



Namibia University of Science and Technology

Department of Agriculture and Natural Resources Management

Bachelor Degree in Natural Resources Management

Project Report

An evaluation of impacts of past participants' behaviour pertaining to waste management aspects taught at NaDEET Centre, Southern Namib.

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Date of Research	January-May 2019



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1. Introduction

Approximately nine billion tons of rubbish ends up in the ocean annually which is much more than the rubbish produced which is only about 250 million tons. It seems that everywhere around the world people are more reluctant to properly dispose of rubbish in rubbish bins and rather choose to randomly throw it anywhere else. It is however shocking to state that there could possibly be about 150 million tons of plastic, which is equivalent to the weight of 25 large elephants worth of plastic in the ocean today (Prize, 2019). As alarming as this may sound, the fact still remains that people are making small decisions to litter which cause big problems to marine life. The Kupferberg landfill site has less than two years to reach its full capacity, according to City of Windhoek PRO Scheifert Shigwedha. He further stated that additional disposal sites were needed at Kupferberg (NBC, 2018). Could more disposal sites really be a solution or do the people need to see potential in the waste that they produce? Waste, often called rubbish or garbage is regarded as anything deemed as useless and needs to be thrown away (Webster, 2019). According to more statistics around the world, out of 1.3 billion tons of garbage generated annually, only 258-368 million tons ends up in one of the 50 largest dumpsites in the world (Foundation, n.d). Another question would be, where is the rest of the rubbish? Namibia is quickly losing its status as a litter-free country, as problem areas become more detectible (Cloete, 2012).

The accumulation of waste is largely seen in urban areas due to urbanisation (Windhoek, n.d.). According to the United Nations' most recent estimates, the world's population is approximately 7.7 billion people (Worldometers, 2019). As the world population continues to grow, waste production simultaneously increases. This fact is true for a developing country like Namibia. Urbanisation has led to many people living under the same roof, hence generating larger amounts of waste on a day-to-day basis. As much as people throw away items that are of no use to them, little to no attention is often paid to the negative impacts waste has on the natural environment (ESD Handbook, n.d.). However, being a part of the various United Nations programs that are built on sustainable development and protection of the environment on an international level, Namibia shows negligence in successfully implementing necessary measures to protect the natural environment. Locally, Namibia is under the Environmental Management Act Act 7 of 2007; and regionally, it is part of the Southern African Development Community which both aim at protecting the environment through laws and regulations (Parliament, 2019).

Solid waste management is the proper handling of solid waste matter in a way that does not harm the environment (LeBlanc, 2018). However, the majority of people may have a change of attitude towards solid waste but very seldom a change of behaviour. Research done in Hungary indicated that changing a person's attitude towards the environment does not always mean that it results in the anticipated environmental impact (Policy, 2012). In an attempt to conserve the environment, one of the greatest challenges is balancing a human's wants and needs with the needs of the natural environment. Studies have shown that there can be a link between environmental conservation and environmental education. There is a continuous pursuit to close the gap between humans and nature by influencing their level of knowledge and their mindsets (Kioko, Kiringe, & Wahungu, 2010). With regards to waste management, is this pursuit really successful? Are the attitudes of individuals becoming the precursors of change in behaviour?

Arguments continue to rise between authors who claim that responsible environmental choices are either made primarily based on lessons learned during youth or the impact school programmes and clubs have on increasing a child's environmental perception (Kioko, Kiringe, & Wahungu, 2010). More specifically, how they perceive waste. According to Kinder (2012), short-term outdoor practical learning experiences may result in children gaining knowledge and a having a change of attitude (Kinder, 2012).

Hence the reason why the Namib Desert Environmental Education Trust (NaDEET) is one amongst a few organisations whose mission is to protect the Namibian natural environment by educating citizens to practice a sustainable lifestyle. NaDEET was established in 2003 and it is geographically located about 100km south of the Sossusvlei on the NamibRand Nature Reserve. NaDEET believes in increasing an ecologically friendly attitude and practical skills in Namibian people and educators in order to encourage involvement (NaDEET, About us: NaDEET Projects, 2019). At NaDEET Centre, participants are taught about the 3 R's of waste management, (reduce, reuse and recycle). These concepts are not only theoretically taught but they are practically applied in activities such as recycling old newspapers into firebricks; reducing waste like plastic when purchasing a single item and encouraging the use of a shopping bag in both the "Shop Until You Drop" and "Enviro Crisis" games; and reusing water bottles (NaDEET, Lesson Plan Guide, 2017).

