

**Waste Management Education in Samoa:
A Collection of Case Studies on Present Issues**

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Abstract

Despite the presence of environmental education and awareness programs, Samoa still faces many environmental problems today, especially in the area of waste management. With the influx of packaged goods into a society that had always lived off the land, Samoans have had to change their conception disposal of rubbish. In schools, students are learning about waste management, yet litter and improper disposal of waste continues to be an issue. In order to understand this dichotomy exists, surveys were conducted at eight secondary schools on 'Upolu and Savai'i to determine what kinds of waste exist at different schools and how much the students know about proper waste disposal. The data reveals that while awareness on many levels exists, the resources for students to actually carry out good waste management both in schools and at home are not always established. These observations provide insight into paths for the future to facilitate good waste management awareness and action inside and outside of school settings.

Dedication

mo Beans: The Dog Who Lived

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INTRODUCTION

I. Historical Views

Samoa has experienced a number of changes in the recent past regarding its relationship with the environment. Prior to 1830 and the arrival of Christianity, Samoan religion was based on a type of animism, where people valued the environment highly, respecting its flora and fauna as gods. Peoples all over the Pacific find roots in a deeply united relationship between humans and nature. Linguistically, languages such as Samoan did not distinguish separate words for the two concepts. Humans and nature were regarded as interconnected, and therefore were not broken into categories. Silao Kasiano, a Samoan Language instructor for the United States Peace Corp, remembers volunteers who inquired about environmental vocabulary only to find that it had not yet been established.¹ In order to conduct environmental projects, vocabulary was added to the language to describe the environment and the concepts needed for its care in an industrialized world.

Similarly, the land itself holds a place of reverence in the hearts of many Samoans even today, stemming from traditional, or pre-Christian beliefs. Samoans value land highly because of its connection to ancestry that remain intact in the *fa'asamoa* (Samoan way of life)², believing that “Our umbilical cords are here.”³ Many still regard land as more valuable than money, and would refuse to sell family land because of their bond to its representation of their bloodlines.⁴ This respect for the land is seen in the pride Samoans take in keeping their land beautiful and clean.

Recognizing the historically recent introduction of non-biodegradable waste products is also vital to understanding current waste management issues. These products have come from the increase in foreign imports and packaged goods. This change in the concept of waste remains a point of confusion, as is reflected in the linguistic representations of the old and new concepts of rubbish. Before this influx of new products, Samoans regarded *otaota*, or rubbish, as leaves or other organic products such

¹ Samoan Language instructor for the School for International Training (SIT). University of the South Pacific (USP), Alafua, 'Upolu. 1/4/08.

² So'o, Asofou, et al., eds. *The Fa'aSamoa*. Samoa National Human Development Report 2006. Apia: National University of Samoa, May 2006 (draft copy).

³ Jackson, Moelagi. Owner of Safua Hotel, Safua, Savaii. 17/3/08.

⁴ Saivaise, Tamasoali'i. Science Specialist. Ministry of Education, Curriculum Development Unit (CDU), 3/5/08.

as peels, fruit skins, or leftover food or food waste. *Lapisi*, on the other hand, is borrowed from the English word rubbish, but speakers sometimes tie it more directly to modern kinds of rubbish such as plastic, tin, glass, and paper.⁵ Yet even this distinction is difficult, since G.B. Milner's *Samoan Dictionary* defines both as "rubbish" or "refuse" without further clarification,⁶ and not all speakers use the words separately.⁷

Throughout Pacific literature, "generally pollution is treated as a foreign intrusion for which local people have little responsibility."⁸ Because of the separation between Samoans and new forms of non-biodegradable waste, many do not feel accountable for its production and therefore its disposal. Others recognize instead that since everyone produces waste, "we are all responsible" for its proper management.⁹ Though "most... [Pacific] indigenous cultures were... ecologically conservative and generally compatible with the laws of ecology," these beliefs did not acquire the title of environmentalism until the onset of development.¹⁰ As threats to the environment increased, stakeholders in Samoa recognized the need to address these modern issues.

