly. People living in the urban areas are more concerned about recycling than those living in the rural areas. On the other hand, land care groups in Australia comprising mainly land users in rural areas are devoted to develop sustainable land management practices. This suggests that rural residents are also more conscious about recycling than urbanites. Students growing up in developed versus less developed countries, their recycling activities had significantly different levels of recycling

attitudes despite their common shared exposure to institutionalised science education (He et al., 2012; Hoalst-Pullen et al., 2013). Another important factor that is likely to influence the perceptions is gender. Several studies reported that females are more positive and show greater concern towards environmental issues than do males. The perceptions can also differ with age of a person (Hoalst-Pullen et al., 2013). Some studies suggest that young children had more positive attitudes towards recycling programs than older students Age was found to have a statistically significant effect on environmental attitudes of high school students who participated in science survey in United Kingdom (Adejoke, et al., 2014). He also reported that younger learners had better scores than their older counterparts in terms of recycling knowledge and attitudes.

The effectiveness of different local recycling programs depends more on the policies selected, how they were chosen, and how they are applicated, than on local community characteristics. The mix of voluntary or mandatory, pick up or drop off was not important, as long as the process was open and democratic in deciding how and what to recycle. Other researchers have had mixed results in identifying characteristics of the programs that successfully predict recycling. Knowledge has been found to be a significant predictor of recycling behaviour by several researchers (Duplessi Sausene, 2017). He also found that the degree of inconvenience affected the level of recycling behaviour reported by respondents, with less recycling reported by those who found recycling inconvenient. She suggests programs to increase recycling behaviour should try to promote learners perceptions that their own actions will improve the recycling, and provide information and a means to implement the action.

It was recommended that investment in recycling program should be at the early stage of children's schooling in order to increase their understandings and knowledge of the recycling. Young people's recycling attitudes have shown to be important because they are the ones that will be affected (Adejoke, et al., 2014). They can provide alternative solutions to environmental problems arising from present day activities. Today's youth are future scientists, policy-makers,

consumers, and voters of a country. Therefore, it appears that effective recycling program for school students is of importance (Adejoke, et al., 2014).

Sustainability refers to utilising the earth's natural resources wisely to meet the necessities also to save the resources for future generations. Teaching recycling had no effects on the perception of the concept of garbage and the importance of recycling, plastic and the concept of garbage recycling (Nadi, 2017). But explanation of the concept of recycling, paper recycling, glass recycling, and metal recycling and also on identifying those who help people collect recyclable garbage has the effects (Nadi, 2017). The need for education is more felt in different parts especially in schools and universities. Respecting the environment is the result of education and the school's role in this regard is essential (Nadi, 2017). Conducting continuous educational program from early ages is necessary for increasing the public knowledge and even in some cases for better recycling of waste. Therefore, the continuity and spreading of such training programs are needed (Nadi, 2017).Attitude, knowledge, behaviour, and underlying factors can affect students' scientific literacy.

Therefore, to achieve a new vision of education in the field of recycling, the following recycling modern methods of teaching (teaching methods) are listed and offered: Problem-solving methods (active methods of teaching and learning), research, field trips, laboratory methods, pretending techniques, discussion, question and answer, and extracurricular activities including sports and mass activities According to the findings, teaching process includes planning, performing, and evaluating. In the correct planning of environmental education, the level of interests and abilities of students, the principles and laws in the science of environment, the sequence of content, the novelty of the subject, developing the fundamental concepts and methods, association with the daily issues, and considering the right time of training should be considered to achieve the goals By increasing awareness and knowledge, people's capability and independence related to their responsibility for environmental protection and recycling are increased(Nadi, 2017).

Their flexibility in life and implementing the regulations in the field of the environment protection and recycling have gained momentum, and consequently their level of life improves which is a good motivation for continuing the desired behaviour. Although the individual characteristics affect a person's behaviour, creating the ability in implementation of various social programs depends on the people's level of awareness and knowledge. The following diagram shows this phenomenon People's participation is the most important factor in success of a recycling program, as well as the garbage separation from the beginning. Designing a public training programme can ensure and increase the percentage of people's participation in different programs of recycling. To attract people's confidence and participation; the field of confidence-building should be provided Increasing the public's participation in environment protection and recycling requires specialised training. This training should be aimed more at understanding of various recycling materials. Preparation for presenting targeted training for the environmental goals requires the related systems' participation and effort. On the other hand, removing the barriers that hinder the participation of people is the public relations responsibility (Nadi, 2017).

The results showed that the need for education is more felt in different parts especially in schools and universities from the viewpoint of this researcher it seems that the training in the field of recycling should be dealt with from the early stages of childhood. Since the childhood training has a great impact on building personal and social behaviour and it can have a decisive role, the environmental education in this period can have a significant impact. If it is accompanied with practical programs, childhood education can build a strong foundation for the next generation's knowledge and attention to environmental issues. Doing some projects by groups of students and transferring the training by the children to their parents has a special importance (Nadi, 2017). A number of primary school learners believed that science education has the potential to influence their behaviour and attitude towards the environment. Regarding the integration of a recycling project in the science curriculum, opinions are divided.

The researcher's concludes by suggesting that understanding the learners' perceptions of recycling was important because they will shortly become the generation who was responsible

for driving the economy and keeping a sustainable society (Jeong, 2015). The findings of this study support the growing awareness of the importance of sustainable recycling attitude among today's learners body, encourage socially responsible behaviour, provide a benchmark against which to quantify the impact of future changes to science education and stimulate sustainable behaviours over time among the people (Jeong, 2015). The study's findings showed interesting insights related to a number of sustainability subject and displayed how challenging it is to draw concrete conclusions on the subject based on a limited amount of regionally constrained sample data. However, despite this we believe that the survey results provide evidence that supports many of the findings of previous studies in this area as well as useful information to help direct future studies on similar subjects (Jeong, 2015).

2.4 Attitudes towards Recycling

A number mediums were incoopereated over the past years with the intension to cultivate the awareness of waste management, for example the 3R's (Raj, 2013). Mediums like posters, newspaper, television, radio etc. were the platforms to broaden the awareness on recycling and other ways of waste control like re-use, reduce etc... Although the allocation given to instil the awareness among the nation has reached millions of people, the results has also yet to be seen. Recycling projects are mainly developed to decrease the nation's generation of trash by processing old materials to new ones (Raj, 2013). The main aim of this particular project which was in line with the National Recycling Target is to have a total of 27% of the garbage recycled by the year of 2021. Nevertheless, present rate is perceived as very low in our country as compared to 58% in Singapore and 68% in Germany (Raj, 2013). With the present alarming situation, the solid waste control services need to be upgraded as to modernise the system. Furthermore, a holistic and integrated effort must be made to minimise the numnber of trash or waste produced, and this requires the cooperation and full involvement of those who produce the waste, which includes the learners and general public. Furthermore, the learners 'role in control the solid waste particularly in the use of paper is also a prominent issue. It was a fact and stil is

that recycling and reusing behaviour has become a routine or habit with recognised awareness of ecology and recycling. This includes high involvement and participation of learners themselves in ensuring that recycling is practice in daily basis (Zahari, 2015).

Nel studied international and specific recycling attitudes and chances for recycling as predictors of recycling behaviour (Nel, 2017). The study found that recyclers' behaviour was motivated more by concern about the increasing consumptions of natural resources than by financial incentives or other rewards (Nel, 2017). However, non-recyclers' attitudes towards recycling were also favourable. Both those who recycle and those who doesn't understood the benefits of recycling and agreed that every household contributed to the problem of solid waste that are piling up on landfills. Based on these outome, Vining and Ebreo, (2006) suggest that emphasising individual contributions to recycling programs might be a succesful way to increase the desired behaviours and attitudes towards recycling. Other researchers have tried to identify differences between recyclers and non-recyclers. Some of the variables studied include income, education, gender, knowledge, motivation and attitude differences. One study found that the process was more important than the actual characteristics of the recycling program or the participants and roleplayers (Nel, 2017).

Establishments of recycling programs that includes education about the surroundings was definitely the begining to save the world from the gruesome effect like landslide-due to trees cutting-save money as well as avoid open burning for paper disposal. The paper recovery rates hover only around 60% which shows well that ten sets of newspaper were manufactured, only six sets were managed to be recycled (Nel, 2017). Accept being one of the largest energy consumers in the world, pulp and paper industry is also a major manufacture of greenhouse gases and pollutions. Apart from recycling Initiatives like reusing the paper as well as double-sided printing of paper must be practiced among people especially learners. The idea was executed by a group of learners who strive to make a difference in their school premises they generally started the Double-Sided Printing Initiative or UTBEAT's paper conservation project. As of October 2009, the Double-Sided Printing Initiative has succeeded in getting over 80 instructors to demand or require double-sided assignments, while UTBEAT succeeded in encouranging one of the largest

courses on campus to adopt a few conservation strategies that snowballed into 11 000 sheets a year saved (Raj, 2013).

practices and efficient moneytory were structured to serve as motivation and to encourage people to recycle and reuse their paper. Changing from textbook to e-book was also one of the ways to reduce the paper usage particularly by learners. Recycling assignment paper and project papers, reusing papers were steps taken towards paperless lesson in order to make a more environmental friendly learning condition. It should be noted that the present adoption process does not require too much effort. This implies that people, specifically young people need to understand the results should the practices are still treated as trivial. Wilson, in his study found that there were no fundamental differences between learners and the cmmunity in their attitudes about recycling or in their motivation to participate (Wilson et al 2013). However, the two groups differed significantly on the degree to which they required additional knowledge about recycling, with community indicating a lack of information on how to carry out the recycling activities. The responses to his survey suggest that recycling was viewed in a positive way by both groups.

Results indicates that there was little room for improvement in attitudes about recycling, suggested that projects should concentrate on teaching their target group in how to recycle, and address barriers that keep learners and the general public from taking part in recycling programs (Wilson D.C et al 2013). Wilson also found that lack of knowledge about how to recycle created a barrier to recycling behaviour, even among respondents with a strong conservation ethic. He found that awareness about environmental issues in general, or awareness about recycling specifically, is a significant predictor of recycling behaviour. Educational programs assume that once individuals have the appropriate information, their attitudes and behaviour change in a logical manner. Research by social psychologists has outlined a number reasons why recycling attitudes may or may not correspond to behaviour. other reason may be that convenience was considered to be more highly than environmental concerns. While other studies have indicated

that when recycling bins were nearby, clearly indicates, and easy to use, learners and the public more likely to recycle (Lopeman, 2013, Kurougul et al., 2015).

Kurougul study found that adding additional recycling bins definitely increased recycling but lack of information of location of recycling bins, and the attitude that sorting and storing recyclable materials need a lot of effort were factors prevent learners and the public from recycling (Kurougul et al., 2015). Robertson and Wallington (2013), in response to the reducing landfill space in many places in Europe and changing landfill capacity in the United Kingdom in particular, set out to evaluate the recycling attitudes of the transient learners populace in Oxford England (Robertson & wallington, 2013). They point out that much of the recycling attitudes research was centred on same populations and largely ignores the colleges and university demographic. "As a large but temporary group, who contribute more in populace in terms of urban areas. They states that recycling attitudes and behaviors of leaners need to be examined further in order to understand how to increase the success of recycling and waste reduction schemes" (Robertson & Wallington, 2013).

An investigation of the populace of Oxford indicates that students at the university make up to 40% of the total. The researchers reported that average household recycling rate in England is 28% and the average rate in Oxford was much lower at 21%. The main objective of their study was to "outline the reported levels of recycling and waste reduction for this population," meaning the temporary student population (Robertson & Wallington, 2013). The researchers developed an online survey questionnaire that was distributed to all student studying at Oxford's two universities. The survey questionnaire link along with a brief explanation of the aim was emailed to the entire students within a period of 2 weeks for responses. The response rate was 4,5% which the researchers call it very poor and attribute to a lack of interest in the populace. This low response rate did represent a quite number of students and, to date this "study was the largest known student survey questionnaire on this issue" (Robertson & Wallington, 2013).

The overall statistical analysis of Robertson's results, set out to determine the extent situational, demographic and psychological factors impacted the reported level of recycling and the desire to reduce solid waste (Robertson & Wallington, 2013). Their findings shows an improved willingness to minimise waste production by females; there was no significant difference in willingness to reducing and recycling rate across education level (undergraduate and postgraduates). The study also shows that the students who reported higher recycling levels tend to be the ones that have much desire to minimise the waste they produced (Robertson & Wallington, 2013). In another study they also investigates the living situations of academic students (halls of residence, shared houses and private/rental residences) and recycling levels. The academic students who stay in private or rental residences had reported recycling rates in high levels. The students who satyed in rental residents state that this was likely related to the easy accessibility of recycling bins and waste reduction programs off campus. contextual factors such as living arrangement, availiability of recycling bins, and knowledge of the social norm to recycle were the influential factors on recycling attitudes for this populace (Robertson & Wallington, 2013).

Robertson recommended to further studies of the temporary student population as a useful means of maximising recycling levels. The data gathered by this studies were "significant for local leaders that were willing to implement recycling programs and run eduactional campaigns for waste reduction as they provide knowledge on appropriate motivators that can guide to greater involvement" (Robertson & Wallington, 2013). Some studies suggested that recycling researchers need to place their focus on attitudes towards recycling and the role players in recycling (Zahari, 2015). The research focuses on a numerous generalised views. The general public tend to stop participating in tasks that were not inherently rewarding or interesting unless there was some other reason to continue with the activity, and that the idea grasped true willingness to recycle. If recycling activities, are made more interesting and enjoyable, individuals will take part in recycling. for people to recycle on a regular basis they must have positive recycling attitudes , understand the benefits of recycling and they must have positive phenomenal experiences

associated with recycling, whether these occured during the intervention or during their recycling intervention(Zahari, 2015).

It is only when the general public think recycling has a positive gain that thye will participate and continue to dao so. individuals who have other reasons to continue with the recycling activities may or may not then psychologically change activities to make them hold positive experience (Rada et al., 2016). Social pressures were a contributing factor that has influence on continuinued recycling attitudes. Another study that was carried out of 500 house holds in a neighbourhood in Salt Lake City, Utaho examine recycling attitudes (Rada et al., 2016). The neighbourhood had good of recycling attitudes prior to the institution of a no cost recycling projects. The researchers aimed evaluate several methods for improving the recycling rate. To achieve this aim, the researchers utilises a series of survey, in two separated years. The research was hindere by the closing of the business that cotributed the no cost recycling service. They were determined to utilises demographic variables as they investigates that there was no significant association with recycling attitudes. However, examinig the fact that people can make interesting or fun activities in recycling,"80% of the people who participated in the study responded poor; indicating to the researchers that recycling was needed toomuch effort and was boring and unpleasant (Rada et al., 2016). Respondents also indicated that participating in recycling was too required a lot of time ; was a mess and there was not enough space for recycling bin and lack of knowledge was also a problem (Rada et al., 2016).

A study on Knowledge and Attitude of Students towards the recycling was done. The researcher states that "environmentally aware, recycling and empowered youths are potentially the greatest agent of change for the long term protection and stewardship of the environment" (Aminrad, et al., 2013). Thus, environmental education which promotes such change will enable these youths to have a greater voice on environmental issue if effectively implemented in Nigeria. Hence, this study was conducted to assess students' level of knowledge and attitude towards the recycling. The survey was conducted on 130 respondents who were full time students of

environmental education in a federal university in Edo state, Nigeria. The result revealed that high level of knowledge and positive attitude towards recycling among the students was not good. Also it was observed that the relationship between their knowledge and attitude towards recycling is a negative, little or no relationship. Therefore, it was concluded that environmental literate students especially in tertiary institutions are being nurtured to foster environmental education (EE) in Nigeria.

Thus, the researchers recommend that more needs to be done to promote and encourage EE at all levels in the country especially by the government and its agency to ensure effective implementation; nongovernmental organisations and international bodies all have a role to play in the country sustainable development goals. This is in line with the study that was done in Malaysia (Aminrad et al., 2013). They reported a weak relationship between knowledge and attitude towards recycling in environmental education among students in Malaysia. In this present study, the little or no relationship observed reveals that the knowledge possessed by the students does not influence their attitude towards the environment. The research conclusion was Environmental Education as a course of study need to be integrated in Nigerian school system especially the higher education, although more needs to be done to sustain the trend. The study revealed that environmental education students in the University of Benin have showed low level of knowledge towards recycling and also on the contents, goals and objectives of environmental education (EE) in Nigeria (Karin, 2017). They also possess a positive attitude towards the natural environment. Thus, this positive attitude and high level of knowledge reveals that the human and material resources in the institution of study have a great impact on the students. Meanwhile there was little or no relationship between their knowledge and their attitude towards recycling (Karin, 2017). Hence this study reveals that environmental literate students are being nurtured to foster environmental education in the country, although more needs to be done to encourage the students and promote the course of study in the country (Karin, 2017). The following recommendations are proposed by the researcher based on the findings from this study. The researcher proposed that the should be an effective cooperation between international, national and local organisation dealing with recycling promotion with the

various departments offering environmental education as a course of study in higher institutions in Nigeria (Karin, 2017).

He also recommends that there should be maximise awareness raising avenues on topics that involves recycling topics towards the learners and the general public , recycling related contents should be introduced into the General education and traaining curriculum and in tertiary institutions in the country (Karin, 2017). Research grants and scholarship opportunities should be provided for lecturers and students of environmental education in the country and that there should be full and effective implementation of environmental education into schools system nation wide, because well-organised waste control was an necesary part of sustainable development (Karin, 2017). The conservation of natural resources and energy was everybody's concern and environmental education was vital to guarantee a sustainable lifestyle in the distinct future. In a study to find out what similarities and differences in views regarding waste control exist between grammar school students and comprehensive school students in britain,survey questionnaires were designed and distributed in the two schools in the same british city (Karin, 2017). The survey questionnaires purpose was to measure and develop students' knowledge, attitudes and behaviour regarding waste contol especially in recycling.

The results indicated that students from the grammar school had much greater levels of knowledge, and were more likely to recycle and utilise more sources of information regarding waste control. Waste management was considered important and by almost all pupils. However, learners in the two schools considered composting and waste management as less important than recycling and thereby did not fully agree with sustainable waste management (Karin, 2017). Sustainable development is an important aim and needs to be strengthened. In the area of waste management, everybody can help to achieve a more sustainable future by producing as little waste as possible and by helping to recycle and compost as much waste as possible. schools in particular can help to achieve this aim. Until now, it has not been analysed in how far grammar school students differ from comprehensive school students in their knowledge, attitudes and behaviour in respect to waste management (Karin, 2017). Questionnaires were designed and

distributed in a grammar and a comprehensive school in the same city of eastern England to find out what similarities and differences exist between the two student populations. It was of importance to find out what teachers in different school types can do to further promote sustainable development in the distance future.