A research study was conducted in 2018 at NaDEET Centre to find out aspects of sustainability learned at NaDEET Centre that are most applicable to the lives of the learners

visiting the Centre, looking at energy, water and waste. This study showed that participants between the ages of 12 and 13 implement the 3 R's at home with regards to waste management (Shihepo, 2018). A recommendation was made from this study to have a follow up study a year later or longer. The main purpose of this post-year study is to determine whether participants who have attended a NaDEET Centre programme are implementing all or at least some of the concepts they learned back at home with regards to waste management.

2. Aims and Objectives

This study aimed at assessing whether the NaDEET Centre programme participants implement the concepts they learned and take environmentally friendlier actions in their lives with regards to waste management.

2.1 In order to achieve the above-mentioned aim, the following objectives are formulated:

- To determine whether the NaDEET Centre programme had an influence on the knowledge of past participants with regards to waste.
- To find out and understand the challenges (if any) past participants may have that hampers them from implementing concepts learned.
- To determine whether there is a difference between public schools, private schools and a Waldorf school with regards to how they handle waste.

Research question: Are the aspects on waste management taught on a NaDEET Centre programme having an actual impact on the behaviour of past participants?

2.2 Hypothesis

H₀: The NaDEET Centre programme has no impact on past participants with regards to how they manage waste.

H_A: The NaDEET Centre programme has an impact on past participant with regards to how they manage waste.

3. Study Area

The initial study was done at the Namib Desert Environmental Education Trust (NaDEET) Centre, on the NamibRand Nature Reserve in 2018. However, the post-year study was conducted in Rehoboth and Windhoek at the respective schools as listed below:

Rehoboth:

1. Dr Lemmer High School
2. M&K Gertze High School
3. Rehoboth High School

Windhoek:

1. St. Paul's College
2. Amazing Kids Private School
3. Waldorf School
4. Windhoek High School
5. Delta High School

Rehoboth is a small town situated 85 km south of Windhoek, the capital city. The town hosts approximately 21,000 inhabitants of which are mainly from the Baster community (Namiba, 2019). Windhoek is geographically situated in the centre of Namibia and hosts approximately 300,000 to 400,000 inhabitants of all diverse cultures. Both towns are surrounded by mountains which are up to 2000 meter high (Namibia, 2019).

4. Methods and Materials

Due to the fact that this study is a follow-up on a previous study done at NaDEET, the methods and materials used were similar to those used with the five schools which were surveyed. Six participants were randomly selected from each programme group in 2018. A

total of 48 learners participated in a one-on-one oral interview at the Centre. For this follow-up study, an attempt was made to locate all the learners who partook in the survey, however, only 36 past participants from 5 schools were found.

An email was sent well in advance to all the schools that the participants were at requesting for their willing participation. Out of 36 learners, only 34 took part in the one-on-one interview. For this follow-up study, only 34 past participants from 5 schools took part in the one-on-one interview. The interviews were conducted at the respective schools in Rehoboth and Windhoek. The materials used were a post-year questionnaire (See appendix 1) which was answered orally and recorded using a mobile device. A research interview comprises of the interviewer, who is the one who facilitates the process of the conversation by asking questions, and the interviewee is the person who responds to the questions asked. A survey questionnaire is a set of questions on paper used in collecting data from a particular population and analysing it. Both methods were used because they are most appropriate when collecting information based on feelings, perceptions, and experiences (Easwaramoorthy, Zarinpoush, & Canada, 2006).

The first section of the questionnaire consists of general questions followed by the section on waste that consisted of modified questions taken from the initial research questionnaire. The structured questionnaire mainly consists more of qualitative questions and less quantitative ones. Qualitative data collection is an in-depth research that specifically aims at understanding why people think, react and behave as they do (Jordan, 2015). A pilot study was done at NaDEET Centre to fix errors before collecting the actual data from the schools. Due to the fact the learners were still minors who were either in the grades seven and eight a consent form was signed by the teachers upon arrival (See Appendix 2).