Thinking back to their past, organizations developed in order to protect the environment as Samoa grappled with becoming a member of an industrial, global community. The Government of Samoa introduced the Ministry of National Resources and Environment (MNRE), while *O Le Siosiomaga Society, Inc.* (OLSSI), was Samoa's first environmental non-government organization (NGO), established in 1990.¹¹ Environmental education has been introduced into the curriculum at all levels beginning in Primary schools, integrated into the Sciences and Geography.¹² Today, these catalysts for environmental education and awareness remain, and continue to promote knowledge of waste management to stakeholders at all levels of society.

⁵ Fa'asisila, Jackie. Academic Director for SIT, SIT Office. 13/5/08.

⁶ Milner, G.B. *Samoan Dictionary*. Pasifika Press: Auckland, New Zealand, (no year).

⁷ Leiataua, Makereta. Principal, Lefaga Secondary School, Upolu. 28/4/08.

⁸ Clarke, William C. *Pacific Voices, Pacific Views: Poets as Commentators on the Contemporary Pacific*. Centre for the Contemporary Pacific, Australian National University. 23.

⁹ Saivaise 1/4/08.

¹⁰ Thaman, Konai Helu. *Beyond Hula, Hotels and Handicrafts: A Pacific Islander's Perspective on Tourism Development*. The Contemporary Pacific, Spring 1993. 105.

¹¹ Faalua, Norma. Assistant Programs Officer and Finance and Administration Officer, O Le Siosiomaga Society, Inc. OLSSI Office. 6/5/08.

¹² Wong, Gauna. Principal Officer of Education. Ministry of Education, CDU. 25/3/08.

II. Perspectives on Current Waste Management

Of the environmental issues facing Samoa today, waste management often comes as a top priority. Samoa's Prime Minister Tuilaepa Aiono Sailele Malielegaoi once said that waste is "the most significant environmental issue facing the Pacific."¹³ Samoa's National Environment Management Strategy (NEMS) also notes waste management as one of the 12 "Key Environmental Issues."¹⁴ A mental dichotomy exists today, where Samoans hold their land in highest regard but do not always connect proper waste management to this reverence.

Waste management has seen much improvement in the recent past, most visibly from the improvement of the Tafaigata Landfill in 'Upolu and corporate garbage collection pickup services on both main islands.¹⁵ The first big improvement for the landfill was its relocation from Vaitoloa, a mangrove area, to its current location in Tafaigata, near Apia. Secondly, 2002 saw the inexpensive redesign and implementation of the Fukuoka semi-aerobic method with funding from the Japan International Cooperation Agency (JICA), which has substantially improved the functioning, efficiency, and cleanliness of the landfill.¹⁶ Savai'i also has its own landfill in Vaia'ata to process rubbish. While this landfill does not use the Fukuoka method, it does sort rubbish in order to more efficiently manage its waste.

These landfill improvements have been enhanced by the expansion of collection services, where families use roadside stands to place rubbish for trucks to pick up for disposal. Services run in both 'Upolu and Savai'i. A short survey administered to ten people who lived in various villages in 'Upolu revealed that the majority of people surveyed felt positively towards the functioning of the service, with eight of the ten indicating that they used the collection.¹⁷ Participants reported that trucks came at least

¹³ *Pacific Islands International Waters Project Strengthening Community-Based Environmental Management in the Pacific Islands*. SPREP 2006.

¹⁴ Reti, Muliagatele I. *Managing Samoa's environmental resources: a global obligation*. Samoan Environment Forum. Pages 180 and 178.

¹⁵ One way former Geography teacher Aniseto Fruean incorporated waste management into his class was organizing a field trip to the landfill over a three year period in order to do observations and evaluations of its effectiveness. Having seen the landfill before and after its remodeling, Fruean highlighted the visible improvement of the site, and the impressions it made on his students. (CDU 1/4/08)

¹⁶ "Tafaigata Case Study." *Rubbish is a Resource!: a waste resource kit for the Pacific Islands*. Apia, Samoa: SPREP, 2006. Book, page 41 (also available in CD-ROM format).