The research objectives of the study was therefore to point out current weaknesses in the area of knowledge, attitudes and behaviour regarding waste control in a comprehensive and a grammar school. While appropriate waste control was a vast area and education on waste control cannot cover the entire potential aspects of this area, educators should be knowledgeable that some field of waste control and some waste reduction options need attention of some sort. The basis for the analysis was the waste hierarchy as was stipulated in the European united (EU) waste framework guideline. Waste reduction was seen as more powerful than waste re-use, re-use was seen as powerful than recycling and composting, which was also seen as more powerful than incineration with energy recovery. Landfill was seen as the worst option for control of waste (Karin, 2017).

To explore similarities and differences between learners from a grammar and a comprehensive school in respect to knowledge, attitudes and behaviour regarding garbage control a study was conducted utilising an explorative approach. In the same year, survey questionnaires were designed and piloted in different schools in britain. educators in the selected schools where respondents were studying were given the survey questionnaire was tested and they were addressed well on how the questionnaire shoul be administered by the learners. educatrs cross-checked that the language was suitable for the learners in terms of thir grades and the also check that selected content of the survey questionnaire match the level of the learners in terms of the grade or the phase the learners were in and they were asked whether they considered the questions to be appropriate for the school type and the age of the questioned learners. After piloting the survey questionnaire, a range of questions were said to be inappropriate were rephrased or changed completely to take into account the level of knowledge of the learners. In general, learners over the age of 12 understood the survey questionnires very well there was no

need to clarify the questionsthat were in the survey questionnaire (Karin, 2017). But that was completely different for the younger learners, they often had problems with some of the questions they neede their educators to explain what was required of to some of the questions. After the survey questionnaire was approved, the survey questionnaire was then distributed in both schools in the same town in britain. The town was in the east of England and has a population of over 99 000 of people (Karin, 2017).

Recycling and composting can reduce waste efficiently away from landfills. In the case of compostable materials, this was very much importance because organic fractions direct to the release of methane when put on landfill sites and exacerbates global warming. Learners, perception were different because when they were surveyed, they clearly favoured recycling over composting, which perhaps show a shortage of information concerning the recyclables that are piling up on landfill sites. Moreover learners' attitudes in terms of landfill, the entire groups in both grammar and comprehensive school learners were equally likely to dislike the technique for environmental reasons. The entire groups from both schools said waste should be minimised takin into consideration environmental or social reasons; this was in line with the garbage hierarchy. litering was overall regarded skeptically by the many of the learners. Grammar school learners were more likely to indicate that they dislike subject technology or to incorporate it to factors such as energy recovery, filtration technologies or the limitation to materials which cannot (easily) be recycled (Karin, 2017).

Learners from the comprehensive school have no idea what incineration was. Results shows that there was a need for more detailed information to be instilled in comprehensive schools concerning incineration and technology. In general, learners should be knowledgeable about the fact that incineration was currently utilised and that it could assist to minimise landfill in numbers (Karin, 2017). However, learners should also be knowledgeable about the different ways of waste reduction and also that they are more sustainable compared with incenineration (Karin, 2017). The results also reveals that learners need to know the advantages and disadvantages of incineration so that they will be able to judge the technology realistically. Over 49% of the

comprehensive school learners and around 37% of the grammar school learners seem to lack this information. Regarding recycling behaviour, grammar school learners highly performed their roleplayers from comprehensive school. The entire groups were recycle paper, glass and cans whenever possible (Karin, 2017).

This was not known whether this was a result of higher rate of knowledge were not clear. Recycling at home, attitudes and values indicates to play huge role, as has been display by many scholars (Best & Mayerl, 2013; Edgerton, McKechnie, & Dunleavy, 2009; Kaciak & Kushner, 2009). Grammar school learners had higher rates of awareness and indicates more environmentally friendly attitude when compared to comprehensive school learners. Therefore it can be said that the learners were concerned about the environment and also indicates to be better educated about waste management (Karin, 2017). The fact that they were better educated about the topic of waste reduction can guide them to them recycling more often. Comprehensive school learners attes that they never heard about some the other ways of waste management and the choices availiable and that they were not awre what was the meaning of some of the concepts (Karin, 2017). The fact that the learners are not aware of some concepts needs to be addressed well at school level simple because only knowledgeable students can choose the correct ways to control solid waste. It was concluded by assuming that comprehensive school learners received obtained their knowledge from different sources such as their family, friends, television or the Internet (Karin, 2017).

A quantitative investigation on recycling attitudes of gifted/ talented students was done in Turkey (Ugulu, 2015). For his study, He developed a recycling project to solve the uncontrolled industrialisation process, and the trend towards consumer society that have resulted in an enormous amount of waste materials. For this result, the purpose of the recycling project that has been developed was to solve this problem and reduce waste materials, recycle discarded materials and save energy, money and time. In this perspective, the purpose of the study was to examine the recycling attitude levels of gifted/ talented learners. Also, gifted/talented students' recycling attitude levels was compared according to some independent variables, such as age,

gender and grade (Ugulu, 2015). The analysis results showed that gifted and talented students had fairly well recycling attitude level and there were no significant difference between gifted and talented students in terms of gender, age and class (Ugulu, 2015).

The Study on the subject showed that the attitudes of the students have an impact on their individual behaviours, determinations for decision-making processes and preferences about the related issues (Ugulu, 2015). The determination of the attitudes of the individuals of superior intelligence and gifted individuals towards recycling and the variables having an impact on such attitudes was of great importance to ensure active participation of such individuals in the resolution of environmental issues, by means of providing an environmental and recycling education for them. Within this scope, average scores of the individuals of superior intelligence and gifted individuals obtained from the RAS showed that all the student were exited and they were enjoying the participation in the project (Ugulu, 2015).

To compensate for the lack of knowledge, institutions need to put more emphasis on recyling related content and concepts (Ugulu, 2015). currently, only 49% of the learners said they obtained the knowledge about solid waste management in school. education in comprehensive school clearly need to maximise high level of knowledge to learners by indicating the benefits, needs and offer the diferent way of waste management in all levels. Furthermore knowledge alone is not enough for perceptionto change,but was necessary precondition. The large number of learners who knew nothing about incineration should be informed about it simple because this it will lead to high number of young adults that were not knowledgeable aout the possible gains and setbacks of incineration technologies (Ugulu, 2015). Therefore learners were prone to manipulation by pressure. In places where incineration plants were utilised, made and also have much opposition, it was important that learners become aware of these possibilities (as well as the limitations of incineration) and that they can reflect rationally in technology (Karin, 2017).

Education could assist to reduce these shortcomings by supplying necessary knowledge on waste management coice. While this might or might not necessarily improve recycling at schools,

perhaaps it could help increase attitude to maximise the desire to assess each and every individuals behaviour more thoroughly (Ugulu, 2015). If people were aware about waste management options, such as composting, curbside collection services and recycling, they gladly participate in, and make the correct decision among these choices. The results obtained when analising the questionnaire also illustrated that the differences between grammar and comprehensive school were primarily one of intensity, not of general attitude. Recycling was considered to be very essentiall by most learner from both schools. The entire learners e thought that garbage could be minimised and all of them state that they recycled sometimes. In fact, these results clearly positive illustrated that the basis on which a further enhancement of environmental factors associated with waste management were possible (Ugulu, 2015). Although some studies shows that waste reduction could be rated as the most important waste management approach (Karin, 2017).

Oregon State University conducted a study on college student attitudes towards recycling. Larsen developed a Likert-type scale to quantify student attitudes towards recycling on approximately a total number of 500 students (Larsen, 2013). The study was conducted in five levels. level 1 was administered to 40 male and 60 female students and likert scale consisted of 81 likert type questions, 50 of these were positive in nature and 31 were negative (Larsen, 2013). level 2 focused on perceptions about transportation of solid waste and “pro-environmental paradigms” (Larsen, 2001). This level utilise the 20-material Attitudes towards Recycling (ATR) Scale, and the 12-material Pro Environmental Scale developed by Dunlap and Van Liere in 1978, as well as 50 questions about the attitudes of students about solid waste transportation (Larsen, 2001). level 2 was administered to 35 male and 65 female students. level 3 assessed recycling attitudes and attitudes about the saving of river salmon (Larsen, 2001).

The questionnaire was administered by 40 male and 40 female students. level 4 once again assessed recycling attitudes but put more emphasise on attitudes towards prisoner rights, and was administered by 20 male and 60 female students. leval 5 combined attitudes about birth management with recycling attitudes, and was administered 38 male and 43 female students.

He concludes that the ATR scale indicated correlations to with other scales quantifying environmental issues. Respondents favouring recycling tend to be against the transportation of solid waste and grasped other attitudes. The relationship between positive attitudes toward recycling, political participation, and prisoner' rights suggested that there was a link between positive recycling attitudes, personal responsibility, and broader social concern" (Larsen, 2013). Another study was conducted, and it was an experiment to assess the relationship between strength of recycling attitudes and perceived social control (Ragazzi, 2016). The study focused on the recycling of soda cans. A total number of 200 students Ghent University in Belgium participated in the study. Students were provided with soda and asked to administer a survey questionnaire about attitudes towards recycling. after that the students were asked to read a text on recycling perceptions and after they have finished the reading of the text they were asked to complete another survey questionnaire which have questions indicating "their perceived rate of management to engage in recycling attitudes" (Ragazzi, 2016).

The students were given incentives, and on their way out were told to deposit their soda can in the recycling bins provided with no peers around. The cans were marked to match participants survey. Approximately 45% of the respondents deposited their can in the ordinary trash bin while 55% utilised the recycling bin (Ragazzi, 2016). According to this studies social pressure and strength of attitude do influence attitude-behaviour consistency. The students who felt higher social pressure tended to act more on their positive attitudes related to recycling. In addition, students who felt more in control of their choice to recycle or not recycled more when they had stronger attitudes towards recycling. Overall the results of this study point to strong attitudes as a good indicator of behaviour.

A study conducted a study to examine the recycling attitudes of African American College Students by using the 15-item New Ecological Paradigm (NEP) Scale (Shem, 2017). In addition, Shem attempted to determine everyday behaviours such as recycling. The study was conducted to address the perceived gap in research examining recycling behaviours and attitudes of minorities in the United States (Shem, 2017). The study focused on African American college

students because this group has a high likelihood of becoming community leaders and opinion shapers. The study looked at 292 African American students in Houston, Texas. The survey included a demographic section that included; “age, gender, major, martial and employment status and current residential type” (Shem, 2017). Past research indicated that these demographic variables are important when looking at recycling attitudes. Part two of the survey was focused on the 15-item NEP scale. Each of the items was measured on a five point Likert-type scale with a range of 1 (strongly agree) to 5 (strongly disagree Student conservation behaviours were also measured using six items: “electricity conservation, water conservation, use of public transportation, decreased use of paper towels, use of high-efficiency laundry detergents, and carpooling” (Shem, 2017).

The study shows that in general these students “took a modest degree of recycling attitudes” (Shem, 2017). The students surveyed purpose was to never and rarely recycle any of the commodities examined; however the conservation related behaviours tended to show significant pro conservation behaviours (Shem, M., 2017). The authors of this study set out to collect quantitative and qualitative data to show how attitudes can impact recycling by utilising the survey format surveyed residents in Exeter, Devon, in the United Kingdom. Only 11% of waste produced in Great Britain was recycled, which was not even close to the rates of diversion required by the European Union Landfill Directive (EULD). The study was lead by three adding factor fields: recycling factors, situational factors, and psychological variables. With regards to recycling factors, “the individuals who hold more values (an intrinsic value of environment) tend to be more environmentally conscious” and recycle more (Barr et al., 2015). The situational factors considered by the researchers include: access to services, age, gender, education income, as well as knowledge of the environment in general (Barr et al., 2015).

The psychological variables that were taken into account involve: ones intrinsic motivation, peer pressure, individual perception of environmental threat, and they believe that their actions could make a difference (Barr et al., 2015). The Exeter survey involved 800 randomly selected household resisdents in the fall 2000. The survey was delivered door to door and left with the

respondent for 1 to three days then collected. Out of the 800 households residents chosen, 671 completed the surveys for a 62% response rate. Useful qualitative data was collected from the back page of 40% of the completed surveys. Results of the study shows that “recycling coud be characterized as a well-defined behavior, structured around a local understating of recycling services, access to a curbside collection, a positive perception of the convenience of recycling and an awareness and acceptance of recycling as normative behavior” (Barr et al., 2015).By understanding this attitudes policy-makers can develop a more focused and detailed recycling policy and be informedon what to incooperate regarding the curriculum.

Roma and Shah, (2013) carried out a study of recycling attitudes and perception of high school learners in San Rafael de Heredia, Costa Rica. The high school that was selected for this research study was Carlos Pascua Zůñiga High School which at the time of the study was being considered for inclusion in a larger ecology conservation program in Costa Rica. San Rafael has a small number of communities in Costa Rica with an established recycling program (Roma & Shah, 2013). The purpose of this project was “to examine recycling attitudes and perceeptions of the learners and to develop a guide that will assist educators in upgrading their their science curriculum (Roma & Shah, 2013). In order to achieve this aim the researchers set out to examine the present state of the recycling project, assessing the interests of learners and their choice methods of studying, identify learners perceptions and attitudes, and aexamine their existing knowledge of the benefits of recycling.

The researchers carried out 30 learners interviews and 10 faculty interviews as well as collecting knowledge from 95 completed surveys. The findings of the project were put into the following three categories: learners attitudes and perceptions, administration objectives, and administration challenges (Roma & Shah, 2013). In analyzing the results of the study the authors found “four factors that played a huge role in the learners’ overall attitude on recycling (Roma & Shah, 2013). Learners aware of the results of not recycling. learners perceive that they were not valued and respected by community members. Learners do not hold a personal obligation to act on the results of not recycling. Learners apathetic attitudes towards recycling rise from the fact

that they do not recycle at home. The authors recommend that the resources available should be maximised for the gathering and promotion of recycling in the school. In addition, they developed a guide for educators which sets out to encourage a sense of ownership for the learners to get involved even more. The researcher hopeful believes that an improvrment in recycling participation will happen if these concepts were integrated into curricular activities.

Some studies suggest that modification to educator education needs to be built to involved stress emphasis on recycling equally across all disciplines. It was also suggested that the experiences of in service educator needs to be more widely shared with learners educators (Criner & Blackmer, 2013). Attitudes and knowledge were to be quantify in close temporal proximity: the longer the time interval between the measurement of attitude and the measurement of knowledge, the greater the probability that the attitude could change for some reason. learners attitudes affect individual's personal behaviour, particularly their options of action, and persistence to contribute more decisions. For example, in schools, learners who have high scientific literacy tend to opt more relavant decisions and seem to be more knowledgeable than other groups of learners (Ugulu, I., 2016). In this direction, a direct relationship between education and recycling attitudes and knowledge, while intuitively appealing, was far from clearly established. In this direction, this study, prepared for this purpose, reports on the development and validation of a multidimensional instrument to quantify high school learners' environmental attitudes (Ugulu, 2016).

It was then believed that the development of this instrument will give a missing connections in the study of recycling attitudes and will promote research studies with a more comprehensive perspective. For example, generally secondary school learners knew about recycling and its importance and benefits but unfortunately, the rate of recycling practice was still low (Yakob et al. 2013) describing that the density of existing content and educators was more focused on learner's practices were the reasons for this problem. Researchers state that the importance of recycling was not emphasised and therefore, learners do not grasped then really reason the demand to take partin the sustainable lifestyle. learners consindered recycling related content

as just another topic to study without realising the need to part in recycling project in their daily routine. A study reported that there was an increasing loss in ability in taking action especially among teenagers concerning an individual's ability to make positive change (Ahmad, et al. 2013) reported that the recycling participation among secondary schools learners in Penang was still very low due to shortages of recycling bins and awareness programs.

A study investigating the recycling attitudes and behaviors of high learners reported that four factors played a huge role in the learner's overall attitude on recycling attitudes (Ahmad et al., 2012). The first was the awareness on the consequences of recycling, second was the sense of ownership and place in their community, third was personal obligation to act, and the final factor was social influences on the learners. learners were willing to involved in recycling when they were more aware of environmental issues (Ahmad et al., 2013). Furthermore, the participation rate in recycling will improve if the learners could feel that he or she was really part of the community and their actions would give to the community. He also state that an person must believe that that he or she can make a difference by putting more effort on recycling in order to be able improve the recycling practice (Ahmad et al., 2013).

This means that learners will be motivated to recycle if they knew that their actions contribute to the community and were valued and respected. Other than that, learners were easily discouraged from being involved when inconvenience experienced as they do not have a strong personal obligation to recycle. The general public did not recycle was also contributed to the apathetic attitude towards recycling among secondary school learners (Ahmad et al., 2013). The attitude and behavior of secondary school learner was vital impoartant toward recycling was vital important as they will have a direct effect on near future of community. Therefore, cooperation and efforts from all parties including schools, government, societies and business entities were needed to stretch the attempt in increasing the recycling knowledge and involments among secondary school learners (Ahmad et al., 2013).

He also states that there were three fundamental components of attitudes; the evaluative component, refer to a matter of liking or disliking of any particular indidual, item or event (what might be called the attitude object), the cognitive component, refer to perceptions on attitude object, whether they were true or false, and the behavioral component, refer to predisposition to act in a way that relavant with our perceptions and feelings about an attitude object (Ahmad et al., 2013). The study reveals that attitudes were the evaluative dimension, thus, change happened in perceptions about certain terms and may cause change in attitude toward the content and concepts (Ahmad et al., 2013). Many studies have indicated attitudes as one of the major determinants of recycling; influences on attitude relationships in recycling; attitudes influencing households‟ involvement in recycling (Ahmad et al., 2013). There was a strong connection between pro recycling attitudes and recycling behavior (Prestin & Pearce, 2014).