All data was recorded on excel spread sheets and statistically data analysis was applied to comparative data. A paired sample t-test was done to determine if NaDEET Centre programme has a significant impact on past participants with regards to how they manage waste, looking at participant's previous and current responses on questions indicated in appendix.....

5. Results

5.1 NaDEET Centre programme influence on the knowledge of past participants with regards to waste

As shown in figure 1, when asked to define the term sustainability, 45% (15) were able to answer correctly and 55% (18) of the learners answered incorrectly. When asked to name, define and give examples of the 3 R's of waste management, 48% (16) answered correctly and 52% (18) answered incorrectly.

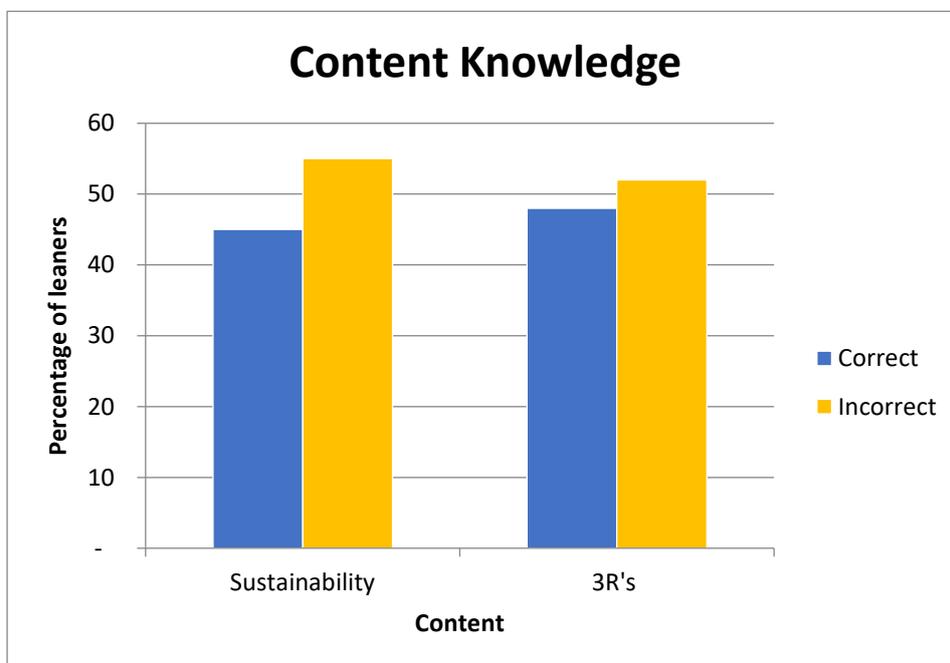


Figure1. Participant's knowledge of content under waste management taught at NaDEET Centre.

5.2 Challenges past participants may have that hampers them from implementing concepts learned

The graph in figure 2 displays how participants react to litter and when they witness someone litter and how they handle it. If they saw litter, 82% (32) indicated that they would pick it up; 13% (5) would walk past it and 5% (2) stated that it would depend on the nature of the litter. If they saw someone litter, 57% (29) stated that they would ask the person to pick it up and properly dispose it; 29% (15) would rather pick it up themselves; 6% (3) stated that they

would keep silent; however, 8% (4) stated that it would depend on who the person is in terms of age.