¹⁷ See Appendix IV.

once a week and most regarded it as reliable. Yet one woman did mention that distant villages do not always have reliable collection services, sometimes going months without receiving any services.¹⁸ While she believed that corporate services would be receptive to customer's complaints, others in rural areas say the companies have not listened to their requests for better services.¹⁹ This serves as a reminder that improvements are just the beginning, and that waste management is far from perfect. In order to understand how waste management can be improved, it is important to assess what people know about waste management.

Opinions differ as to where the level of awareness of waste management stands. Knowing there is a strong environmental education and awareness effort present in Samoa, in conjunction with the presence of persistent waste management issues, one of the useful areas to explore is the effectiveness of the programs in existence in producing awareness. This paper will assess one specific component of general public awareness, which is at the level of secondary school students. Since all members of society are stakeholders in waste management, it is easiest to look at awareness in smaller sets, and evaluating knowledge in schools is a task that is feasible for the limited time-frame for this research. This paper will explain the methodology used to conduct a survey that examines students' knowledge regarding waste and waste management, as well as the school's current role in facilitating that knowledge. The findings from the survey will be accompanied by other observations and interactions within the school, and will be analyzed in order to give recommendations for the future.

Methodology

Before designing environmental awareness lessons for schools, officers with the Secretariat of the Pacific Regional Environment Program (SPREP) highlight the importance of conducting evaluations of the target school in order to assess awareness levels and also identify the specific issues relevant to their audience.²⁰ With this in mind, a fifteen-question bilingual survey was designed under the guidance of Tamasoali'i

¹⁸ Schuster, Tuiolo. Principal Capacity Building Officer. MNRE, Planning and Urban Management Agency (PUMA). 31/3/08.

¹⁹ Fui, Sara. Principal, Aana (No. 1). 28 April 2008.

²⁰ Griffin, Frank, and Mark Ricketts. Waste Officers, SPREP. 24/4/08.

Saivaise, the Science Specialist with the Curriculum Development Unit in the Ministry of Education, in order to assess some basic information about waste management at the secondary school level.²¹ This included questions regarding what kinds of rubbish students produce at school and at home, how it is disposed, and whether the schools are teaching students about waste management. As this project coincided with a Ministry trip to seven rural secondary schools in Samoa, the survey was conducted at four rural schools in ‘Upolu and three rural schools in Savai’i in conjunction with the Ministry trip, and one urban school in Apia separately.²² The variety of school locations was crucial to the survey, for it allowed comparisons to be made about how the awareness differs by location. Personally administering the survey also allowed there to be comparisons made between interactions at the school, such as observations and interviews, and the survey results to check for incongruities in the results.

Many complex constraints were met, however. The most obvious constraint was the language barrier. Though the surveys were written bilingually, the students at every school needed to be assisted verbally.²³ In either case, it is never certain if the intent of the question was fully explained or if certain misunderstandings or miscommunications occurred. Literacy issues were another constraint in some rural schools. This was apparent in the students’ difficulty with answering some questions even in Samoan, since there were lots of misspellings or blank answers for the four open-ended questions. Finally, there is the added difficulty of translation when discussing waste management, due to the different concepts of waste in Samoa. An improvement of the survey would be to add a second component to the last question regarding how the students’ families dispose of rubbish at home. After describing what methods they use for disposal, students should be asked to describe what kinds of rubbish they would include in these types of waste disposal. This is important in many cases such as burning, where the difference between burning leaves and plastic is the difference between creating relatively harmless versus toxic fumes.

Finally, the survey itself had a few weaknesses. Due to tight time constraints, a few typographical errors remained in the printed survey, including two misspellings and a

²¹ See Appendix I.

²² See Appendix II.

²³ This would either be done by myself or with a native speaker assisting me.

mis-numbering of two questions. Another weakness was that coastal locations were not included in the final question regarding how and where the students' families disposed their rubbish, such as beach (*matafaga*) and sea or ocean (*sami*). Finally, the choice of recycling (*toe fa'afo'i*) should have made a distinction between recycling bins for plastic bottles, such as is found at Leifiifi College, and the act of returning glass bottles to the store to be recycled at the Vailima plant.