A study reveals that households who did not take part in recycling may or may not contribute to apathetic attitude toward recycling among teenagers (Busteed et al., 2009). The findings may or may not describe the claim from learners that they were not really interested in recycling because their families did not take part in recycling and that was a sluggish attitude towards the recycling practice (Busteed et al., 2009). Recycling projects were basically held to distribute the knowledge of recycling and improve further the understanding about it. Studies reported that knowledge of how, where, what to recycle as well as the benefits of recycling correlated with individuals participation (Kaplowitz et al., 2014). This show that general knowledge of recycling is very important in stimulating participation and it is reported to influence attitudes and motivate recycling (Kaplowitz et al., 20014). Except that, to perform certain attitude, in particular to recycle, people required considerable measure of efforts and availability.

These factors have been a major obstacle for those who has the intention to recycle but have no desire to put extra effort to do these practices. However,if people who do really recycle, it should be one of the attitude with a high potential of becoming habitual as recycling was a highly repetitive behavior (Altanlar, 2013). Their indifference towards the actual act of recycling and reusing materials was a stark contrast of their perception in the importance of preserving

conserving of the earth natural resources. High number of the participants in the study did not embrace the right attitude towards conserving used materials in their daily life as learners. Results From the analysis conducted, shows that yuong generally did not consume reused paper-based materials in their daily life. 80% of the respondents admitted to reusing their seniors" notes or textbooks. This may due to their willingness to save money for the buying of new books. However 50% did not utilise recycled papers for writing or printing. 55% of the populace was also did participate in joining book expositions (expo) to either purchase and sell their old books (Altanlar, 2013).

A huge number of the participants approximately 60% also did not use back their books or materials that stiil had some blanks left in them. The reason may be due to their refusal to combine different subject matters in the same single old book. A whopping 650% of the participants agreed that they did not throw off their used books and other materials after using them. This act may or may not be attributed to their willingness to save them for future references. On the recycling paper acticities, the learners too fared equally distressingly. A huge number of respondents agreed that it was not their habit to recycle paper-based materials. 70% of the learners were lazy recycled papers to the recycling center. 40% did not take part in any recycling programs organised by the university. 79% of the participants were not even aware of the availability of the recycling facilities in the campus. 60% of the respondents admitted to not recycling their books and textbook and magazines after utilising them. The habit may be or not attributed to their practice of keeping the materials for future use. On the contrary, when asked whether they were knowledgeable of the possibility that the greenhouse effects might be the results of paper wastage, 70% of the respondents agreed they were aware of these fact (Altanlar,2013).

These findings were aligned with the study reported which stated that only 69% from the total number of 16,000 respondents participated in recycling. However, the findings of this study also does not support a study that indicated that recycling and reusing behavior has become a routine and habit with recognised knowledge of ecology and recycling. This was because the participants

attitude in our study did not echo the attitude of the respondents in that particular research. Moreover, the indifferent attitude indicated by the participants in the study, suggested to increase the solid waste management services put forth will not be an easy feat (Rodgers , 2005). The cause of this indifferent attitude cannot be directly attributed to their ignorance as the result of their beliefs revealed otherwise (Mutlu, 2013).

2.5 Understanding of Scientific Knowledge of Recycling

Education is known to be one of the most commonly suggested strategies to increase recycling activities, working by changing awareness and attitudes (Adeolu, 2014). He emphasizes that higher recycling knowledge and positive attitudes can help understand the science behind recycling and impact of not recycling. They give an hatexplanationt a study in which respondents were allowed to experience outdoor educational programs, in order to maximise their understanding of energy saving ways. After the completion of the project, respondents revealed a greater understanding of issues involving energy usage; however, there was a lack of behavior change accompanying the shift in attitudes and awareness. As they describe, there are a variety of barriers that can deter individuals from participating in recycling activities, and lack of knowledge, understanding and pro-recycling (Adeolu et al., 2014).

According their results from the study the diversity of challenges which exist for any sustainable practice means that information project alone would not be able to bring about good understanding. Further more to the limitations of recycling in education were the reason for the different challenges that have maximised the difficulty of implementing awareness and understanding on a huge scale in schools. Ham and Sewing have identified four groups of challenges that minimise the effectiveness of recycling projects: conceptual, logistical, educational, and attitudinal (Ham & Sewing, 2013). According to them, conceptual barriers arise from the shortage of consensus about the explanation ot concept of recycling. As mentioned earlier, negative consequences of consumption and the resolving waste are manifold. The

individuals as well as the economy is taking harm through waste carried to landfills or incinerators instead of closing the loop and treating “waste” as a valuable resource. While the ideal option, consume less, is hard to combine with the current economic model first steps are taken towards a circular economy (Adeolu et al., 2014).

Essential for a circular economy is to reuse products by recycling them. The authorities need to provide a framework for member states to become active and transform our economy towards a circular model but in the end it is the people who need to change their views and make recycling part of their daily life. That is why this study seeks to answer which factors influence students’ recycling understanding with the aim to make recommendations to policy makers. In order to bring change one needs to analyses what to change i.e. what is the problem and in this case, what factors determine if students recycle or not? As Fishbein states “the more one knows about the factors that underlie the performance (or nonperformance) of any given action, the more likely it is that one can design a successful intervention to change or reinforce that action.” (Fishbein, 2008, p.834 cited in Adeolu et al., 2014). A study found out that understanding the concept of recycling views were major challenge to recycling activities among college learners (Kaplowitz et al., 2014).

The results of the study also reported that learners did not recycle because they did not understand why it is important that they should recycle, what are the effects of recycling, how do recycling help save natural resources and why natural resources needs to be saved (Kaplowitz, 2014). The finding was in line with study that was conducted by Omran (2008), the states that the participants asked what was the main reason recycling was interesting. It seems that learners were discouraged to recycle due to lack of understanding the scientific knowledge of recycling and they also felt that recycling was time consuming and that needs a lot of effort and it also consume space in recycling centres. An upgrade of the recycling facilities and their location as well as making recycling convenient could not increase the motivation to recycling if learners do not believed that a good recycling program would help save natural resources for future generations (Kaplowitz et al., 2014).

The indicated that if more recycling information was available recycling was going to easier and more relavant, and in turn recycling activities will improved. In addition, this was the evidence that recycling and education among the college learners may increase after being educated (Kaplowitz et al., 2014). More focus was needed in this matter because negative situational factors may deter recycling understanding. In order to make recycling a routine, supportive facilities must be developed. In case of significance of these factors, situational factors was included as one of the variable tested as determinant of recycling understanding in this study. Knowledge and perception held with much of the same conceptual mind, plus they were often related to each other in literature (Kaplowitz et al., 2014). Some researchers on epistemology argued about when and how perception were justified to qualify as knowledge. Studies showed that scientific knowledge of recycling usually developed when learners become and also when they reach high school. when they become teenagers the stage enable them to make well-defined perceptions about environmental matters including recycling (Prestin & Pearce, 2010 cited in Kaplowitz et al., 2014).

Assumed to be known by many, learners obtained a basic understanding of the expaltion of recycling concepts and the rewards of this act as early they were six years old and majority of high school learners knowledgeably aware of the consequences of not recycling (Busteed et al., 2009). However, many learners cannot describe the link between the rewards in recycling and the results of not recycling to the science education (Prestin & Pearce, 2010). Young learners were incapable to see the bigger picture of the situation, perhaps in their mind, little amount of waste they litter they thought that it was not going to make a huge bad difference global (Busteed et al., 2009). Learners appeared really not to comprehend the messages of recycling. Education was and still is the key factor for teenegers to assist them to see the big picture. There was a need for a new paradigm in teenagers to make them understand that recycling was not just a matter of right or wrong and not only to make the world cleaner and beautiful, but it was more of global commitment, a civic obligation that everyone should take part in to make recycling more effective.

Students need to understand the damage caused to the ecosystem will continue in this way if they don't take actions and recycle, concern is also on the rise for future generations that there could be inability to sustain their life in a healthy and balanced environment. If the results of unhealthy, poor conditions and disasters created by environmental issues are not understood well, there will be no solutions tried to be developed for these issues from global to local scale. However, not only international agreements, technological innovations, regulations or local solutions but it is recognised that all individuals can play an important role in the solution of scientific issues and experienced natural disasters. Therefore, educating students about recycling in science can help in getting rid of issues and disasters; First, studies intended for changing the attitudes and perceptions of individuals about global issues and disasters increased (Kaplowitz et al., 2014).

The importance of effective and life-long ongoing education about recycling needs to be acknowledged (Kahyaoglu & Ozgen, 2013), as a result of this; school courses related to recycling and ecology must be included in all stages of schooling system grades from preschool education, primary school, secondary school and high school to higher education level. In Turkey, such issues and research related on sensitivity of students who get this education increased especially since the second half of the 2000's. With the researches which examines students' level of interest, attitudes, sensitivity and understanding of scientific knowledge of recycling; approaches of students in primary school (Degirmenci, 2013; Karatas, Aslan, 2012; Atasoy, Erturk, 2008), secondary (Uzun & Saglam, 2007), high school (Kaya, Akilli, Sezek, 2010; Aydin, & Kaya, 2010) and higher education (Oguz, Cakici, & Kavas, 2011; Sadik & Cakan, 2010; Ozmen, Cetinkaya, & Nehir, 2005) tried to be determined. Researchers state that students' attitudes, perception and approaches in recycling on the one hand and on the other hand these researches provide examining the results of the changes made on education programs at different level of education (Kahyaoglu & Ozgen, 2013).

Consequently, questions relating to why humans behave in a certain way require knowledge about understanding (Rada, 2016). While various studies discuss recycling and ultimately recycling knowledge the term “recycling understanding” is receiving less attention. In order to define recycling understanding we look at Stern's article about student willingness to recycling (Stern, 2013). Stern defines a desire to recycle primarily as acts that change or alter resources from the environment or that impact the “dynamics of the ecosystem” in general (Stern, 2013). learners need to understand that, incineration of thegarbage produced minimise the massive of trash but generates air and water pollution and toxic ash in the process. Inert toxic items in plastics were freed under the high temperatures where they can be leached from the ash into the groundwater after the ash had been buried in a particular dangerous waste landfill. Incinerators produces and release nitrogen and sulfur oxides, carbon monoxide, acid gases, dioxins and furans and lead, cadmium and mercury. These are either released into the air and eventually deposited on the ground or gathered in the ash of smokestack scrubbers (Mayerl, 2013). The above mentioned facts were some of the things that student need to know in order to help them understand why we should recycle (Mayerl, 2013).

Scientific knowledge describes knowledge that relates to collection of data through observation and experimentation, formulation and testing hypothesis (Mayerl, 2013). Scientific knowledge was accumulated by a systematic study and organised by general principles. For example, scientific knowledge of a desired behaviour like recycling would include information that is necessary in order to recycle. Students who recycle have scientific knowledge that can be broken into groups of characteristics. First, they were better told about what items can be recycled. Second, they know the place where they can place their recyclables items. Thirdly, it was important to note that an individual who recycles understands the importance of recycling better than non-recyclers. These factors are interrelated and the amount of recycling will not increase unless all three of the factors are elucidated. In order to increase scientific knowledge, and the amount of recycling, an individual must receive education that addresses the three key factors of scientific knowledge. For example, people who recycle have the scientific knowledge of which items that they can recycle (Mayerl, 2013).

This aspect or factor is one of many that compose the body of scientific knowledge of a recycler. In order to make education successful, it must address the specific factors that will most increase an individual's scientific knowledge. Clarification of which factors to focus education on is not as easy as it initially appears since other influences such as gender and age must also be considered. Understanding the factors that affect scientific knowledge and individual influences will improve the success of educational attempts to increase recycling in the university setting (Best & Mayerl, 2013). Individuals tend to select different means for showing their concerns. Often they are engaged in some facets of recycling action and not in others. There is evidence to support the idea that the general attitudes about the recycling attitudes may indirectly affect specific environmental issues. As there is also evidence that a specific attitude can often be related to a specific knowledge and understanding; however, the resultant actions are additionally modified by social norm. These norms can prevent or interfere with an individual's ability to act on their personal attitude (Best & Mayerl, 2013).

An individual may want to recycle, but if it is not the norm of their peer or social group, this fact may strongly inhibit the desired behaviour. In order to ultimately change a person's understanding about recycling, education in relation to recycling must occur (Grimmette, 2014). This change in understanding often comes from education. This is a critical aspect that most of the programming in the research lacked. For example, many countries lacked formal or planned education of the students for why recycling program was being must be implemented and the reason they should recycle and reducing waste. Education of the students as to why recycling program must be implemented or the importance of the program is something that the administrators seemed to overlook (Grimmette, 2014). Another study shows the influence of recycling education programs on the understanding of knowledge of recycling of students (Rada, 2016).

The students were exposed to different levels of recycling program. One group of students was exposed to classroom presentations while another group was taken to a landfill to educate them

on waste. Education on the topic had an influence on the behaviours in the classroom; however, students that were exposed to education and were physically shown the outcome were more likely to ultimately have a change in their understanding, which influences knowledge (Flordeliza, 2016). This was likely also true of college age students (Floderliza, 2016). The study also highlighted the importance of waste reduction programs on campuses. An understanding of the outcome of their practices was an essential aspect in encouraging learners to take part in recycling programs. The study also suggests that recycling programs are more effective on younger, preadolescent children. The author felt that this was the case because some students at college do not have well established habits (Floderliza, 2016).

One can developed a passion for recycling efforts on campus because administrators have the ability to influence a large population through programming. For most traditional freshman and many transfer students this will be the first time that they are not living with family. Their family habits will no longer be present. This gives housing administration a rare opportunity to influence their understanding. This makes it crucial that students are educated about recycling programming and understand the outcome of their recycling and pro-environmental efforts (Gadiraju, 2016). A study analysed recycling knowledge of high school students (Adeolu et al., 2014). The study focused on 10th and 12th grade students. The results revealed that students had low levels of recycling knowledge. While students were able to recognise basic facts, most could not apply this to consequences or solutions related to the problems (Adeolu et al., 2014). The authors also felt this was alarming because many of the students surveyed would not receive additional formal education. This study illustrates the importance of continuing and increasing recycling program in education for those students that do continue into higher education.

A study also showed a high correlation between attitudes and recycling behaviours. The study focused on undergraduate student attitudes towards recycling and its connection to positive recycling attitudes, personal responsibility, and broader social concern (Enesi & Adeolu, 2014). This study did not focus on the efforts of the university, simply the personal efforts of the students. They found that attitudes were not the most significant determinant of recycling

actions. Students at two large universities in the United States were surveyed. This study showed that perceived understanding of recycling, a person's perceived ease of performing in recycling, was the strongest factor influencing paper recycling behaviour among the students studied (Enesi & Adeolu, 2014). Positive attitudes do not always result in positive recycling behaviour. The individual's perceived ease of performing the action is important. With students living on-campus the knowledge must be perceived as easy in order to encourage participation.

One study, that was of particular relevance, looked at recycling attitudes and beliefs on campus (Filza et al., 2014). This study highlighted the importance of social norms especially to the study population of college students. Those students that were found to participate more in recycling or were more aware of recycling on campus were those that perceived the task as a social norm. Convenience is thought to have a great effect on the decision of students to recycle; however, investigating if this convenience is simply influencing behaviour or changing attitudes about recycling is an important topic that needs exploration. Many studies have left out the important role campus administration plays in the process. Campus administrators have the task of implementing sustainability programs and making investments that have the greatest impact and return on investment. However, there is little literature to guide administrators in the decision making process or help others understand why the decisions that were made, for example budget, need, student input, etc. are important (Filza et al., 2014).

The study also found that the recycling programs varied greatly at the schools studied. Some schools even had no process for recycling of waste. Many local administrations were working to improve the programs at their individual schools, but there was no significant and comprehensive educational program on the topic of solid waste recycling. The authors suggest both individuals and administrators seek education to support recycling programs. There is a need for a comprehensive study of recycling habits for school administrators at many levels in order to gain the necessary knowledge (Filza et al., 2014). A study was conducted on recycling knowledge among senior secondary school students of Chandīgarh (Silo, 2015). The major findings of her study were that student of both government and private schools showed comparable recycling

knowledge, science students exhibited very high degree of recycling knowledge compare with the students of arts. Moreover, male science students exhibited very high degree of than female science students but overall no significant difference was found between male and female students in this context (Silo, 2015).

Quantifying learners' awareness, attitude and practice of the recycling was the main aim of the study done by silo (Silo, 2015). Knowledge, attitude and practice (KAP) surveys were first to be utilised in the 1950s to explore how the concept of family planning was received, understood and practiced by different populace across the world (Launiala, 2013). The basic premises of the KAP surveys were that awareness forms attitude, and that both knowledge and attitude were the building blocks for practice. KAP surveys were utilised for three general goal: as a diagnostic tool to explain the populace's present knowledge, attitude and practice; to give insights on a present situation in designing specific interventions; and as a tool to assess the succesfulness of cvarious interventions and projects. KAP surveys have been broadely applied to explore human behaviour in different areas including health (Launiala, 2013), surveys in general were andare well accepted, as a conceptual framework to quantify public's understanding, knowledge, desires and roleplaying on a certain issue (Launiala, 2013).

KAP surveys have also been used to in find out the level of knowledge of young the people, attitude and practice of recycling. For example, in a study conducted to quantify medical sciences students' understanding and practice concerning to trash generated and disposal and recycling, it was demonstrated that, 75% of the learners holds higher than moderate understanding, with male learners reported to have significantly better understanding and knowledge of the recycling matters when compared to female learners (Ehrampoush & Moghadam, 2013). Knowledge, however, was found not to necessarily direct learners to better practice (Ehrampoush & Moghadam, 2013). In another KAP survey conducted to explore the rate of the recycling knowledge to the current learners, attitude and practice of among 200 young and old gorvenment employees in Malaysia, it was found that although participants in general had better knowledge and attitude towards recycling, their recycling practice was only satisfactory (Besar et

al., 2013). Both findings shows that having recycling knowledge does not necessarily direct to sustainable practices.

The question addressed in this study was: asked what was the relationship between learners' rate of knowledge and sustainable practices? The opinions on learners' knowledge, attitude and practice towards sustainable practices would provide a helpful framework for communicating recycling knowledge succesful to learners at higher learning institutions. Communicating recycling messages to learners doubtless, communication was crucial in improving public awareness and increasing practice and activities related to recycling (Besar et al., 2013). The crucial understanding of the links between fossil fuel consumption and climate change was significantly related to use all the mediums (television, newspapers, magazines, and books) and to communication through interpersonal channels (family/friends). Communication behaviour was also connected to support for key solutions, such as driving less, reducing home energy utilised, and utilising more energy-efficient technology. Effective communication was considered a key to the effectiveness of many recycling projects (Besar et al., 2013). This was achieved through careful incooperation of environmental factors into the school curriculum, the growth of training materials and inservice training courses for educators and school staffs (EU, 2014).