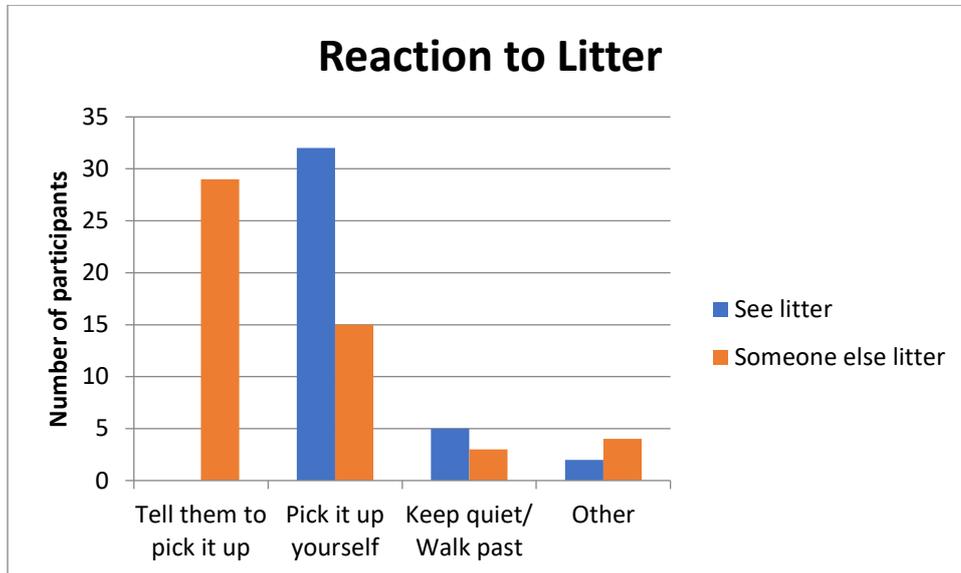


Figure 2. Action taken if participant saw litter or someone else littering

5.3 To determine whether there is a difference between public schools, private schools and a Waldorf school with regards to how they handle waste.

This table displays a comparison between three different schooling systems based on the responses they gave with regards to how they would reduce litter.

Table 1. Pre-year and post-year responses on how to reduce waste

Litter reduction method	Private Schools				Waldorf				Public Schools			
	Pre		Post		Pre		Post		Pre		Post	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Dustbins on the street	2	6	0	0	0	0	0	0	6	30	4	15
Pick up litter	9	29	5	16	5	71	2	29	5	30	2	7
Raise awareness	11	35	9	28	1	14	2	29	3	15	7	26
Implement strict laws	3	10	1	3	0	0	0	0	1	5	0	0
The 3 R's	6	19	14	44	1	14	2	29	4	20	10	37
Have cleaning up	0	0	3	9	0	0	1	14	0	0	4	15
Total	31	99	32	100	7	99	7	101	19	100	27	100

Figure 1 shows the difference in the responses of respondents during the Pre-year survey and the Post-year survey based on the responses given when asked to state three things they would do to reduce waste. The most stated answer was that of personal effort (Pick up litter) and the lowest was cleaning campaigns in 2018. In 2019 the highest stated response was practical application of the 3 R's and the lowest was the implementation of strict laws/fines. (See Table 1 for numerical data)