Observations of Schools

Every school has a time set aside in the morning to clean the compound, and at the end of the day students are expected to clean again before leaving. Prefects are elected by teachers to serve as monitors throughout the day, since many schools have a policy of giving students detention if they are caught littering. For the schools visited during interval, students eat outside of the building within the compound, and a canteen was either on the compound or people from the community would pay a marginal fee to come and have small stands on the compound. One school limited the products the canteen could sell to bread (*falaoa*) and ice blocks (*aisa*), and another school restricted certain junk foods, such as Twisties. Otherwise, all the products bought by student had packaging, which according to both the survey and observations included prepackaged foods such as Twisties, dried noodles, lollipops, and homemade foods such as pork cakes (*keke pua'a*) and pancakes (*panikeke*).

Most schools use dumpsites for rubbish, which are for the most part sorted, though not all schools sort on a regular basis. Schools that sorted use the roadside bins for rubbish like plastics, since all schools are aware that burning plastics produces harmful fumes. One school admitted to burning plastics on occasion for convenience. One school that does not have reliable roadside collection buries its plastic and tins. Organic rubbish is burned in pits weekly, weather permitting, though Aleipata does compost organic waste for its agriculture science program. Leifiifi College in Apia has a recycle bin sponsored by a Japanese company for its plastic rubbish, which is collected as often as necessary and sent to Australia for processing.

In regards to conducting the survey, it often seemed that the students had a difficult time with the survey in general, noted by very obvious hesitation when starting

the survey at every school. Students also seemed very unsure of both my and the survey's purpose, since many classes did not want to discuss the survey afterwards. Skepticism was also noticeable from questions such as "What is your aim?" and "Why do you care?" This may have led to biases in the answers since the students were aware of my environmental beliefs. A final observation was that the students may have been taken aback by the survey, since they are used to taking tests in school with right and wrong answers, and may also explain some of the blank answers to open-ended questions. These observations are important when looking at the survey data, because it is necessary to contemplate the realities of the survey when making conclusions from the results.

Survey Summary²⁴

A total of 421 surveys were completed by students at the eight secondary schools during this research period, four in rural 'Upolu, one in urban 'Upolu, and three in rural Savai'i. Samples ranged from 40 to 77 students surveyed at each school, with 154 surveys from Level Nine, 168 from Level Ten, 79 from Level 11, and 19 from Level 12, and one survey without a Level indicated. Of the participants, 194 identified as male and 224 as female, with 3 surveys left blank. Reported ages ranged from 13 to 18 years of age.

Personal communications with members of the schools consisted of formal and informal interviews with five teachers, four Principals and one Vice Principal, as well as a conversation with two students following the administration of the survey.

Part I: Waste Production and Management In the Schools

Data Results²⁵

i. Waste Production

The first question²⁶ (*Do you bring food to school from home or do you buy it at the canteen?*) reveals that the majority of students buy food at the canteen, with roughly 87% of students indicating that they only bought food from school. This figure

²⁴ See Appendix III for data.

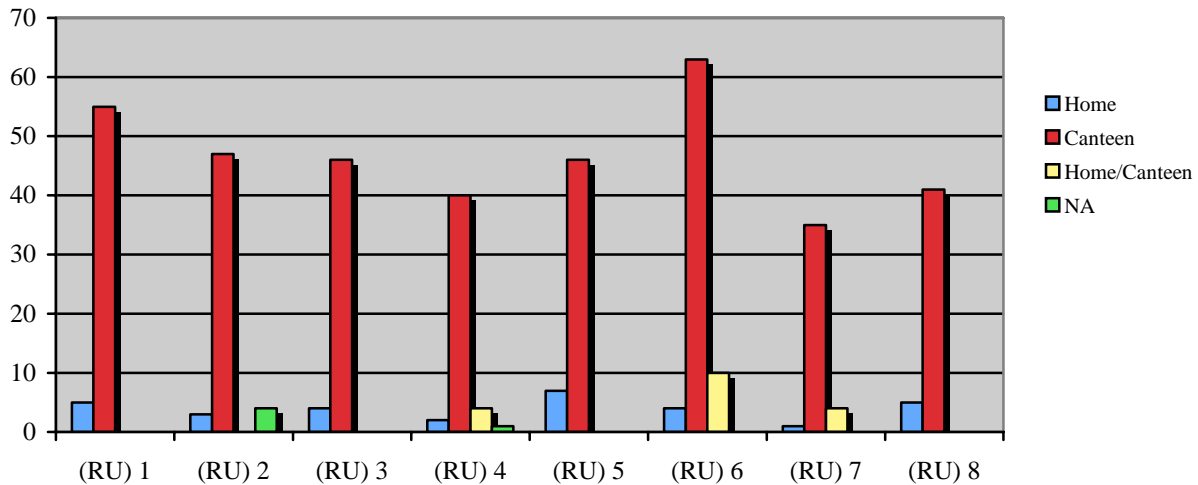
²⁵ For the purpose of this paper, only closed ended questions were tabulated, while the open ended questions (2, 3, 13, and 14) were observed for patterns but not numerically evaluated.