In another study, the Eco-Animation project utilised cartoon as a medium to teach learners aged 8-12 on the importance of saving natural resouces (Animate-eu, 2015). A suitable form of communication was necessary to teach the learners in science clas (Animate-eu, 2015). Same to the Eco-Animation, the Ocean Program also stressed on the importance of using a specific form of communication when dealing with a certain target group (Ocean, 2015). In their study, the Ocean Program marked the social media as the most important communication medium to reach young people aged 16-21, and to disseminate any knowledge (Ocean, 2015). This was in line with the increase in access and usage of social media among young people (Ocean, 2015). Besides social media, recycling knowledge can also be succesfully communicated to young people group session. This can take place in the real life through taking part in practices and projects designed for young people (Ocean, 2015).

Previous studies have clearly displayed that it was important to successful distribute the necessary information to students (Animate-eu, 2015; EU, 2014; Ocean, 2015; Stamm et al., 2000); it was also vital to note that, succeful communication with youth was not easy to be achieved due to the complexity of their behaviour (Cristeson, 2004). It also vital to take into consideration the fact that, young people want themselves to give their own opinions, they did not want to follow prescribed orders blindly and, they demand equality and respect (Cristenson, 2004). Ordering, threatening, preaching, avoiding, pacifying, and lecturing were listed as major obstacles to effective communication with young people (Sapp & Goh, 2015). These hindrances if not effectively addressed, would built a communication gap between youth and adults, and lately leads to unsuccesful programs that intend to attract youth's involvement (Cristenson, 2004). In the Malaysian context, it remains unknown whether programs that were carried out and taken into consideration and the diverse nature of young people including their concerns, attitudes, perceptions, needs and wants, and if these projects were effectively announced utilising their preferred mediums.

The reason for the past studies was the fact that, the studies that had been conducted in Malaysia were focused on leaners' role in saving natural resources (Nadeson & Barton, 2013), their understanding of knowledge and role playing (Ahmad et al., 2012; Said et al., 2007), and related plans and policies (Foo, 2013; Rosly, 2012). Reflected by the number of waste thrown by Malaysian each day, the problem that the government has to face was never insignificant. Malaysian as the matter of fact on the average throws away 2 kg of waste each day and this quantity was regarded as unusual as compared to other countries in the world where the blame normally being parked on the responsibility of the young people who were expected to partake 3R in their daily routine (Yacoob, 2015).

Another study purpose was to investigate learners‟ practices of reuse and recycle paper in their daily life (Yacoob, 2015). Aluminum, was one of the most cost-effective materials to recycle, utilises less than 7% of the energy needed to produce aluminum from ore, and recycling causes

much less pollution of air and water. Recycling one ton of newspaper preserve approximately 18 trees, 6900 litres of water, and 3 square meter of landfill. Recycling old newspapers and aluminum cans into new products preserves 80 to 90 % of the energy needed to manufacture the same products from raw materials. The economic gain from recycling was and still is highly dependent on the price of competing raw materials. The uniform and predictable quality of virgin materials was generally a better option by factory producers. If the true price of virgin materials were evaluated, recycling would be very much cost-effective, but the current strategies of valuing natural resources assigns them value only when they were extracted. Prices that accounted for the real costs of raw materials was the single most effective incentive for source reduction, reuse and recycling (Yacoob, 2015).There was a developing market for "green" products that had less impact on the environment that the products they were replacing this was some of the knowledge that learners need to understand.

2.6 Participating in the recycling project

Gareth Morton in another article rethinking attitudes towards recycling explains the significance of the rethinking rubbish program in the United Kingdom. "Waste, or rubbish, as the public prefers to call its individual contributions towards millions of tons of municipal garbage generated each year, was a developing challenge" (Best et al., 2014) Public awareness was very important and often overlooked factor in the drive towards sustainability in the field of recycling. The recycling solid waste project was carefully developed to raise public awareness. The project was launched in 2014 and achieved an immediate effectiveness. The questionnaires of the public indicated that waste awareness increased with 4% rate and the knowledge about recycling, solid waste and trash increased more with 8%. The project lead to an 15% increase in people who say "they were willing to try to play an active role in recycling. One of the programs objective was to strengthen and increased its particicpants and to reach more areas with its universal appeal and identity. Learners and general public participation was considered to be the touchstone for the effectiveness of recycling programs (Bestet al., 2013).

Another study points out that education about recycling tends to be the main driver for maximising participation in recycling and it also indicated that increasing awareness of recycling alone may not improve participation (Best et al., 2013). Other factors that were contributing to limited participation included limited direct economic rewards and lack of recycling centres. Bolaane's study follows the case study format and was thus limited by design with regards to the ability to make generalisations from the results. A study that was carried out surveyed 400 households in Gaborone, Botswana, ranging across residents incomes starting from lower class to higher classes. moreover, three senior waste management department officials were interviewed and the transcripts of the interviews were coded to the categories of the investigation (Bolaane, 2013).. The senior officials saw recycling as a means of reducing the quantity of waste disposed of but cited shortages of manpower and transport as the key reasons recycling were not more abundant. The officials also expressed a need for more publicity of recycling to increase the success of source separated recycling schemes (Bolaane, 2013).

2.7 Theoretical Framework for the study

Socioscientific issues have become vital important in the field of science education as a means to make science more appropriate to students' lives (Cajas, 1999; Pedretti, 1999) as a selected way for addressing learning outcomes such as an appreciation of nature of science (Chambers & Zeidler, 2002; Zeidler et al., 2002), improved dialogical argumentation (Zohari & Nemet, 2002), and the ability to evaluate scientific data and information (Driver, 2000) and as an important component of scientific education (driver et al., 2000). Socioscientifc issues describe societal dilemmas with conceptual, procedural, or technological connections to science. A huge number of socioscientific issues were rooted from dilemmas involving environmental challenges. Environmental problems and recycling can be regarded as socioscientific issues (Zohari & Nemet, 2002). The suggestion that issues such as those related to environmental problems and its solutions such as recycling can be classified together as "socioscientific issues" was not meant to assume that science and society represent independent entities. All science were inseparable

from the society from which they arise. However, topics defined by the phrase “socioscientifc issues” display a unique degree of societal interest, effect and consequent (Zeidler et al., 2002). Socioscientific issues (SSI) were typically contentious in nature, can be considered from a different of perspectives, did not hold simple conclusions, and frequently includes morality and ethics. Recycling was and stiil is a SSI utilised for this study highlights the significance of moral and ethical considerations in decision-making regarding science related matter. Environmental challenges have inextricable connected matters subsumed by the environmental topic such as recycling to moral reasoning (Stock & Campbell, 2000). The message made by implicitly by the arguments of environmental challenges as well as articulated explicitly by science teachers and facilitators suggest that socioscientific decision-making, particularly when dealing with matters like recycling, must include the consideration of morality and ethics (Pedretti, 1999). In order for an individual to make informed decision regarding socioscientific issues he or she needs to have considered the moral ramifications of those decisions (Haker & Beyleveld, 2000).

Conclusions drawn in ignorance of the moral and ethical dimensions of socioscientific fetter the efficacy of those conclusions (Evans, 2002). regarding the issue of recycling, scientific researchers and policy makers are currently embroiled in a debate over whether or not more of recycling related content should be incooperated even more in the science curriculum (Friedmen, 1999). The assertion just made connections SSI like recycling with morality begs the question: why were these issues moral? This again raises the question, what makes the issue moral? Domain theorist suggests that morality is an intrinsic aspect of certain events, situations, or issues irrespective of the culture from which the incident arises (Blair, 1997; Nucci, 2001; Tisak, 1995; Turiel, 1983; Turiel & Smetana, 1984). They suggest that social knowledge and decision making reside in one of the three universal domains**:** conventional, personal and moral.

The conventional domain subsumes issues best resolves with applications of social norms. Student raising their hands in class to gain teacher recognition exemplifies the conventional domain. Speaking without raising ones hand is not inherently wrong, but in a classroom, doing so may violate normative procedures. The personal domain represents decisions that are subject

to an individual's personal choice and preference. In modern societies, individuals usually select their own clothing and this represents the personal domain. Although social norms impose boundaries on what constitutes acceptable attire, individuals typically make every day wardrobe decisions, within limits sets by societies, according to their own preferences (Zeidler et al., 2002). The Moral domain is define by universally recognised prescriptions based on conceptions of human welfare, justice, and rights. The excerpt below Nucci describes the moral domain as it differs from other domains of social knowledge.

A moral judgement about unprovoked harm ("it is wrong to hit.") would not be dependent on the existence of a social agreed-upon norm or standard but could be generated solely from the intrinsic effects of the act (ie, hitting hurts). In this example, the prescriptive force of the moral standard "it is wrong to hit" is objective in the sense that the effects of the acts were independent of the views of the observer, prescriptive in the sense that the effects of the act possessed across the public irrespective of thieir social background.

The domain account of social awareness would suggest that SSI were inherently moral because they include objective, prescriptive, and generalisable standards (Nucci, 2001).although domain theory has been utilised by researchers as an investigatory it suffers from singular reliance on one particular philosophical perspective, namely Kantian morality (Schneewind, 1998).The Kantian model occupies a significant place in case of moral philosophy, but subsume all approaches to morality. All three broad moral philosophies could be theoretical be applicable to socioscientific decision making: deontology, consequentialism, and care-based morality (Sadler & Zeidler, 2002).Deontology, which encompasses Kantian morality, was based on moral rules and principles. This perspective posits that moral dilemmas can be resolved according to pre-existing standards to which moral agents adopt (Sadler & Zeidler 2002). Deontology principles such as beneficence and justice impose duties, on moral agents that can lead decision making and behaviours. In other words individuals appliying deontology reasoning solve moral problems by considering principles convinient to the act of the decision itself irrespective of the potential consequences (Beauchamp, 1982; DeMarco, 2012).

Consequentialism also referred to as utilitarianism, was frequently contrasted with deontology. Deontology reasoning was based on the degree to which a decision or act upholds principles, whereas consequentialism was based on the degree to which a decision or act upholds principles, whereas consequentialism was based on the projected outcome of decision (Sadler & Zeidler, 2002). Consequentialist morality was based on quantifying the expected results of a decision or action. The decision which produces the greatest positive outcome corresponds to the most morally correct option (Beauchamp, 1982; Moore, 1991). Care-based morality rejects notion, supported by both deontology and consequentialism that single formula exists for solving challenge (Zeidler et al., 2002). Instead morality was connected to the contexts of individual situations and the people involved, rather than abstract prescriptions or calculations. The care-based perspective prescribes a far more relational approach, and emotions such as sympathy and empathy contribute significantly to decisions and actions (Nodding, 1984; Tronto, 1987).

Even if morals are universal and intrinsic to certain situation an individual decision maker must still recognise the morality of that situation. If moral decision stem from consequentialist calculations, then the decision-maker must recognise the context in which the calculation should be made (Zeidler et al. 2002). From the care based perspectives the individual defines the morality of a situation in terms of his or her experiences. In all the three case the individual plays a key role in assessing the extent to which morality contributes to decision making (Zeidler et al., 2002). The process by which individuals assess the morality of situation has been term construal (Bersoff, 1999; Saltzstein, 1994), and this study will focus on how learners construe SSI.

In order for a person to employ deontology principles, calculate moral consequences, or respond to a situation with care perspective, he or she must first recognise that the situations involve moral consideration (Hoffman, 2000). Construal was the process by which recognise, perceive, and interpret particular situations or decisions as moral (Saltzstein, 1994). Construal does not necessarily have to be a conscious process in fact it was more likely that a person's immediate reactions which were informed by emotions, previous experience, and habits, contribute

significantly to construal (Bersoff, 1999). Although experts in environmental topics and science education may profess the intrinsic morality of scientific issues the ultimate arbiters of morality were the individual decision makers (Andrew & Robottom, 2001). In order for a moral consideration to contribute to socioscientific issues decision making, the individual must construe SSI as moral problems (Zedler et al., 2002).

This theoretical framework informs the current study because recycling is classified as a socioscientific issue. The idea of teaching via controversial topics and more recently (SSI) has been recognised in the international science education community and the national documents of many countries in one form or another (levinson, 2003; Zeidler & Keefer, 2003). It has been discovered that what is missing most from science classrooms are engaging activities that focus on contemporary social issues that require scientific knowledge for informed decision making. While certain scientific principles require specific instruction, the development of pedagogical models dealing with contemporary issues in general and SSI in particular, must necessarily include learners' active participation in developing argumentation skills, the ability to differentiate science from non-science issues and the recognition of reliable evidence (Ratcliffe & Grace, 2003).

The framework has suggested that contextualised argumentation in science education may be understood as an instance of education for citizenship. It follows that it is essential to present the humanistic face of scientific decisions about moral and ethical issues, and the arguments and evidence used to arrive at those decisions. Separating the learning of science from consideration of its application and its implication is an artificial divorce (Sadler & Zeidler, 2005; Zeidler & Sadler, 2008b). SSI have become important in science because they occupy a central role in the promotion of scientific literacy (Bingle & Gaskell, 1994; Zeidler & Keefer, 2003).This perspectives on science education, which is consistent with the standards and reform documents in the United States (American Association for the Advancement of Science, 1990; National Research Science, 1996) holds that science students require the ability to make informed decisions regarding scientific issues of particular social import.

Environmental topic like recycling, at least in part entails the ability to discuss, interpret evidence relevant to draw conclusions in response to scientific issues. Because the promotion of integrating scientific literacy, defines the (if not the) fundamental goal of science education and socioscientific decision-making represents an integral part of this goal, the current researcher believes that it is necessary to explore how learners negotiate and resolve SSI. Explicating the process and patterns learners use as they confront controversial dilemmas will aid the development of appropriate socioscientific curricula and pedagogical strategies, thereby enhancing the promotion scientific literacy in order to encourage learners to make informed decision about the environment in the future.

In England and Switzerland, educators are beginning to bring controversial environmental topic into science classroom and outdoor environments. That afford learners the opportunity to discuss issues-based science, connecting what they are learning to real world issues such as nuclear power and rain deforestation (Rickinson & Lunholm, 2008). When learners engage with these issues they might also take a larger role within recycling projects. The study argue for the importance of creating critically thinking learners at a young age who are exposed to real world science and internalise the principles of recycling as well as and possibly informed decisions about environmental activism. SSI allow learners to view science realistically by integrating attitudes and ethics in making judgements about scientific information. The SSI framework use meaningful discussions, formal debates and argumentative thinking as an important part in preparing learners to use the information in familiar and personally relevant context (Sadler & Donnelly, 2006; Zeidler et al., 2009).

SSI coupled with highly contextual educational experiences have the ability to create scientifically literate citizens by enhancing students' understanding of how science works outside of the classroom. Zeidler and Sadler (2011) place particular emphasis on the quality educative experiences that enhance people's quality of life. It is also possible that the pairing of the

environmentally issues in particular recycling and SSI will help to cultivate learners to be informed and scientific literate citizens (Bureck & Callahan, 2005; Bureck et al., 2004). If the goal of scientific literacy for learners to understand complex scientific issues and make decisions based on their knowledge, then it is imperative that they are exposed to SSI embedded within these authentic contexts or learning environments (Zeidler & Sadler, 2011; Zeidler et al., 2006).

An SSI curriculum incorporates real world, ethically and morality debatable scenarios that are drawn from local communities that citizens deal with on a daily basis, for example, resourceful wastes that are deposited in landfills instead of being recycled. The three main characteristics of the SSI movement are that issues are controversial in nature, open-ended, and include moral or ethical reasoning (Zeidler & Sadler et al. 2005). SSI is essential tool needed to create critical thinking and meaningful dialogue. It is important for children to begin the development of critical thinking at a young age, while focusing on recycling. Research has shown that adults who are more aware and involved with environmental issues were exposed to meaningful learning in the environments or alternatives learning as a youth (Rennie & Williams, 2006; Falk & Heimlich, 2009). There is a growing need to connect SSI with the health of environment and put them into a context with larger engrossing societal concerns that children as well as adults are faced with, such as less dumping sites, shortages of resources and issues of social justice.

In the study involving college students Zeidler analysed 11 dyadic interactions focused on an environmental dilemma (Schafer et al., 1984). Trends emerged from the group discussions indicate that the participants incorporated morality in their decision making. Several student groups concentrated whether the proposed justified the result. Other students decision making patterns whereby they integrated personal experiences, effects and moral reasoning. The call to integrate science and morality is consistent with the growing push to encourage the development of sophisticated epistemologies of science which includes an appreciation of the social context (including morality) in which science operates among students (Siebert & McIntosh, 2001). In order to progress to a position where pedagogy and curriculum help students integrate ideas

about scientific issues and their values and ethics, the community needs understanding of how individuals natural construe these issues (Zeidler et al., 2002). The development of this suggested understanding requires an elaboration of the trends explored in previous work as well as description of issue construal in other context (Pedretti, 1999). The present study addresses the needs just presented by exploring student construal and resolutions of dilemmas related recycling which form a subset of SSI.

One approach to discovering how people construe and resolve socioscientifc issues is to ask questions and get to understand how they perceive recycling (socioscientific issue) and get to know their perceived ideas as they answer the study questions of socioscientific issues. The present study relied on this approach by engaging participants in answering the study questionnaires. In addition, the study asked explicit questions regarding participants' feelings and reactions towards recycling to understand the role of moral or ethical consideration in their decision making. The results from these questionnaires were used to construct a profile of how the participants perceive, construe, and understand the scientific knowledge of recycling as a it is a socioscientific issue.

3. CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Concerning synthesising research, Cooper (1990) suggests that the pursuit of knowledge with the tools of science is a cooperative and interdependent enterprise. Any one scientific research endeavour depends on, and contributes to an array of other research endeavours in a particular field (Cooper, 1990). As a result, for a researched piece of information to be well integrated into the broader world of scientific knowledge, a specific research methodology needs to be adhered to.