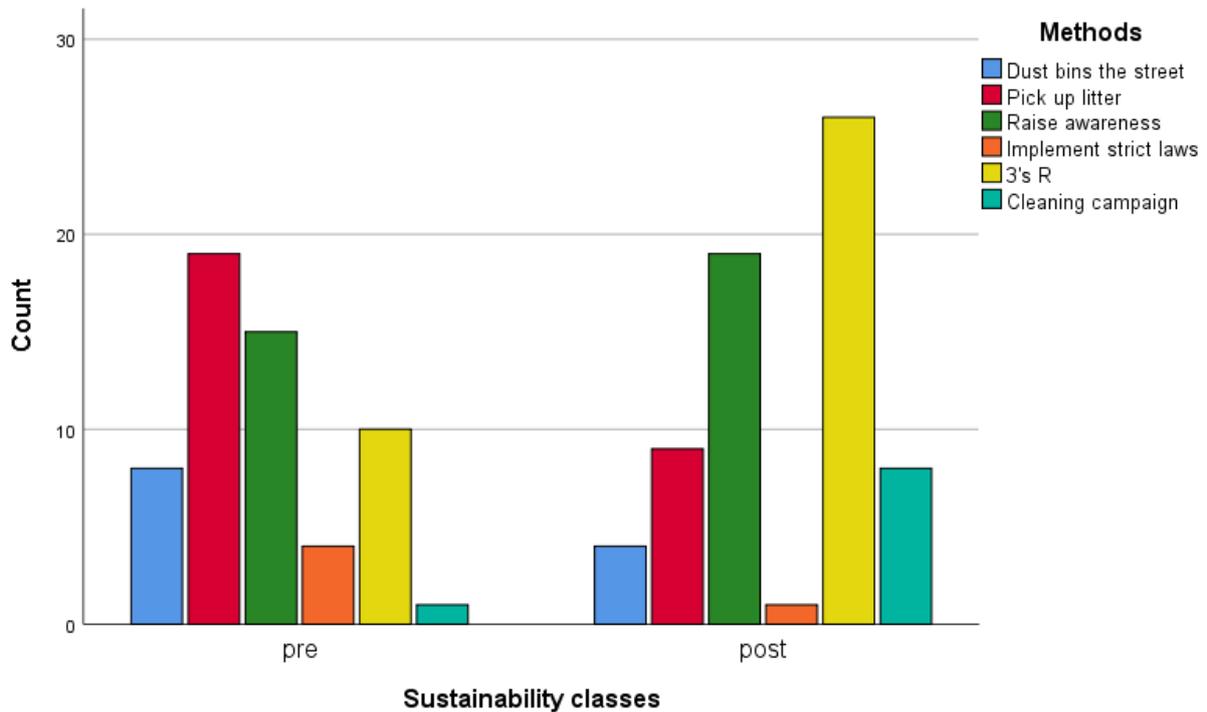


Figure 1. Pre and Post responses on waste reduction

This table displays a comparison between three different schooling systems based on the responses they gave with regards to how they handle waste at home.

Table 2. Pre-year and post-year responses on what happens to rubbish at home

Handling Rubbish	Private Schools				Waldorf				Public Schools			
	Pre		Post		Pre		Post		Pre		Post	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Throw on the ground	0	0	0	0	1	17	0	0	0	0	0	0
Municipality	14	58	13	72	4	67	4	67	1	100	13	72
Recycle/ DIY Project	9	38	3	17	1	17	2	33	0	0	2	11
Reuse	1	4	2	11	0	0	0	0	0	0	2	11
burn it	0	0	0	0	0	0	0	0	0	0	1	6
Total	24	100	18	100	6	100	8	100	1	100	19	100

This table displays a comparison between three different schooling systems based on the responses they gave with regards to whether they accept plastic at the shop.

Table 3. Pre-year and post-year responses on the acceptance of plastic at the shop

Take Plastic at shop	Private Schools				Waldorf				Public Schools			
	Pre		Post		Pre		Post		Pre		Post	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Yes	8	44	9	62	4	67	2	50	10	71	11	85
No	8	56	7	38	2	33	2	50	4	29	2	15
Total	16	100	16	100	6	100	4	100	14	100	13	100

Figure 2 shows the Pre and Post responses given when asked if they will/do accept plastic bags at the shop. There is no difference between pre and post responses of respondents who take plastic, however the number of those who do not take plastic has decreased. (See Table 3 for numerical data)