²⁶ See Table I for graph.

encompasses 91% of students when including those who indicated that they sometimes did both. This leaves 7% of students who indicated bringing food from home to eat at school, while 1% left the question blank.

Table I: Question One Results (Separated by School)

Do you bring food to school from home or do you buy it at the canteen?



Three questions assessed what kinds of rubbish the students produced. For Question Five (*What kinds of rubbish are leftover after you eat at school?*), students most often indicated plastic, paper, and food as the top three categories of leftovers, with plastic and paper always being noted by over half the students in each school. Percentage reported overall was 87%, 81%, and 61%, respectively. Bottles and cans were the least often reported overall, with only 27% and 15% respectively. Question Ten (*What kinds of rubbish are produced in the classroom?*) showed an even stronger trend, where paper and plastic were always the top two reported categories, with the exception of one rural Savai'i school where plastic and foil were the top two categories. The largest percentage of students overall reported the production of paper in the classroom, with 89%. Peels, bottles, and cans were the least reported, with only 12% of students indicating the production of cans in the classroom. Finally, Question Eleven (*What kind of rubbish do you produce most often?*) showed the most noticeable trend of the set, where plastic was always the most common answer in individual schools and 93% indicated overall, followed by paper with 80% overall. Food and peels were the least often indicated, with only 37% and 34% overall.

The fourth question (*Where do you eat at school, inside or outside?*) was written to inquire where students ate in order to find out where their rubbish would be produced. Leifiifi College was aware of this connection, evidenced through their purchase of another rubbish bin for the canteen area since they noticed students produce the most rubbish in that location.²⁷ However, in administering the survey there seemed to be confusion as to whether the location was the school building or the compound. Despite the inconclusiveness of the numbers, personal interviews and observations indicated that students ate outside of the building but on the compound, therefore producing waste on the school lawns and outdoor spaces. This leads to looking at what kind of receptacles are available in this area.

ii. Waste Management and Awareness

Three questions assessed what resources the school provided for students to dispose of rubbish. For Question Six (*Does the school provide rubbish bins?*), 65% of students said Yes, while roughly 35% said No.²⁸ A breakdown of this question reveals that six schools provided rubbish bins, while two did not.²⁹ Question Seven (*If yes, how many rubbish bins are on the school grounds outside?*) and Question Eight (*How many rubbish bins are in your classroom?*) checked to see where rubbish bins were present, if at all. 56% of students reported positive numbers for rubbish bins on their school compound, and roughly 43% indicated that there were no outdoor bins. A much higher 98% indicated that rubbish bins were in their classrooms, with only 2% reporting no classroom bins.

²⁷ Tuaniu, Falefata Petaia. Principal, Leifiifi College. 30/4/08

²⁸ For the three yes/no questions (Six, Nine, and Twelve), it should be noted that the second school (rural 'Upolu) most commonly has outliers in the data, which is most likely attributed to the students' struggle with literacy.

²⁹ See Table II for graph.