Because of the nature of the study, specific methods used in collecting and analysing data in different sections of this project are given in each chapter. In this chapter background knowledge to specific methods are given. In this regard, a vast number of research methods exist and the choice of any one method depends entirely on the nature of the research being conducted at a given time. However, according to Cooper (1990), a great deal of researchers fails to use proper methods when finding, evaluating and integrating past research methods into their studies. As a result, most researchers' work tends to lack proper synthesis procedures. To ensure that the current research avoids this shortfall, a number of issues were considered upon designing and conducting this research, particularly with regards to data collection. This involved using a range of different research methods, testing for validity and reliability of the instrument, and reviewing data to determine the best methods for the current study.

3.2 Qualitative, quantitative and mixed-method approaches

There are two major types of methods that can be used for collecting and analysing data, namely, qualitative and quantitative approaches (Creswell, 1994). The value of the two approaches is a

source of great debate among researchers. However, there is a clear distinction between the two methods and based on this, researchers find value in whichever method they prefer for a particular study based on the research questions being addressed (Patton, 1990).

According to Hoepfl (1997), phenomenological enquiry or qualitative research, uses a realistic approach in search of understanding a phenomena in context-specific settings. In human and social sciences such as science education, qualitative research involves enquiring about participants' opinions, behaviours and experiences from the informant's points of view (Zucker, 2001). Such qualitative methods are often used in educational studies with the aim of describing and discovering events, phenomena and situations of theoretical significance (Zucker, 2001).

Researchers (for example, Hoepfl, 1997; Strauss & Corbin, 1990) agree that qualitative methods are best suited for situations where little is known about particular phenomena. In such cases, the qualitative method is used to define certain variables that can later be tested through quantitative methods (Hoepfl, 1997), even though quantitative methods may not always follow qualitative methods. In this regard, qualitative researchers follow what Patton (1990) calls "non-absolute characteristics, but rather strategic ideas that provide a direction and a framework for developing specific designs and concrete data collection tactics" (p. 59). This means the researcher remains "objective" as an instrument where they only make observations, descriptions and interpretations of the given data (Patton, 1990). As a result the research is interpretive in the sense of discovering meanings of the events (Hoepfl, 1997). At the same time, qualitative researchers "pay attention to the idiosyncratic as well as the pervasive, seeking uniqueness of each case" (Hoepfl, 1997, p. 3).

In science education research a number of qualitative methodologies, for collecting and interpreting data, are employed. Nonetheless, qualitative research is very much dependent on the researcher's subjectivity (Bogdan & Biklen, 1992). This poses a threat to the validity and reliability of the data as these will depend heavily on the logic of the approach (Libarkin &

Kurdziel, 2002). As a result conclusions in such research are often applicable to very limited circumstances and contexts (Libarkin & Kurdziel, 2002).

In contrast to qualitative methods, quantitative methods refer to research methods where findings are observed through the use of statistical means of quantifying information (Strauss & Corbin, 1990). According to Hoepfl (1997), "quantitative researchers seek causal determination, prediction, and generalization of findings" (p. 2). In this instance, quantitative researchers instead seek illumination, understanding, and extrapolation to similar situations. With respect to quantitative studies, already-defined methodologies for collecting and interpreting data are used (Libarkin & Kurdziel, 2002). During the use of these methods, a well-structured approach is followed in which case divergence from such methods needs to be backed up by sensible arguments. Hence, the reliability and validity of quantitative methods is governed by established statistical techniques (Creswell, 1994).

Because of the nature of individual approaches in qualitative and quantitative approaches, a mixed methodology approach has been explored and successfully used. According to Bazeley (2003), a mixed method of research generally refers to the combined use of different qualitative and quantitative methods to investigate a particular phenomenon (Bazeley, 2003). In the 1980s, it was rather unacceptable to combine methods in research as it was viewed as "creating a conflict in ontology and epistemology" (Bazeley, 2003, p. 1). This "paradigm war" however faded away in the 1990s as an increase in the use of mixed method approaches emerged (Bazeley, 2003).

In another study where a particular town was chosen because educators in the two schools the comprehensive and the grammar school indicated to be very much supportive of the research aims and objectives and they promise to be full involve in the study and they also agree that they will participate in the questionnaire (Karin, 2017). collecting data from multiple choice and open-ended questions on waste control, attitudes regarding waste reduction choices and behaviour in the field of waste recycling were main aim of the survey questionnaire of the study (Karin, 2017).

The learners were also asked where they think they gained their recycling-related knowledge from. especially, the part of the survey questionnaire which was analysed. The paper consisted of seven questions. Question 1, was a different type of problems and learners were asked to tick the relevant box to show how much knowledge they have about the different problems of waste control. Different types of concepts was given. Learners have to choose between the answer from the multiple choice question as follows: never heard of it; heard of it but I don't know what it means and heard of it and I know what it means (Karin, 2017).

Question 2 asked the asked the learners to make a choice on how important on a scale, they find the issues named (5 = very important and 0 = not at all important). learners were asked how important different recycling related knowledge choices (reduce the quantity of thrash, recycle garbage, compost trash and re-use trash) seen to them. In question 3 learners were asked to give their views about what they think can minimise the quantity of household trash from their bins? List the type of waste they think cannot not be reduce , learners had to give reasons why they think so. If they think can be minimised, they also had to give their reasons Question 4 asked how often they recycle, they had to explain which materials they recycle and how often. Learners were given options to choose from whenever possibly; at least once every month; at least twice a year; almost never and other (please specify. For the analysis, at least once every month and at least twice a year were summarised as one category which was called sometimes (Karin, 2017).

Question 5 learners were given with the different types of materials. They were asked to choose the materials that they can be recycled. Question 6 they were asked if they can explain what incineration was, and point out what they think was a good way of treating solid waste. The answer options was: Yes it was, because...; No, it was not, because...; It can be if... and I am not aware. learners could then describe their opinions. Question 7: Where did they obtain most of their recycling related knowledge from? different of potential subject that provided with the information. The Participants were learners between 12 and 15 years of age (Karin, 2017). 140 learners participated in the grammar school and 150 in the comprehensive school. The survey questionnaires were administered anonymously in their respective classes. The researcher

delivered the survey questionnaires in the two schools on same day and the same time. The researcher indicated that there were no right or wrong answers and that the survey questionnaire and the answers to the questions were completely anonymous and that copying of neighbours was therefore not necessary (Karin, 2017).

educators were advised not to give any assistant in cases where learners were not sure about a question. Quantitative and qualitative analyses was done. For the quantitative analysis, the statistical software package SPSS and Excel was utilised. Answers to multiple choice questions was analysed by providing cross-tabulation and calculating frequencies to allow direct comparison between the two student groups. Open-ended questions was grouped into categories so as to be able to compare them relatively easily. For example, answer choices such as litering was bad because it pollutes the air and Incineration wasbad because it leads to exhaust gases were compiled in the section Incineration leads to air pollution. The answers were also compiled into categories by another researcher from the same department. In some cases, this researcher compiled the answers slightly differently and used more categories. Where there were discrepancies regarding categories, instead of combining them, more categories were created. Answers which was only given by one learner was categorised under a specific section which was called single version (Karin, 2017).

Lastly, grammar school laerners had higher levels of knowledge and were more likely to recycle materials. They also rated different waste reduction choices (reduction, re-use, recycling and composting) as being of greater importance compared to the learners from the comprehensive school. However, the level of importance was the same between learners from the grammar school and learners from the comprehensive school. Both schools considered recycling as most important, followed by waste reduction, re-use of waste and finally by composting. According to the garbage hierarchy and national policy, waste reduction is the best option, followed by re-use and then recycling/composting. It should be easy to see that reduction was the most sustainable choice because it leads to a maximising of resources and energy savings. It was then amazing that learners did not rate it as the most important of the proposed choices. It was interesting, how

learners do not feel that recycling and composting were equally important, although the treatment hierarchy saw the both approaches as equal importance (Karin, 2017).

According to a number of researchers (for example, Libarkin & Kurdziel, 2002), the mixed method incorporates both the qualitative and quantitative methods. The argument is that the combination of both methods strengthens the research findings. The researcher may perform one method and follow it up with the next as a substantial tool for his or her findings (Bazeley, 2003). Derry *et al.* (2000) used the mixed method approach in their study and argued that the findings of such an approach are applicable to both a local setting (the context of the study) and in more general terms. Other authors (for example, Leahey, 2006; Denzin, 1988) agree that mixed method designs enhance the validity and reliability of results compared to if each method is used on its own. Furthermore, it is believed that the simultaneous use of both methods reduces the limitations posed by the weaknesses of individual methods alone (Derry, 2000). As a result of such arguments, a large volume of researchers favour mixed method designs to conduct their studies as they ensure a high degree of validity and reliability (for example, Leahey, 2006; Tashakkori & Teddlie, 2003; Alford, 1998).

The researcher has chosen mixed method for the current study. The goal for choosing mixed methods is not to replace either of these approaches (qualitative and quantitative) rather to draw from the strengths and minimise the weaknesses of both in the present study. If you visualise a continuum with qualitative research anchored at one pole and quantitative research anchored at the other, mixed methods in a research covers the large set of points in the middle area. If one prefers to think categorically, mixed method sits in a new third chair, with qualitative research sitting on the left side and quantitative re-search sitting on the right side. Mixed methods approach offers great promise for practicing researchers who would like to see methodologists describe and develop techniques that are closer to what researchers actually use in practice. Mixed methods as the third research paradigm can also help bridge the schism between quantitative and qualitative research (Cristenson, 2004). Methodological work on the mixed methods research paradigm can be seen in several recent books (Brewer & Hunter, 1989;

Creswell, 2003; Greene, Caracelli, & Graham, 1989; Johnson & Christensen, 2004; Newman & Benz, 1998; Reichardt & Rallis, 1994; Tashakkori & Teddlie, 1998, 2003).

The researcher uses mixed methods as an attempt to legitimate the use of multiple approaches in answering research questions, rather than restricting or constraining researchers' choices (ie, it rejects dogmatism) also mixed methods is an expansive and creative form of research, not a limiting form of research (Christensen, 2004). The researcher has chosen mixed method because it is inclusive, pluralistic, and complementary, and it suggests that researchers take an eclectic approach to method selection and the thinking about and conduct of research. What is most fundamental is the research question; the research methods should follow research questions in a way that offers the best chance to obtain useful answers. Many research questions and combinations of questions are best and most fully answered through mixed methods solutions. Mixed method allows the researcher to collect multiple data using different strategies, approaches, and methods in such a way that the resulting mixture or combination is likely to result in complementary strengths and non-overlapping weaknesses (Brewer & Hunter, 1989).

Mixed method provide the researcher with many opportunities for instance if the researcher might want to qualitatively observe and interview, but supplement this with a closed ended question to systematically measure certain factors considered important in the present study might do so, these example could be improved (if the research questions can be studied this way) by adding a component that surveys a randomly selected sample from the population of interest to improve generalisability. If findings are corroborated across different approaches then greater confidence can be held in the singular conclusion; if the findings conflict then the researcher have greater knowledge and can modify interpretations and conclusions accordingly. In many cases the goal in using mixed method is not to search for corroboration but rather to expand the researchers' understanding (Cristenson, 2004).

3.3 Methodology adopted in the present study

Since the present study was using mixed method for data collection, in collecting data a sequential methodology was employed in response to the research question and the sub-questions of the study which was stated in Section 1.5 of the study. Because of the specificity of the research methods (ie, data source, collection strategy and sampling) methods will be different to each sub-question. For example, document analysis was used in response to research sub-question 1 while a questionnaire was used to collect data in the quasi-experimental design in response to research sub-question 2 and 3.

3.3.1 Sampling and sample description

Convenience sampling is the best way of collecting information quickly and efficiently. In another another samples of undergraduate business learners were from three public universities. These groups of undergraduate business learners were selected based on few reasons: they have completed business ethic courses/modules; they have adapted themselves the condition of the school environment, and they have been exposed to management rules and regulations related to recycling issues. A total of 500 sets of questionnaire had been distributed to students in three higher education institutions, and 410 (82 percent) questionnaires were returned. After, subsequent data screening, only 370 questionnaires (74 percent) were used for coding and analysing purposes (Filzah Md Isa et al., 2014). The study has shown that students take an active role in environment related activities at schools, if given an opportunity.

In selecting students to participate in the current study, a non-probability purposive sampling approach was followed. The researcher selected only one school in Nkomazi, Mpumalanga province. All Grade 7 learners aged between 12 and 14 years enrolled in Senior Phase Natural Science participated in the study. A total number of 140 learners participated in the study. The school divides the learners into three classes, Classes A to C, based on its internal policy. In the present research, all learners in Class A (n = 55) were randomly allocated into the control group.

This group consisted of 20 boys and 25 girls. Classes B and C were allocated into the experimental group, consisting of a total of 90 learners, 55 boys and 40 girls.

All learners participated in the study voluntarily after their parents, class teachers, school principal and the provincial Department of Basic Education had given relevant consent and ethical clearance. The researcher also obtained ethical clearance to conduct the study from the University of South Africa (ERC reference 2018/02/14/36500704/46/MC).

3.3.2 Instrument design and validation

The researcher systematically developed questionnaires for data collection. The primary aim of the questionnaires was to determine the effectiveness of a small-scale recycling project on grade 7 learners' perceptions, attitudes and understanding of scientific knowledge of recycling, and the learners' perceptions and attitudes towards recycling and the extent do grade 7 learners have a scientific understanding of recycling. To determine the extent of recycling related content integrated in to grade 7 natural sciences curriculum, the CAPS document was analysed using a semi-structured document. The development of the entire data collection instrument is described below.

a) Drafting the questionnaires

The entire data collection instrument that was used in this study went through various stages of preparation. The first step in this phase was to choose what type of questions were to be included in the questionnaires that will answer the present study research question.

Like it was mentioned earlier the questionnaires were systematically developed by the researcher to meet the research objectives. The questionnaire was divided in to three sections to give answers to the research question. The main question of the study asks: what is the effectiveness of a recycling project on learners' perceptions, attitudes and understanding of scientific knowledge of recycling? To find answers to this question the researcher developed a questionnaire which was divided into three sections. The first section probed learners' perceptions, and attitudes towards recycling. The second section probed learners content knowledge of recycling. The third section probed learners' understanding and participation in the recycling project. The test of content knowledge (Section 2) consisted of ten multiple choice questions, which were developed using the content available from the CAPS natural science curriculum designed for Grade 7.

b) Validation through a supervisor

After the questionnaire for data collection was developed it was given an independent researcher (not part of this research) for validation. This was to satisfy Taylor-Powell (2008) who suggest that researchers should ensure that:

- The items in the questionnaire measure what they are supposed to measure.
- All the words are understood by the respondents.
- All respondents interpret the item in the same way.
- All response choices are appropriate.
- The range of response choices is actually used.
- The respondents correctly follow the instructions.
- The questionnaire creates a positive impression that motivates students to respond.
- Length of time available to complete the questionnaire is adequate.

In line with the above therefore, the independent researcher validated the questions to address two fundamental questions, through which face and content validity of the probes would be established. These questions were:

- *Do questions (items) in the questionnaires test what they ought to?* Given that each item was meant to assess specific knowledge, the researcher was therefore meant to determine whether the questions were able to test for such knowledge that is effectiveness of recycling project on learners' perceptions, attitudes and understanding of scientific knowledge of recycling and the integration of recycling related content into Grade 7 natural science curriculum, scientific understanding of recycling and learners' perceptions and attitudes towards recycling.

- *Are the questionnaires suitable for the purpose it is designed for?* In this instance the main focus of questionnaire assessment was on the conceptual background of each question. The supervisor assessed the use of terms, especially natural sciences terms so that all the learners would be able to understand the questions. The supervisor was also asked to check whether, in his view, the questions were suitable for the educational level of the students, that is, Grade 7.

The same procedure was followed for the document analysis, after the researcher had outlined and selected the content she was interested in when analysing the document. That information was sent to the supervisor to evaluate and assess its value on the study.

The independent researcher was satisfied by the validity of the questionnaire.

c) Piloting the questionnaire

In line with Taylor-Powell's views, other researchers (for example Creswell, 2008; Maree & Pietersen, 2007; Libarkin & Kurdziel, 2002) suggest that questionnaires should be distributed on a sample of respondents within the same context as the actual study. As a result a group of Grade 7 Natural Science learners from a different school were purposively sampled to participate in the study as a pilot group. As part of the pilot process, a specific procedure for administering the questionnaire was followed. This procedure is similar to that used in administering Aptitude Tests

(O'Neill, 2007), namely announcing all relevant instructions, providing an example or a practice question, recording time for completion, ensuring that students work independently and collecting the scripts soon after the students finished answering the questionnaire. This procedure was also used during later data collection of the validated questionnaire.

After administering the test all questionnaires were collected and analysed by the researcher who was satisfied that learners in the pilot group *i)* understood the question, *ii)* answered what was asked, *iii)* used the range of response options available, and *iv)* followed the instructions accordingly (Taylor-Powell, 2008).

3.3.3 Data collection and analysis

Having satisfied herself that the questionnaire was valid, the researcher then proceeded to collect data from the main sample of the study. The pre-intervention data were collected first. Here, all learners in both groups (ie, control group and experimental groups) were asked to complete the questionnaire. During pre-intervention students were not told about the questionnaires prior to administering it in order to ensure they did not prepare for the questionnaire in any way. The procedure for administering the question was the same as the one that was used during piloting of the questionnaires. The questionnaires were distributed by the researcher, natural science educators in the school helped with the invigilation and the questionnaires were collected by the researcher after they were completed by the student. After collection these data, students' responses to the questionnaire were marked by the researcher.

After the pre- intervention learners from the experimental group were involved in the recycling project. The researcher used CAPS document as a guideline to educate the learners and the content that was in it. She used the curriculum that was prescribed for term three since it was the content where recycling was integrated. During intervention each and every grade seven class has a recycling bin and in the front of the Grade 7 classes there were three big recycling bins, they were well labelled one for papers, one for plastic and one for metals and near the

garden we placed one for compost. All learners were provided with guidelines on how the recycling should work. Learners were sorting out all the materials found in the bins before recycling them. The recycling items were sold to the nearest scrap dealers. During their participation learners were actively involved and they were able to make resources from the recycled materials. The resources made by the student were used by Grade 7 learners. Learners from the control group were told to strictly not participate in the recycling project. During the recycling project the leaarners in the control group continued with their nomarly routine in the school. The recycling project lasted two weeks. After the recycling project, the post-intervention data were collected by administering the same questionnaire to both groups of learners in the same manner as the pre-intervention data collection.