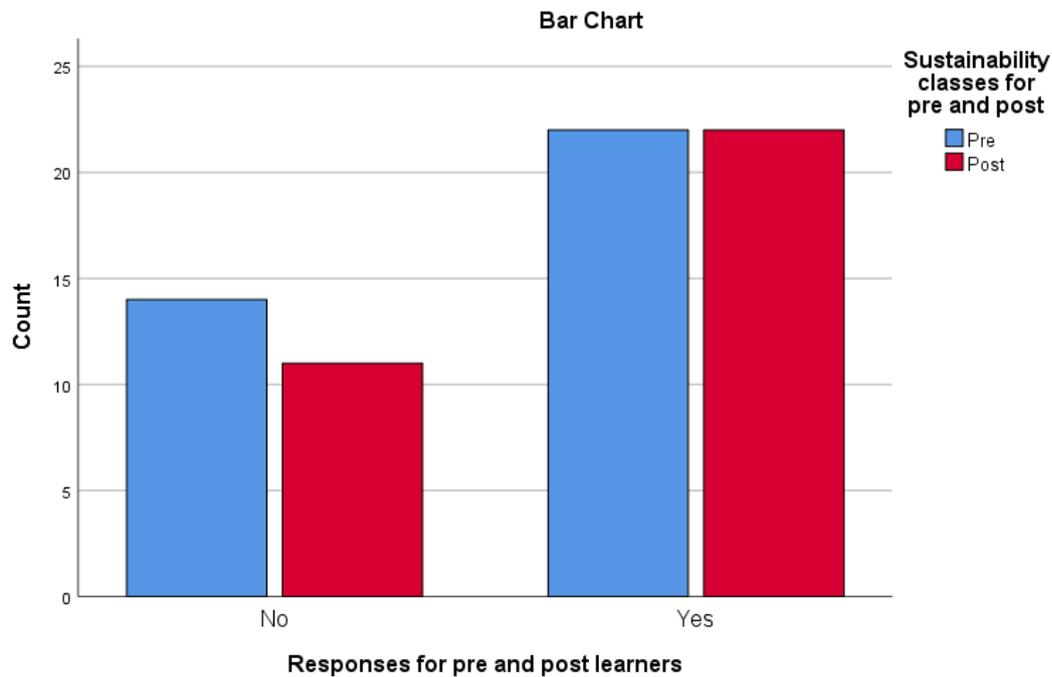


Figure 2. Pre and post responses on the acceptance of plastic bag

6. Limitations

- The format of the Pre-year Survey Questionnaires were not structured in a way that is suitable for a follow-up study.
- Two schools were missed due to numerous loopholes in the data of the initial study
- A comparative study of individual learners was discouraged by the fact that there were no identification numbers from the initial research.

7. Discussion

The schools that mainly visit NaDEET are usually the ones in the Hardap region where the centre is located. However, all the schools that were part of this follow-up study included those from the Khomas region.

6.1 Determine whether the NaDEET Centre programme had an influence on the knowledge of past participants with regards to waste.

The term sustainability, though mentioned daily throughout an entire NaDEET Centre programme, when asked to define it, all participants seemed puzzled at first. The 45% (15) that were able to answer correctly were all guided by clues, otherwise, it is clearly evident that the majority of the learners were familiar with the term but could not understand it. By definition, sustainability is the quality of being able to utilize resources for a long time without causing complete damage to them or the environment (Dictionary, 2019). Linking it to waste management, which means controlling rubbish as taught at NaDEET, it is important to observe sustainability in line with making use of every rubbish in an efficient way instead of dumping it all at landfills (Hill, 2019). It seems that the 55% (18) learners may have had better understanding of the term if it was clearly portrayed in a balanced intellectual, practical and artistic lesson instead of the mere mention of it (Newcombe, 2018).

The 3 R's of waste management question was well answered by the 48% (16), however, it is important to acknowledge that from the 52% (18) that responded incorrectly, a significant number of learners simply confused the terms. They gave correct definitions for the wrong concept. Reuse and recycle were the most misunderstood concepts and also defined and described interchangeably. Despite the emphasis on these concepts during a NaDEET Centre programme, the learners were not able to clearly differentiate between them. Most also failed to give examples of the term "reduce" despite the fact that the concept is self-explanatory and often regarded as one of the easiest to remember. However, 2% of those who gave incorrect responses defined recycle as the sorting of waste. This could be influenced by the fact that NaDEET Centre called their sorting of rubbish as "Introduction to Recycling" prior to the research, hence causing confusion. However, these remain assumptions until clearly proven.

Intellectual knowledge alone does not offer a full learning experience unless accompanied by practical application in order for an individual to not only grasp the full meaning but also the significance of the knowledge they are gaining.

6.2 To find out and understand the challenges (if any) past participants may have that hampers them from implementing concepts learned.

For both the secondary school and primary school programmes, littering is a key topic in theory and practice during the NaDEET Centre programme. During both school programmes, littering is one of the main subjects that are clearly emphasized on. It is mentioned in the classroom rules; “Environmental Crisis”, “Sustainable NaDEET”, and the “Environmental Problem” games and drama. In fact, upon arrival, participants are reminded that they are not allowed to litter on the nature reserve. During the interviews, all respondents knew what littering was and they gave various examples of what littering does to the human and natural environment.

However, there are some very interesting reasons why the 5% (2) choose to not pick up all litter. According to what they stated, health was among the few reasons. They clearly pointed out things such as used tissues and anything else that did not look too clean to touch. This may presumably be one the reasons why the 13% (5) said they would walk past. As for seeing someone litter, 57% (29) seem to be brave enough to openly reprimand the person unlike the 8% (4) that stated that it would all depend on who the person was. This may all be influenced by social and moral upbringing.

6.3 To determine whether there is a difference between public schools, private schools and a Waldorf school with regards to how they handle waste.

There is not much of a difference between a private and public schooling system except for the fact that the private schools have advanced learning facilities and this is one major advantage over public schools. However, a Waldorf schooling system does not only have better learning facilities but it also accommodates learners from different social and financial statuses. More outdoor learning experiences are more prevalent in private and Waldorf schooling systems compared to the mainstream public schooling system.

During the follow-up, the top three mentioned things that participants all mentioned most as ways to reduce littering is the 3 R's, raising awareness and picking up litter (leading by example). Comparing these to the pre-year responses, the top three were picking up litter, raising awareness, and the 3 R's. These results are of keen interest because the 3 R's are most emphasised compared to picking up litter. Impact can easily be seen here. It is however, important to note that the least mentioned methods are not taught at NaDEET, but they are rather considered prior knowledge participants already had.

Waste as seen in table 2, is commonly handled by municipal services. Nonetheless, there are some very interesting results in the table. The Waldorf School had one learner stated that they would throw rubbish on the ground but had not stated so during the follow-up survey. It may be logical to state that in the beginning of mankind it did not really matter what you threw on the ground, because it would all rot and become a part of the environment again. This was not an issue until the invention of plastic. Hence the reason why, education is a significant approach in changing littering culture, however young people's behaviour may only change if they actively experience the problem themselves (Wagner, 2014).

The highest impact can be seen in the public schools. Previously, they all let municipal services handle the waste but now they stated that they recycle and reuse the waste. Reasons why the 6%(1) burn waste is unknown. One more of the private school participants stated that they reuse. It takes an individual to either completely change something for the worse or for the better. Either way, both have an impact on the environment.

Table 3 shows that the previously, public school had the highest number of learners indicate that they would take plastic at the shop and private schools stated that they would not. However, during the follow-up survey, the results do not differ much, apart from more learning from both schooling systems preferring to take plastic bags compared to the pre-year responses. A relatively small percentage of the learners stated that they take plastic bags to reuse at home. Interestingly, 9% more of Waldorf school learners stated that they would not take plastic at the shop compared to the pre-year responses. Plastic is the most common litter around the world and Namibia is taking bold steps towards discouraging its use in the trading industry. Citizens have to pay for every plastic bag they would like to use at some of the common grocery shops.

8. Conclusion

The results of the study revealed that, most of the learners during the pre-survey chose to pick up the litter as the most effective method to reduce waste with an average percentage of (15.3%). However, 21% of the learners during the post-survey chose the use of 3R's as the best method to reduce waste. Therefore we reject the null hypothesis with $X^2(5) = 19.048$, $p < 0.05$ because there was a significant association between the pre and post responses on how they reduce waste (See appendices III). On the other hand, the results regarding the acceptance of plastic bag from the shops showed that, most of the pre-survey respondents do not take plastic bags (20.3%) compared post-survey respondents (15.9%). However, the same proportion (31.9%) of learners from both pre and post indicated that they take plastic bags at the shop. Therefore, we failed to reject the null hypothesis $X^2(1) = 0.230$, $p > 0.05$ because there was no significant association between the pre and post responses of respondents who accept plastic bags at the shop (See appendices IV).

9. Recommendations

-The incorporation of intellectual, practical and arts is considerable teaching method especially when it comes to understanding very significant terminology.

-Not knowing which participant was which made this study challenging. I recommend that name or identity numbers of future research participants be well noted down and well-kept for reference for further studies in the future. The initial data has some loophole that require an entirely new study to be undertaken in the future. Interview questions need to be well formulated to answer very specific objective.

10. Acknowledgements

The following individuals helped tremendously in the support, data collection and analysis of this research.

- Richard Kavari, Tutor and Lecturer at NUST
- Theofilia Ndahalele, Research mate and Supporter
- Tuwilika Shihepo, NRM Honours student
- Viktoria Endjala, Mentor and NaDEET Centre Manager
- Viktoria Keding, NaDEET Director
- Samantha Lindgren, Research advisor and Phd student from the University of Illinois

- All teachers/principals from Rehoboth and Windhoek
- Andrea Calleson , Teacher from St. Paul's college
- Mr.Siegfried Katjizeu, Teacher from Amazing Kids Private School
- Sussane Hampf , Teacher from Waldorf School
- Craig Sambu, Supporter and Research advisor
- Donana Kachilulwa, Research helper
- Maya Makumbi, Research helper
- Nathan Dasneves, Research helper
- Abraham Muti, NRM Honours student
- Sylvester Shikongo, NRM Honours student

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