Following the scoring process, percentage scores were generated for each student, and for each questionnaire. These percentage scores were used to compare the performance during pre-intervention and post intervention. Data were also analysed according to the classes (the control and the experimental). All statistical analyses were performed using *SPSS Statistics 25.0 Ink* software where descriptive and inferential statistics were calculated. The primary statistical analysis performed on the data was the non-parametric Mann-Whitney (or Wilcoxon-Mann-Whitney) test which is used to detect differences in data distribution, shape and spread as well as differences in medians of two independent samples (Dergirmenci, 2013; Altin, 2001). Non-parametric statistics are those that are used when the populations are not normally distributed.

The researcher chose this statistic because of the differences in the nature of samples (the experimental and the control group). Furthermore, the sample sizes differed. Non-parametric tests are also used when data is ordinal. For example, data related to students' open-ended questions and their choices were ordinal and hence a non-parametric text was suitable for them. While there are other non-parametric tests such as the unpaired t-test that could have been used, the researcher decided to use a Mann-Whitney test. The Mann-Whitney test was chosen because it assumes that the data from two independent samples (experimental and control group) have a similar but not normal distribution, which can only be explained by determining

the median instead of the mean (Altin, 2001). Similar to parametric tests, the Mann-Whitney test is used to determine if the difference between the medians of two groups is significantly different. (Non-parametric tests compare median rather than means due to data not being normally distributed).

The median is the numeric value separating the higher half of a sample from the lower half, whereas the mean is the central tendency of a sample (Nachar, 2008). Using the Mann-Whitney test, the null hypothesis could be tested by generating a probability value at which the null hypothesis could either be accepted or rejected. This probability value is termed the Asymptotic Significance value. If this value was greater than the set alpha value (which can be 0.01, 0.05 or 0.1) the null hypothesis was accepted and rejected if the Asymptotic Significance value is lower. The researcher used SPSS to test correlation between different groups. Here Spearman's correlation coefficient (represented as "*r*") was calculated. This is a non-parametric measure of statistical dependence between two variables. The generated correlation coefficient (which ranges from -1 to +1) is compared with the alpha value to determine whether the correlation is significant or not. If *r = 0,* that means there is absolutely no correlation between the variables. A correlation co-efficient of *1* means there is 100% correlation such that the two variables are directly proportional to one another. A correlation of *-1* is as strong as that which is *1* the difference is an inverse relationship. The significance of a correlation (or lack thereof) is measured against the established alpha values and denoted with asterisks.

When analysing the CAPS document, the first stage was open coding, which entailed reading and rereading the data in order to have an idea of how patterns could be clustered and coded. Open coding involves naming the identified patterns or categories of expression, breaking them down into discrete parts, closely examining them, comparing them for similarities and differences, and questioning the phenomena that are reflected in them (De Vos, 2005). In this study, the researcher highlighted the clustered patterns or themes in yellow and then named each theme depending on its focus or subject matter and marked the name down in red in the text above the highlighted narrative. This naming process is called "conceptualizing the data" whereby the name stands for or represents a phenomenon (Strauss & Corbin, 1990, in De Vos et al., 2005). This is

done by comparing utterances as the researcher goes along so that similar phenomena can be given the same name. The name given to each theme or category is the one that seems most logically related to the data it represents and is catchy enough to draw the researcher's or reader's attention (Strauss & Corbin, 1990, in de Vos et al., 2005.

Axial coding was then undertaken, which involved looking for links and connections between the themes so that related themes could be merged into clusters. De Vos (2005) calls this classifying or looking for categories of meaning and it involves searching for categories of meaning that have internal convergence and external divergence. De Vos (2005) qualifies this by explaining that the categories or themes should be internally consistent but distinct from one another. In accordance with this, the researcher clustered the highlighted themes in the different participants' narratives that were similar, and moved them to a new document. Diverging instances of the identified patterns, trends and themes were noted from the narratives of the participants and they gave new meaning to my understandings of the text. They encouraged me to critically evaluate the "very patterns that seemed so apparent" (De Vos, 2005:339) and to search for other, plausible and alternative explanations for the data.

Selective coding was the final process whereby all themes, from the document of the combined participants' themes, were divided into a selected number that comprised the final presentation. This involved "winnowing the data, and reducing it to a small, manageable set of themes to write into the final narrative" (De Vos, 2005:338). In the process, 'families' of themes were created with the sub-themes and categories being the 'children' and 'grandchildren' (De Vos, 2005). As I conducted the above three processes, I realised that the lines or boundaries between one type of coding and the next could be artificial (Corbin, 1990, in de Vos et al., 2005) and tended to be blurred at times, as I constantly moved between the three methods. Furthermore, the different types of coding did not necessarily take place in sequence. The findings of the data analysis are presented in Chapter 4.

4 CHAPTER 4: RESEARCH RESULTS

4.1 Introduction to the chapter

As discussed in Chapter 1, the aim of the study was to determine the effectiveness of a small scale project on improving grade 7 learners' perceptions, attitudes and understanding of scientific knowledge of recycling. The study had the following objectives, to determine:

- The extent to which recycling is integrated in the Natural Sciences curriculum;
- the extent to which grade 7 learners have a scientifically correct understanding of content knowledge related to recycling;
- Grade 7 learners' attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling; and,
- the relationship between learners' content knowledge of recycling, attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling.

To this end, the study attempted to respond to the research question that asked: what is the effectiveness of a small scale project on improving grade 7 learners' perceptions, attitudes and understanding of scientific knowledge of recycling?. Related to this, the following subquestions were asked:

- To what extent is recycling integrated in the Natural Sciences curriculum?
- To what extent do grade 7 learners have a scientifically correct understanding of content knowledge related to recycling?
- What are grade 7 learners' attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling?
- What is the relationship between learners' content knowledge of recycling, attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling?

Methods followed in responding to these research questions are discussed in Chapter 3. In the present chapter results are presented and discussed in Chapter 5.

4.2 The presentation of recycling in the Natural Sciences curriculum

The analysis of the Natural Sciences CAPS document revealed that recycling is taught in Natural Sciences. However, it is not taught as an individual concept, but it is integrated into other concepts. Additionally, it was found that recycling is taught through practical activities. Furthermore, there was evidence to suggest that learners are encouraged to practice recycling in their everyday life. These are discussed below.

The term 'recycling' appeared five (5) times in the Natural Sciences CAPS document (ie, on Pages 13, 23, 38, and 39, Table 4.1). The analysis of the Natural Sciences CAPS document also revealed that "recycling' is taught in Grades 7 and 8. In Grade 7, the recycling is taught in the Matter and Materials knowledge strand where learners are taught about recycling in the context of 'mixtures'. Here, it was found that learners are taught methods of physical separation of mixtures. This physical separation of mixtures included recycling of materials as an example (Table 4.1). Additionally, learners are taught about the significance of recycling and their roles and responsibilities in recycling. For example, the Natural Sciences CAPS document states that "it is every person's responsibility to dispose of waste in a proper way, only certain materials are suitable for recycling, such as metals, plastics and glass. Organic waste can be made into compost" (Department of Basic Education, 2011, p. 23).

It was also found that recycling is integrated in other concepts. For example, on Page 22 (Department of Basic Education, 2011), the CAPS document discusses Properties of Materials. Here, learners are taught that:

> "Properties of materials determine their suitability for a particular use such as: *(refer to Grade 5 Energy & Change);* strength; flexibility; boiling and melting points; electrical conductivity; heat conductivity. The study reveals that according to CAPS curriculum learners need to be taught that the boiling point of a substance is the *temperature* at which the liquid starts boiling (boiling is a rapid change in state from a liquid state to a gas state)other factors (such as cost, color and texture) are also taken into account when using materials."

In the above example, learners are introduced to the properties of materials. Thereafter, they are taught, through practical activities, management of different forms of waste of which recycling is one.

Table 4.1

The appearance of the terms recycling, recycle and recycled in the Natural Sciences CAPS document (extracted from Department of Basic Education, 2011).

Term	Page reference	Grade	Strand	Content
Recylcing	13	7	Matter & Materials	Separating mixtures -- Mixtures -- Methods of physical separation -- Sorting and recycling materials
	23	7	Matter & Materials	Sorting and recycling materials • it is every person's responsibility to dispose of waste in a proper way • only certain materials are suitable for recycling, such as metals, plastics and glass. Organic waste can be made into compost. Material which cannot be recycled has to be dumped • local authorities have systems for sorting and disposing of waste materials • there are negative consequences associated with poor waste management such as pollution of water, soil and the environment; health hazards and diseases; blockage of sewage and water drainage systems; waste of land used for landfills; wastage of valuable materials which could be recycled

	38	8	Life & Living	Conservation of the ecosystem • environmentalists and others work towards managing ecosystems, such as control of alien vegetation and preservation of wetlands • individuals can contribute to conservation in various ways, such as appropriate waste disposal (including recycling, reusing)
	39	8	Life & Living	Useful micro-organisms • some micro-organisms play an essential role in ecosystems, such as decomposing dead plant and animal matter, thereby recycling nutrients in the soil
Recycle	37	8	Life & Living	Feeding relationships • plants are producers. They make their own food • animals are consumers. They obtain food from plants either directly (such as herbivores) or indirectly (such as carnivores) • herbivores: feed on plant material (for example cows, horses) • carnivores: feed on other animals (living or dead). The group includes: -- those that hunt other animals (prey) are predators (for example leopards) -- those that eat dead animals are scavengers (for example hyenas, vultures) -- insectivores feed mainly on insects and other smaller invertebrates such as worms (for example earthworms) • omnivores: feed on plants and animals (for example humans) • decomposers: breakdown (decompose) the remains of dead

				plants and animals. They recycle important nutrients in the environment (for example bacteria, fungi, earthworms)
Recycled	23	7	Matter & Materials	Sorting and recycling materials • it is every person's responsibility to dispose of waste in a proper way • only certain materials are suitable for recycling, such as metals, plastics and glass. Organic waste can be made into compost. Material which cannot be recycled has to be dumped • local authorities have systems for sorting and disposing of waste materials • there are negative consequences associated with poor waste management such as pollution of water, soil and the environment; health hazards and diseases; blockage of sewage and water drainage systems; waste of land used for landfills; wastage of valuable materials which could be recycled

In this instance, the Natural Sciences CAPS document suggests that the following practical activity:

> "investigating and comparing the strength of selected materials [by dropping weights onto, or hanging weights on materials such as different shopping bags, aluminum foil, newspaper, photocopier/printer paper, plastic wrap, wax paper]; reading about the boiling and melting points of different materials such as salt, water, ethanol, paraffin, iron, copper, gold, silver, lead; investigating what happens when water heats up and boils [heat water and take the temperature reading every 3 minutes until the temperature reading becomes constant for three readings]. Record time intervals and temperature readings in a table, and draw a line graph [Note: you can do the same with other liquids such as orange juice, apple juice, cola]; reading and writing about how a material such as a metal or plastic or fuel is produced and its impact on the environment" (Department of Basic Education, 2011, p. 22).

As part of the above activity, learners are expected to recycle materials. Additionally, in this activity, learners are taught about the "the production and/or use of materials such as metals, plastics and fuels has an impact on the environment" (Department of Basic Education, 2011, p. 22).

In response to the first sub-question therefore, the above evidence, therefore, suggests that recycling is taught in Natural Sciences as a concept integrated into other concepts. The teaching method in this regard includes practical activities where learners are recycle recyclable materials in their everyday life.

4.3 Learners understanding of content knowledge related to recycling

Having established that Recycling is taught in Natural Sciences, the researcher went on to investigate learners' understanding of content knowledge related to recycling. Using a closed-ended multiple choice test, learners were asked to respond to several items that probed their understanding of recycling. Results showed that there was no significant difference between the control and experimental group mean scores in the pre-test ($p > .05$, Table 4.2). To this end, in the pre-test, the mean score for the control group was 56% (S.D. = 19.21%), and 51.05% (S.D. = 15.67%) for the experimental group.

Table 4.2

A comparison of student performance in the content knowledge pre-intervention test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	4,104	0,045	-1,713	148	0,089	-0,04947	0,02889	-0,10656	0,00761
Equal variances not assumed			-1,623	95,515	0,108	-0,04947	0,03048	-0,10999	0,01104

The pre-intervention results also showed that both groups had highest understanding of the definition of recycling, the role players involved in recycling as well as recyclable materials (Table 4.3). However, they had poor understanding of role players involved in recycling, the definition of biodegradation, and the impact of recycling among others.

Table 4.3

Students understanding of specific concepts related to recycling as found in the pre-test.

Learner Groups		Average Content Knowledge	Recycling definition	Recyclable materials	Recyclable materials	Recycling role players	Biodegradability definition	Recycling role players	Recyclable materials	Impact of not recycling	Impact of not recycling	Strategies for waste management at school
Experimental Group Pre-Intervention	N	95	95	95	95	95	95	95	95	95	95	95
	Mean	0,5105	0,94	0,36	0,54	0,08	0,32	0,76	0,78	0,21	0,54	0,59
	Std. Error of Mean	0,01608	0,025	0,049	0,051	0,029	0,048	0,044	0,043	0,042	0,051	0,051
	Std. Deviation	0,15674	0,245	0,482	0,501	0,279	0,467	0,431	0,417	0,410	0,501	0,495
	Variance	0,025	0,060	0,232	0,251	0,078	0,218	0,185	0,174	0,168	0,251	0,245
Control Group Pre-Intervention	N	55	55	55	55	55	55	55	55	55	55	55
	Mean	0,5600	0,85	0,53	0,75	0,24	0,25	0,67	0,93	0,22	0,49	0,67
	Std. Error of Mean	0,02590	0,048	0,068	0,059	0,058	0,059	0,064	0,035	0,056	0,068	0,064

	Std. Deviation	0,19206	0,356	0,504	0,440	0,429	0,440	0,474	0,262	0,417	0,505	0,474

The results in the post-test, however, showed that, students' content understanding in the control group dropped by 2.26% from 56.00% (S.D. = 19.21%) to 53.74% (S.D. = 20.94%) (Table 4.4). The mean difference, however, was not statistically significant ($p > .05$) (Table 4.4). Levene's Test for equality of variance also showed that there was no significant difference in the variance (ie, $p = .517$). Students' knowledge of recyclable materials, the definition of biodegradability, recycling role players and strategies for waste management in schools improved. However, this improvement was not statistically significant ($p > .05$). Results also showed that students' understanding of the definition of recycling, and the impact of not recycling did not improve.

Table 4.4

A comparison of control group learners content knowledge in the pre- and post-intervention tests.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	0,422	0,517	0,564	99	0,574	0,02256	0,03998	-0,05678	0,10190
Equal variances not assumed			0,560	92,464	0,577	0,02256	0,04030	-0,05746	0,10258

The results also showed that in the experimental group, students the mean difference was 3.16% (Table 4.5). A t-test here showed that learner performance in the post test was not significantly higher than in the pre-test ($p > .05$). There was, however, a significant change in the variance ($p = .018$). Results here showed that students understanding of the recyclable materials, recycling

role players, definition of biodegradable and strategies for waste management at school improve, albeit not statistically significantly ($p > 0.05$). However, students' knowledge of the impact of not recycling did not improve.

Table 4.5

A comparison of experimental group learner's content knowledge in the pre- and post-intervention tests.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	5,666	0,018	-1,261	188	0,209	-0,03158	0,02504	-0,08098	0,01783
Equal variances not assumed			-1,261	182,392	0,209	-0,03158	0,02504	-0,08099	0,01783

In the post-test, the control group mean score was 53.74% (S.D. = 20.94%) whereas the experimental group mean score was 54.21% (S.D. = 18.71%). These results show that the experimental group had a slightly better understanding of content knowledge related to recycling. However, a t-test comparison of these two groups' post-test scores showed that there was no significant difference between them ($p > .05$). Similarly, Levene's test for equality of variances showed that there was significant difference between the variances ($p = .429$).

Overall therefore, the result showed that, the intervention does not seem to have improved students understanding of recycling in any significant degree. Students participating in the intervention did not have any significant understanding of recycling than those who did not. A discussion of these results in presented in the Discussion (see Chapter 5).

4.4 Learners' attitudes towards recycling, perceptions of recycling and the role of education in recycling

The researcher also explored students' attitudes towards recycling. Results here showed that both sets of students had a generally positive attitude towards recycling pre- and post the intervention. In this instance, pre-test results showed that 78.2% of learners in the control group and 84.2% of learners in the experimental group had a positive attitude towards recycling (Table 4.6). Similarly, learner's attitudes towards recycling as determined in the post-test were generally positive. In this instance, 100% of learners in the control group and 76% in the experimental group reported positive attitudes towards recycling.

Table 4.6

The summary of learners' attitudes towards recycling

Learner Groups			Frequency	Percent
Experimental Group Pre-Intervention	Valid	Positive	80	84,2
		Neutral	14	14,8
		Negative	1	1,1
		Total	95	100,0
Control Group Pre-Intervention	Valid	Positive	43	78,2
		Neutral	10	18,2
		Negative	2	3,6

		Total	55	100,0
Experimental Group Post-Intervention	Valid	Positive	72	75,8
		Neutral	22	23,2
		Negative	1	1,1
		Total	95	100,0
Control Group Post-Intervention	Valid	1.00	46	100,0

A Mann-Whitney U test was then used to determine if there was significant change in student's attitudes in relation to the intervention recycling project in the experimental group. Results in this regard showed that there was no significant difference between students' attitudes prior and post the recycling project, in the experimental group (Table 4.7).

Table 4.7

A comparison of student's attitudes towards recycling at school, perceptions of recycling and perceived role of education in recycling prior and post the recycling project, in the experimental group.

	Attitude towards recycling at school	Perceptions of recycling	Perceived role of education in recycling
Mann-Whitney U	4132,500	4198,500	4511,500
Wilcoxon W	8692,500	8758,500	9071,500
Z	-1,444	-0,869	-0,011
Asymp. Sig. (2-tailed)	0,149	0,385	0,992

The Mann-Whitney U test was also used to determine if there was significant change in control group students' attitudes in relation to the intervention recycling project. Results in this regard

showed that there was a significant difference between students' attitudes prior and post the recycling project (p = .001, Table 4.8).

Table 4.8

A comparison of student's attitudes towards recycling at school, perceptions of recycling and perceived role of education in recycling prior and post the recycling project, in the control group.

	Attitude towards recycling at school	Perceptions of recycling	Perceived role of education in recycling
Mann-Whitney U	989,000	1044,000	1265,000
Wilcoxon W	2070,000	2125,000	2346,000
Z	-3,354	-1,603	0,000
Asymp. Sig. (2-tailed)	0,001	0,109	1000

Results in this regard showed that prior to exposure to the intervention, students in the experimental group had neutral attitudes regarding:

- How they "feel when people throw things that should be recycled;
- Extent of worry about the current school level of recycling;
- Frequency of recycling; and,
- How often do I talk to others about the importance of recycling?"

These attitudes remained generally the same in the post-test; expect for the students' "feeling when people throw things that should be recycled". In the post test, students had stronger negative feelings about people throw things that should be recycled. Interestingly, the same trends were observed in the control group pre-test. However, in the post test, students in the control group did not have negative attitudes towards "people throw things that should be recycled" or "worry about the current school level of recycling".

Data were also analysed to determine learner's perceptions of recycling. It was found that in the pre-test, the majority of learners in both groups' generally positive perceptions towards recycling

(Table 4.9). Notably, 85.3% of learner in the experimental group reported positive to somewhat positive perceptions of recycling. In the control group, 90.9% of learners reported positive to somewhat positive perceptions of recycling. In the post-test however, 86.4% of learners in the experimental group reported positive to somewhat positive perceptions of recycling, while 95.7% of the learners reported positive to somewhat positive perceptions of recycling. These results suggest that, overall, learners in the control group, had greater positive perception of recycling than learners in the control group. A Mann Whitney U test, however, showed that with regards to students in both groups, there was no significant change in students' perceptions in the post-intervention ($p > .05$, Tables 4.7 and 4.8).

Table 4.9

The summary of learners' perceptions of recycling

Learner Groups		Frequency	Percent
Experimental Group Pre-Intervention	Positive	36	37,9
	Somewhat positive	45	47.4
	Somewhat negative	13	13.7
	Negative	1	1,1
	Total	95	100,0
Control Group Pre-Intervention	Positive	20	36,4
	Somewhat positive	30	54.5
	Somewhat negative	4	7.2
	Negative	1	1,8
	Total	55	100,0
Experimental Group Post-Intervention	Positive	35	36,8
	Somewhat positive	49	50.6
	Somewhat negative	10	10.6
	Negative	1	1,1
	Total	95	100,0

Control Group Post-Intervention	Positive	24	52,2
	Somewhat positive	20	43.5
	Somewhat negative	2	4.4
	Total	46	100,0

Results were also analysed to determine students' perceived role of education in recycling. Results here showed that, in the pre-test, 98% and 100% of students in the experimental and control groups respectively had a positive perception of the role of education in education. These figures did not change in the post test, as supported by the Mann-Whitney U test which showed no significant difference between the students' perceived role of education in recycling in the pre- and post-intervention tests ($p > .05$).

Mann-Whitney U test analysis of the pre-test results also showed that students in both groups had generally similar attitudes towards recycling, perceptions of recycling and the role of education in recycling ($p > .05$). This result was also observed in the post-test, except for the attitudes towards recycling. In this instance, learners in the experimental group had significantly more positive attitudes towards recycling those students in the control group ($p < .001$). This observation suggests that participating in the recycling project may have led to the adoption of positive attitudes towards recycling among learners in the experimental group.

4.5 Correlation between learners' content knowledge of recycling, attitudes towards recycling, perceptions of recycling and the role of education in recycling

Data were then analysed to determine if there is a relationship between learners' content knowledge of recycling, attitudes towards recycling, perceptions of recycling and the role of education in recycling. This focused primarily on the experimental group results after the

intervention. Results (Table 4.10) here showed that content knowledge does not correlation significantly with attitudes towards recycling, perceptions of recycling and the role of education in recycling. However, attitudes towards recycling had a significant correlation with perceptions of recycling and the role of education in recycling. This correlation was, however, not strong. Perceptions of recycling and the role of education in recycling did not have a significant correlation.

Table 4.10

Correlations between learners' content knowledge of recycling, attitudes towards recycling, perceptions of recycling and the role of education in recycling

			Average Content Knowledge	Attitude towards recycling at school	Perceptions of recycling	Perceived role of education in recycling
Spearman's rho	Average Content Knowledge	Correlation Coefficient	1000	-0,022	-0,017	-0,060
		Sig. (2-tailed)		0,714	0,779	0,307
		N	291	291	291	291
	Attitude towards recycling at school	Correlation Coefficient	-0,022	1000	.168**	.270**
		Sig. (2-tailed)	0,714		0,004	0,000
		N	291	291	291	291
	Perceptions of recycling	Correlation Coefficient	-0,017	.168**	1000	0,078
		Sig. (2-tailed)	0,779	0,004		0,184
		N	291	291	291	291
	Perceived role of education in recycling	Correlation Coefficient	-0,060	.270**	0,078	1000
		Sig. (2-tailed)	0,307	0,000	0,184	
		N	291	291	291	291

**. Correlation is significant at the 0.01 level (2-tailed).

4.6 Conclusion

Results of the present study as reported above, suggests that:

a) Participating in the recycling project did not have a significant impact on students' content knowledge of recycling.
b) Participating in the recycling project did not have a significant impact on students' attitudes towards recycling.
c) Participating in the recycling project did not have a significant impact on students' perceptions of recycling.
d) Participating in the recycling project did not have a significant impact on students' perceived role of education in recycling
e) Content knowledge is not related to attitudes towards recycling, perceptions of recycling and the role of education in recycling.
f) Attitudes towards recycling are related to perceptions of recycling and the role of education in recycling.

These results are discussed in the following Chapter in relation to existing literature and theoretical framework of the present study.

5 CHAPTER 5

5.1 Introduction to the Chapter

The primary aim of the present study was to determine the effectiveness of a small scale recycling project on natural sciences grade seven learners' perceptions, attitudes and understanding of scientific knowledge of recycling. In this instance, the research questions asked, "what is the effectiveness of a small scale project on improving grade 7 learners' perceptions, attitudes and understanding of scientific knowledge of recycling?" Related to this, the following sub-questions were asked:

- To what extent is recycling integrated in the Natural Sciences curriculum?
- To what extent do grade 7 learners have a scientifically correct understanding of content knowledge related to recycling?
- What are grade 7 learners' attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling?
- What is the relationship between learners' content knowledge of recycling, attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling?

In the current chapter, the results obtained in Chapter 4 following the research methods discussed in Chapter 3 are discussed against the literature presented in Chapter 2. This is aimed at responding to the aims of the study and research questions posed in Chapter 1.

5.2 Key findings

5.2.1 Integration of recycling in the curriculum

The first important finding of the study is that recycling is integrated in the Natural Sciences curriculum as reported in Section 4.2 of this dissertation. This integration of recycling in the curriculum responds positively to Littledyke (2008, p. 1) who suggests that education should "encourage and develop in children a sense of relationship with the environment, which may translate into pro-environmental behaviour that follows through into adulthood". This is evident in that the curriculum does not merely present recycling as a concept, but provides a direct link to everyday life. For example, it was found that the curriculum actually states that "it is every person's responsibility to dispose of waste in a proper way" (Department of Basic Education, 2011, p 23). Additionally, the curriculum provides specific everyday life consequences of poor waste management. In this instance, the curriculum states that "there are negative consequences associated with poor waste management such as pollution of water, soil and the environment; health hazards and diseases; blockage of sewage and water drainage systems; waste of land used for landfills; wastage of valuable materials which could be recycled" (Department of Basic Education, 2011, p 23). It can be deduced from this therefore that the Natural Sciences curriculum provides necessary knowledge to learners on recycling which can be adapted into everyday life.

Another important finding was that recycling is integrated in the curriculum into other topics rather than as a standalone topic. For example, it was found that recycling is taught in Grade 7 in relation to mixtures and solutions. This is primarily within the context of physical sciences where learners are taught about matter and materials. In this case, recycling is taught to learners in terms of teaching the differences between solutions and mixtures where sorting and recycling is applicable to mixtures and not solutions. This integration of scientific concepts is in line with suggestions that science teaching and learning should provide a solid foundation of facts and basic science while also fostering creative, cross-disciplinary problem identification and solving skills (Roma & Shah, 2013). In the present study, it was found therefore that while teaching factual knowledge regarding the properties of matter and materials, the curriculum also provided

learners with an opportunity to learn everyday life problem identification and solving skills related to recycling and waste management. This is significant because it shows that the Natural Sciences curriculum responds positively to recommendations in literature that suggest that "schools should take an active role in this process, serving as a vehicle to make children more aware of their role within the natural world and how to act in an environmentally responsible manner" (Williams, 2011, p. 2)

In responding to the first research sub-question (ie, to what extent is recycling integrated in the Natural Sciences curriculum) therefore it is concluded therefore that the Natural Sciences curriculum provides relative knowledge and skills required by learners to manage waste materials through recycling. The actual impact of this teaching on learners' perceptions, attitudes and understanding of scientific knowledge of recycling is discussed in the following sub-sections.

5.2.2 Learners' understanding of content knowledge related to recycling

Prior to participating in the recycling project, the results of the study show that students generally understand the importance of recycling. However, this understanding is relatively low (ie, the scores were just over 50%). There were no differences between students from both groups (the control group and experimental group). Specific topics related to recycling that students understood the most were also identified. These included definition of recycling, the role players involved in recycling as well as recyclable materials. It was, however, found that students did not understand role players involved in recycling, the definition of biodegradation, and the impact of recycling among others. These findings are significant because they provide a baseline on which learners could be educated about recycling. For example, researchers agree that learners build new knowledge on prior knowledge which may have been constructed through informal and formal learning experiences (Ambrose, Bridges, DiPietro, Lovett, Norman, 2010). Additionally

research shows that learners attitudes towards recycling and their intentions to recycle are informed by existing knowledge and the ability to translate that knowledge into behaviour (Mahmud & Osman, 2010). Consequently, by identifying the prior knowledge related to recycling, the present study shows that perhaps poor recycling behaviours among learners are due to limited understanding of recycling and potentially an inability to translate this knowledge into positive behaviour.

Another significant finding is that the participating in the recycling project did not lead to improved understanding of recycling among the students. This is because students participating in the intervention (ie, control group) did not have any significant understanding of recycling than those who did not (ie, even though the raw score was higher, the t-test showed that there was no significant difference). Interestingly, in the control group, students' knowledge in the control group dropped by over 2% while the experimental group improved by 3% (both not statistically significant). The improvement in the control group could be due to participating in the recycling project. Not participating in the recycling project may have negatively affected students in the control group. According to Zhang, Liu, Wen, & Chen (2017), students are likely to participate in recycling of solid waste if they have knowledge related to waste classification, and their friends participate in related activities. Consequently, in light of the findings in the present study, the author posits that learners participation in the recycling project may have had positive impact on their understanding and willingness to recycle. This view is supported by Williams (2011, p. 1) who suggests that "recycling education can positively impact the environmental attitudes and behaviors of students and increase their knowledge".

The minimal improvement suggest that further actions may be required to significantly improve learners understanding of recycling. These could include increasing recycling content knowledge in the curriculum, adopting teaching strategies that have been shown to significantly improve students content understanding. These could include project-based learning, case-based learning, and enquiry-based learning. Additionally, recycling projects such as the one implemented in the present study could be undertaken for longer. For example, the present

study showed a 3% improvement in learners content understanding. Therefore, perhaps a longer project could have a higher percentage improvement, more so if such a project is directly linked (integrated) into classroom activities.

In responding to the second research sub-question (to what extent do grade 7 learners have a scientifically correct understanding of content knowledge related to recycling), therefore, the present study has shown that learners have relatively satisfactory knowledge or recycling, this knowledge imrpves, albeit insignificantly, due to participation in the recycling project.

5.2.3 Learners' attitudes towards recycling, perceptions of recycling and the role of education in recycling

The third sub-question sought to determine learners' attitudes towards recycling, perceptions of recycling, and the role of education in promoting recycling. Results showed that learners in both groups had positive attitude towards recycling. However, there was no significant difference between experimental group students' attitudes prior and post the recycling project. However, students' attitudes in the control group improved significantly even though they did not participate in the recycling project. Similarly, students in both groups generally had positive perceptions towards recycling with learners in the control group reporting greater positive perception of recycling than learners in the control group post the recycling project. It is not clear why learners in the control group improved significantly better than those in the experimental group even though they did not participate in the recycling project. The cognitive load theory and the limited capacity theory suggest that there limited amount of information that the working memory can process at any given time (Sweller, 1988). Researchers have actually shown that certain instructional practices can increase the cognitive load leading to learning difficulties and negative attitudes towards learning. Sweller (1988) actually argued that some learning activities may complicate learning making it unnecessarily complex. This leads to reduce attention, information processing, and increases negative attitudes towards the learning and the content

being learnt. While Sweller's views were not tested empirically in the present study, the author posits that participating the in recycling project may have added an additional strain on learners cognitive load leading to lack of improvement in content understanding, poor attitudes and perceptions of recycling. This may actually have been exacerbated by the fact that other learners did not participate (ie, control group). As such, those who participated may have felt unfairly treated by the teachers leading to poor attitudes and perceptions of recycling. This hypothesis, however, requires further investigation in order to reach conclusive findings.

5.3 Conclusions

During pre and post intervention learners were very much excited, they had positive attitudes towards the recycling project and after a week they seem to understand their role in the recycling project and they had fun in doing it. I think that the lack of complexity played an important role, and also the fact that the students were encouraged to recycle a small number of recyclables was also very beneficially these results are likely to a previous study findings done by the European Recovery and recycling association (ERRA) they indicated that recycling in smaller numbers have also helped them to reduce the cost and increases participation (ERRA, 2013). Results show that during post intervention there was no improvement in their understanding of recycling related content that is currently included in the CAPS curriculum, the study results revealed that although most students were able to define the term recycling they were unable to describe other concepts that were related to recycling such as biodegradable and many more. It can be concluded by saying that students' average knowledge and understanding of recycling related content was not satisfactory. Results revealed that they were many subjects in the CAPS curriculum that teaches the learners about recycling the problem was that all the subjects had limited information and the was no time for teachers to implement the topics because of the time that was allocated to recycling topics was very little. This information was supported by the study done in Nigeria where learners have heard and knows a lot of terms regarding recycling

but could not explain the terms in general (alaydin , 2014). However, present study results they were conscious of recycling.

Results of the present study also revealed that one of the reason recycling activities is not largely implemented in the classroom is because of various barriers, one of the barriers is lack of time due to various factors. One of the factors are CAPS curriculum requirements to meet the DBE requirements for standard testing, the current study findings shows that there is a little time for recycling topic in the natural science curriculum and this factor does not allow the teachers to add more of recycling activities in the existing curriculum because the topic recycling and the concepts related to it are only given only two hours yearly. Recommendations can be that since the topic recycling is an environmental education and environmental education is multidisciplinary and recycling related content not only integrated in natural sciences curriculum but it there in other subjects. The fact that the recycling is included in other subject shows that there is no need for the department of education to add more of recycling topic into natural sciences CAPS curriculum the reason is the fact that although there is little information about the recycling in natural science curriculum students but they can be provided with the opportunity to do so in all the other subject. Recycling related topics can be used as the foundation for example problems and illustrated points in subjects such as maths, social sciences and languages. Moreover that can help to ensure that the learners gain awareness without the teachers needing to overhaul their curricular.

The findings of the present study also revealed that it takes a good deal of time to create lesson plans and develops classroom resources; the time which the teacher lacks, however, resources can be made using recycling as a tool to provide the needed resources for teaching and learning these recommendations comes from the fact that during the interventions learners manage to create a lot of resources from the recyclables materials. The results of the present study lead to findings which made the researcher to recommend in-service workshops which should be provided for teachers as they could be extremely beneficial in providing them with update information regarding the changes that would have been made. These workshops could also be

of help to ensure that teachers who do not have a background in science have the information necessary to integrate recycling activities into CAPS curriculum. The results of the study also shows that there is a room for improvement in learner's knowledge of recycling in South African schools so that they reach tertiary level with a lot of information regarding this issue.

The results obtained from the study showed that there is also a need to put more emphasis in South African school about integration of more of recycling related content into all the subjects in the CAPS curriculum than in recycling project which will enable learners to understand more about recycling and waste management in order to reduce environmental problems, reason being the results has shown that participating in the recycling project did not have a significant impact on students' content knowledge of recycling; it also had no impact in their attitudes and perceptions towards recycling but the results reveals that their understanding of the concepts related to recycling was unsatisfactory. This results is unlikely to a previously study that found correlation between students' knowledge and recycling projects (kabir 2014). Their studies found enormous support with previous studies, who has documented some relationships between students' knowledge, attitudes and perceptions and participation in recycling projects (Navarro, 2002; Clay, 2005; Budak &Oguz, 2008; Christenson, 2008). According to the results of the present study it is clear that recycling attitudes and perceptions are affected by various factors and in order to increase scientific understanding of knowledge of recycling content in learners these factors needs to be overcome.

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7 APPENDIX 1 INSTRUMENTS FOR DATA COLLECTION

INSTRUMENTS FOR DATA COLLECTION

questionnaire

INSTRUCTIONS

- **READ ALL QUESTIONS CAREFULLY BEFORE YOU ANSWER.**
- **TY TO BE HONESTY AS POSSIBLE.**
- **ANSWER ALL THE QUESTIONS AS BEST AS YOU CAN.**
- **WRITE NEATLY.**
- **REMEMBER THERE IS NO WRONG OR CORRECT ANSWER.**

Section A: Attitudes and Perceptions

1.1 Circle the letter with the correct answer.

1. How often do you recycle?
   a) Once in a while
   b) Most of the time
   c) Always
   d) Never
2. Why do you recycle?
   a) I want to help saving natural resources
   b) My teacher or my parents make me recycle
   c) All my friends are participating in the recycling project
   d) I don't understand why
3. Where do you think people should recycle?
   a) At home
   b) At school
   c) Near shopping malls
   d) All of the above
4. Who do you think should be responsible for recycling projects?

a) Municipality

b) Elderly people

c) Learners

d) Everyone

5. Which of the following materials can be recycled?

a) Paper, plastic, metals and bottles.

b) Food, paper, banana peels and wood.

c) None of the above

d) All of the above

6. How important is participating in a recycling project to you personally?

a) Very important

b) Fairly important

c) Not important at all

d) I don't know

7. Which of these statements best describes your attitude towards recycling?

a) I don't understand why we should recycle

b) I can recycle if it does not requires a lot of effort

c) I can recycle if someone can help me understand the need to recycle

d) I do not recycle

8. How often do you talk to others about the importance of recycling?

a) Never

b) Sometimes

c) Most of the time

d) Always

9. If your school has a recycling project, will you be interested and take part?

a) Yes

b) No

c) Not sure

d) I don't know

10. What might cause you not to recycle?

a) I don't always know what garbage can be recycled

b) Nothing can stop me from taking part in recycling because I know it's important

c) I just cannot be bothered to recycle

d) I don't know why we should be recycling

1.2. circle your choice

1. Recycling projects in schools can help learners to understand the importance of recycling.
    a) Agree
    b) Disagree
    c) Neutral
2. Participating in a small scale recycling project can help to improve learners' understanding of recycling content in a natural science class.
    a) Agree
    b) Disagree
    c) Neutral
3. Learners need to be educated even more about recycling related content in a natural science class.
    a) Agree
    b) Disagree
    c) Neutral
4. Having a small scale recycling project in the school will keep the school environment clean.
    a) Agree

b) Disagree

c) Neutral

5. Participating in a recycling project is fun and exciting.

a) Agree

b) Disagree

c) Neutral

6. I feel good when I recycle.

a) Agree

b) Disagree

c) Neutral

7. If I saw someone who is not recycling, I would tell them to recycle and explain the importance of recycling.

a) Agree

b) Disagree

c) Neutral

8. I know and I understand why recycling is promoted.

a) Agree

b) Disagree

c) Neutral

9. I don't know how to recycle properly but I would like to learn.

a) Agree

b) Disagree

c) neutral

10. Education about recycling should be increased so more people can recycle.

a) Agree

b) Disagree

c) Neutral

1.3 Answer the following questions the best way you can.

1.3.1 What is recycling?

1.3.2 In your own understanding please explain why it is important to recycle?

1.3.3 What type of waste materials is produced by your school?

1.3.4 From your answer above what materials do you think can be recycled in your school?

1.3.5 Do you believe learners need to be more educated on the subject of recycling?

1.3.6 If your school has a recycling project, would you make an effort to recycle more?

1.3.7 Have you ever been educated about the importance of recycling?

1.3.8 Which subjects teaches you about recycling?

1.3.9 What will happen if we don't recycle?

1.3.10 Do you think it is important to talk about recycling?

1.4 Select one correct answer from the following:

1.4.1 How do you feel when you see people throw things that should be recycled?

- Not sure
- Worried
- Not worried
- Very worried

1.4.2 How worried are you about the current school level of recycling.

- Not sure
- Worried
- Not worried
- Very worried

1.4.3 Recycling can help improve your school environment.

- Agree
- Disagree
- neutral

1.4.4 Everyone should recycle as much as possible.

- Agree
- Disagree

- Neutral

1.4.5 Recycling related content should be integrated even more in to natural science curriculum.

- Agree
- Disagree
- Neutral

1.4.6 I believe education will be more effective if recycling is used as an educational tool.

- Agree
- Disagree
- Neutral

1.4.7 How will you rate your level of understanding the scientific knowledge of recycling?

- Good
- Not good
- Very good
- I don't know

1.4.8 I will be interested in recycling at home and at school.

- Agree
- Disagree
- Neutral

1.4.9 Recycling is the great idea that can help slow the filling of landfills.

- Agree
- Disagree
- Neutral

1.4.10 I believe if learners could understand the direct consequence of not recycling they would do it more often.

- Agree
- Disagree
- Neutral

1.4.11 What would you prefer to recycle an item or to just throw it away?

- Recycle
- Throw it away
- I don't know

1.4.12 Recycling is a very important topic that needs to be integrated more in natural science curriculum

- Agree
- Disagree
- Neutral

1.4.13 I would like to see recycling happening in our community

- Agree
- Disagree
- Neutral

Section B: Content knowledge

Choose the correct answer from those given below each question. Answer the question by circling the alphabet (A, B, C OR D) in line with the correct answer or statement.

1. _____ can be defined as a way to treat things that have been used so that they can be used again.
   a) Re-using
   b) Recycling
   c) Reducing
   d) recovering

2. Type of metal that is no longer used for its original purpose, but can be reprocessed and used to make new products.
   a) Steel
   b) Copper
   c) Scrap metal

d) Copper

3. Metals, paper, glass and plastic……..
   a) Can have a positive impact on the environment if they are left lying around.
   b) Can be recycled and provide a way for people to earn money.
   c) Cannot be reprocessed and used to make product.
   d) They are biodegradable.
4. People that collect scrap metal and deliver it to scrap dealers are called……
   a) Thieves
   b) Gleaners
   c) Cleaners
   d) Delivery boys
5. Biodegradable means…….
   a) Able to break down like compost.
   b) Waste compost
   c) Liquid waste
   d) Cannot be break down like compost
6. Recycling is
   a) everyone's responsibility
   b) Poor people's responsibility
   c) Learner's responsibility
   d) Municipality's responsibility
7. Which of this cannot be recycled
   a) Metal
   b) E-waste
   c) Paper
   d) Food
8. A greenhouse gas that's produced in landfills as materials degrades/ breaks down.
   a) Organic waste
   b) Landfill

c) Methane

d) Biodegradable

9. Poor waste management leads to problems such as:
    a) Pollution of our water, soil and the environment.
    b) Good and health environment.
    c) Reduced landfills.
    d) Valuable materials which could be recycled.
10. Which of the following options can be a best way to manage waste in the school
    a) Recycling
    b) Burn all the waste available on the dumping side
    c) Put waste on the waste bins.
    d) Stop throwing papers around.

APPENDICES

APPENDIX B

UNISA university of south africa

REQUEST PERMISSION CIRCUIT OFFICE

Request for permission to conduct research at Mbazima primary school

Title of the title of research: The effectiveness of a recycling project on Natural Science learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

Date: / / 2018

Circuit manager
Nkomazi East Circuit
Department of Education
Contact Details: 082 575 1127

Dear Shabangu P. (Mr.)

I, Busisiwe Patience Mkhonto am doing research under supervision of Mnguni L.E , a Professor in the Department of Science and Technology towards a MED at the University of South Africa. We are requesting for permission to conduct research in a study entitled the effectiveness of a recycling project on natural science learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

The aim of the study is to determine the effectiveness of a small scale recycling project on learner's perception attitudes and understanding of scientific knowledge of recycling.

The school has been selected because of its characteristics population that meets the needs of the study which are the aims and the objectives of the study.

The study will entail learners to

- Take part in a survey questionnaire.
  The learners will be asked to answer a questionnaire. All grade seven learners will be participating in the answering of the questionnaire. The questionnaire will be administered in grade seven classes in the school during school hours. They will be expected to answer questionnaire twice before and after they have participated in a recycling project.
- They will be asked to take part in a recycling project

The researcher will establish a small scale recycling project inside the school. Learners will be expected to recycle all the waste that is produced by the school e.g. papers, plastics, broken furniture's etc.

- Participate in a focus group interview.

The researcher will select only ten learners to participate in the focus group interview. Only those who are selected will be participating in the focus group interview. The interview will take place in the classroom in the school.

- Complete a test.
  A test of content of content knowledge will be administered in the classroom all grade seven learners will be asked to complete the test. The test will be assessing their knowledge of recycling content.

The benefits of this study are: the study will enhance learners understanding of scientific knowledge of recycling; help learners become critical thinkers at a young age, improve the school environment and help them become aware of their role towards the environment, learners will become scientific literate.

Although children are younger than 18, the topic is not sensitive therefore no risk or harm is anticipated.

There will be no reimbursement or any incentives for participation in the research.

Feedback procedure will entail the researcher to give feedback to learners verbally and in a written form. After the data collection process has commenced the researcher will have a short meeting to brief them with the results of the study and a letter with explanation of the results of the study will be mailed to them. It will also be available in the school notice boards. All the feedback will be given to learners after the data collection has been commenced

Yours sincerely

Busisiwe Patience Mkhonto (Reaseacher)

APPENDIX C

REQUEST PERMISSION THE SCHOOL

Request for permission to conduct research at Mbazima primary school

Title of the title of your research: The effectiveness of a recycling project on natural science learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

Date: / / 2018

The Principal
Mbazima Primary School
Contact Details: 0822584826
Email address: mbazimaprimaryschool@gmail.com

Dear Makhubela D.P. (Mr.)

I, Busisiwe Patience Mkhonto am doing research under supervision of Mnguni L.E , a Professor in the Department of Science and Technology towards a MED at the University of South Africa. We are requesting for permission to conduct research in a study entitled the effectiveness of a recycling project on natural science learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

The aim of the study is to determine the effectiveness of small scale recycling project on learner's perception attitudes and understanding of scientific knowledge of recycling.

The school has been selected because of its characteristics population that meets the needs of the study which are the aims and objectives.

The study will entail learners to

- Take part in a survey questionnaire.
  The learners will be asked to answer the questionnaire. All grade seven learners will be participating in the answering of the questionnaire. The questionnaire will be administered in grade seven classes in the school during school hours. They will be expected to answer questionnaire twice before and after they have participated in a recycling project.
- To take part in a recycling project.
  The researcher will establish a small scale recycling project inside the school. Learners will be expected to recycle all the waste that is produced by the school e.g. papers, plastics, broken furniture's etc.

- Participate in a focus group interview.
  The researcher will select only ten learners to participate in a focus group interview. Only those who are selected will be participating in the focus interview. The interview will take place in the classroom in the school.
- Complete a test.
  A test of content of content knowledge will be administered in the classroom all the learners will be asked to complete the test. The test will be assessing their knowledge of recycling content.

The benefits of this study are: the study will enhance learners understanding of scientific knowledge of recycling; help learners become critical thinkers at a young age, improve the school environment and change learner's knowledge, skills and behaviour towards recycling and help them become aware of their role towards the environment, learners will become scientific literate and will lessen the behaviour that lead environmental degradation.

Although children are younger than 18, the topic is not sensitive therefore no risk or harm is anticipated.

There will be no reimbursement or any incentives for participation in the research.

Feedback procedure will entail the researcher to give feedback to learners verbally and in a written form. After the data collection process has commenced the researcher will have a short meeting to brief them with the results of the study and a letter with explanation of the results of the study will be mailed to them. It will also be available in the school notice boards. All the feedback will be given to learners after the data collection has been commenced.

Yours sincerely

Busisiwe Patience Mkhonto (Researcher)

APPENDIX D

REQUEST PERMISSION GRADE 7 CLASS TEACHERS

Request for permission to conduct research at Mbazima primary school

Title of the title of the research: The effectiveness of a recycling project on natural science learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

Date: / / 2018

To all Grade 7 Educators
Mbazima Primary School
Contact Details: 0822584826
Email address: mbazimaprimaryschool@gmail.com

Dear Grade 7 Educators

I, Busisiwe Patience Mkhonto am doing research under supervision of Mnguni L.E , a Professor in the Department of Science and Technology towards a MED at the University of South Africa. We are requesting for permission to conduct research in a study entitled the effectiveness of a recycling project on natural science learner's perceptions, attitudes and understanding of scientific knowledge of recycling.

The aim of the study is to determine the effectiveness of a small scale recycling project on learner's perception attitudes and understanding of scientific knowledge of recycling.

The school has been selected because it meets the needs of the study which is the aims and objectives of the study.

The study will entail learners to

- Take part in a survey questionnaire.
  The learners will be asked to answer the questionnaire. All grade seven learners will be participating in the answering of the questionnaire. The questionnaire will be administered in grade seven classes in the school during school hours. They will be expected to answer questionnaire twice before and after they have participated in a recycling project.
- To take part in a recycling project.
  The researcher will establish a recycling project inside the school. Learners will be expected to recycle all the waste that is produced by the school e.g. papers, plastics, broken furniture's etc.
- Participate in a focus group interview.

The researcher will select only ten learners to participate in a focus group interview. Only those who are selected will be participating in the focus group interview. The interview will take place in the classroom in the school.

- Complete a test.
  A test of content of content knowledge will be administered in the classroom all the learners will be asked to complete the test. The test will be assessing their knowledge of recycling content.

The benefits of this study are: the study will enhance learners understanding of scientific knowledge of recycling; help learners become critical thinkers at a young age, improve the school environment and change learner's knowledge, skills and behaviour towards recycling and help them become aware of their role towards the environment, learners will become scientific literate and will lessen the behaviour that lead environmental degradation.

Although children are younger than 18, the topic is not sensitive therefore no risk or harm is anticipated.

There will be no reimbursement or any incentives for participation in the research.

Feedback procedure will entail the researcher to give feedback to learners verbally and in a written form. After the data collection process has commenced the researcher will have a short meeting to brief them with the results of the study and a letter with explanation of the results of the study will be mailed to them. It will also be available in the school notice boards. All the feedback will be given to learners after the data collection has been commenced.

Yours sincerely

Busisiwe Patience Mkhonto (Researcher)

APPENDIX E

A LETTER REQUESTING PARENTAL CONSENT FOR MINORS TO PARTICIPATE IN A RESEARCH PROJECT

Dear Parent

Your child is invited to participate in a study entitle the effectiveness of a recycling project on Natural Science learner's perceptions, attitudes and understanding of Scientific knowledge of recycling.

I am undertaking this study as part of my master's research at the University of South Africa. The purpose of the study is to determine the effectiveness of small scale recycling project on learner's perception attitudes and understanding of scientific knowledge of recycling. and the possible benefits of the study are the improvement of learners understanding of scientific knowledge of recycling; help learners become critical thinkers at a young age, it will improve the school environment and change learner's knowledge, skills and behaviour towards recycling and help them become aware of their role towards the environment, lastly it will lessen the behaviour that lead environmental degradation.. I am asking permission to include your child in this study because he/she is doing grade seven and he/she is in a natural science class at Mbazima Primary School. I expect to have him/her and other children participating in the study.

If you allow your child to participate, I shall request him/her to

- Take part in a survey questionnaire
  The learners will be asked to answer the questionnaire. All grade seven learners will be participating in the answering of the questionnaire. The questionnaire will be administered in grade seven classes in the school during school hours. They will be expected to answer questionnaire twice before and after they have participated in a recycling project.
- Take part in a recycling project
  The researcher will establish a recycli ng project inside the school. Learners will be expected to recycle all the waste that produce by the school e.g. papers, plastics, broken furniture's etc.
- Take part in a focus group interview
  The researcher will select only ten learners to participate in the focus group interview. Only those who are selected will be participating in the focus group interview. The interview will take place in the classroom in the school
- Complete a test

A test of content of content knowledge will be administered in the classroom all the learners will be asked to complete the test. The test will be assessing their knowledge of recycling.

Any information that is obtained in connection with this study and can be identified with your child will remain confidential and will only be disclosed with your permission. His/her responses will not be linked to his/her name or your name or the school's name in any written or verbal report based on this study. Such a report will be used for research purposes only.

There are no foreseeable risks to your child by participating in the study. Your child will receive no direct benefit from participating in the study; however, the possible benefits to education are that the study will determine the extent to which recycling related content is integrated in to natural sciences curriculum, the extent to which learners have scientific understanding of recycling, the learners' perception and attitudes towards recycling and the effectiveness of a small scale recycling project on learners' perceptions attitudes and understanding of scientific knowledge of recycling.

Your child's participation in this study is voluntary. Your child may decline to participate or to withdraw from participation at any time. Withdrawal or refusal to participate will not affect him/her in any way. Similarly you can agree to allow your child to be in the study now and change your mind later without any penalty.

The study will take place during regular classroom activities with the prior approval of the school and your child's teacher. However, if you do not want your child to participate, an alternative activity will be available he/she will be allowed to go another class in the school.

In addition to your permission, your child must agree to participate in the study and you and your child will also be asked to sign the assent form which accompanies this letter. If your child does not wish to participate in the study, he or she will not be included and there will be no penalty. The information gathered from the study and your child's participation in the study will be stored securely on a password locked computer in my locked office for five years after the study. Thereafter, records will be erased.

The benefits of this study are it will enhance learners understanding of scientific knowledge of recycling; help learners become critical thinkers at a young age, it will improve the school environment and change learner's knowledge, skills and behaviour towards recycling and help them become aware of their role towards the environment, lastly it will lessen the behaviour that lead environmental degradation.

Although children are younger than 18, the topic is not sensitive therefore no risk or harm is anticipated.

There will be no reimbursement or any incentives for participation in the research.

If you have questions about this study please ask me or my study supervisor Mnguni L.E a professor in the Department of Science and Technology College of Education, University of South Africa. My contact number is 0835669234 and my e-mail is busisiwemkhonto24@gmail.com/36500704@mylife.unisa.ac.za.

The e-mail of my supervisor is mngunile@unisa.ac.za. Permission for the study has already been given by the principal and the Ethics Committee of the College of Education, UNISA.

You are making a decision about allowing your child to participate in this study. Your signature below indicates that you have read the information provided above and have decided to allow him or her to participate in the study. You may keep a copy of this letter.

Name of child:

Sincerely

_____ _____ _____

Parent/guardian's name (print) Parent/guardian's signature: Date:

Busisiwe Patience Mkhonto (Researcher) _____

APPENDIX F

UNISA university of south africa

A LETTER REQUESTING ASSENT FROM LEARNERS IN A PRIMARY SCHOOL TO PARTICIPATE IN A RESEARCH PROJECT

Dear learner, Date_____

My name is Teacher Busisiwe Patience Mkhonto and would like to ask you if I can come and do some activities with me. I am trying to learn more about how children do activities with their teachers as well as when they play with friends.

If you say YES to do this, I will come and watch you when you are with your teacher doing activities in natural science class as well as when you play on the playground and do some activities with you. We will do a fun game where you have to answer some questions for me. I will also ask you to do some activities with me. I will not ask to you to do anything that may hurt you or that you don't want to do.

I will also ask your parents if you can take part. If you do not want to take part, it will also be fine with me. Remember, you can say yes or you can say no and no one will be upset if you don't want to take part or even if you change your mind later and want to stop. You can ask any questions that you have now. If you have a question later that you didn't think of now, ask me next time I visit your school.

Please speak to mommy or daddy about taking part before you sign this letter. Signing your name at the bottom means that you agree to be in this study. A copy of this letter will be given to your parents.

Regards

Teacher Busisiwe Patience Mkhonto

Your Name	**Yes I will take part** 	**No I don't want to take part** 
Name of the researcher		
Date		
Witness		

Appendix G Research Ethics Certificate Unisa

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Mrs BP Mkhonto.pdf

Appendix H language edit certificate

2019-08-06 Busi Mkhonto.pdf