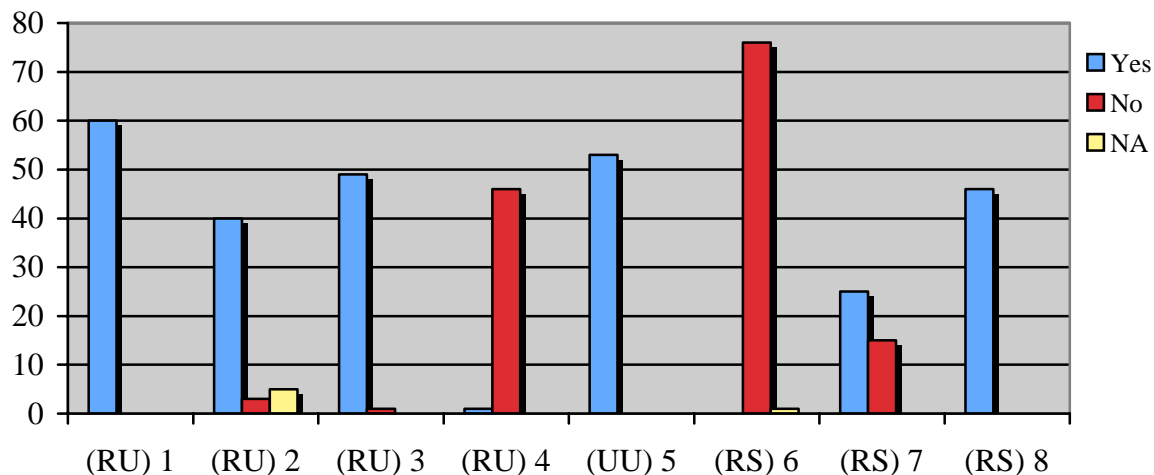
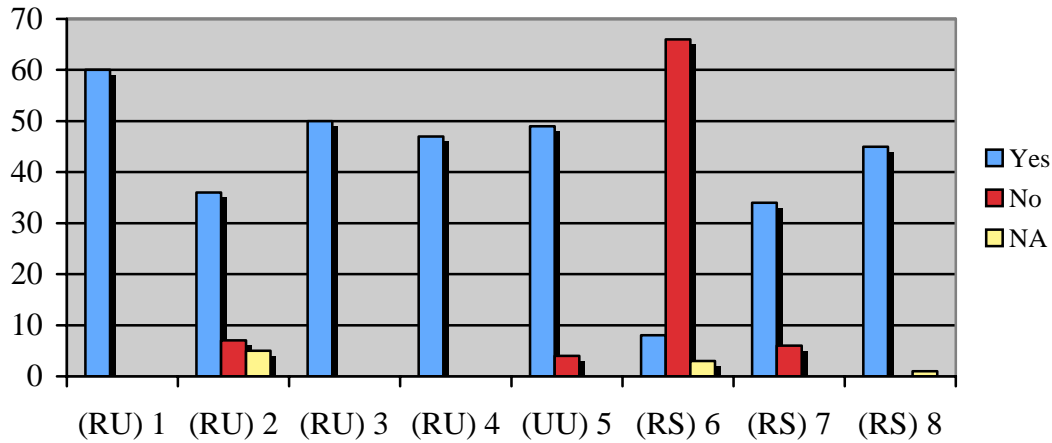


Table II: Question Six Results
Does the school provide rubbish bins?

Regarding the school's role in providing awareness, Question Nine (*Does your school teach you how to dispose of rubbish?*) revealed that overall, schools do teach waste management techniques. Not only is this seen from the 95% of students who answered Yes, but the data also shows that negative answers were usually spread, therefore never revealing any one school that did not teach waste management. The sixth school with the largest sample size also had the largest percentage of negative answers. The statistics for this individual school still show 87% of students responding positively to the question, which indicates a general awareness overall. It should also be noted that the second school with five blank answers was the school that particularly struggled with literacy issues.

Finally, Question Twelve (*Does your school sort its rubbish?*) shows the majority (78%) of students reporting their school sorts its rubbish, though the sixth school overwhelmingly brings this percentage down. Removing all the results from this school, the percent of students indicating a positive answer in the remaining seven schools jumps to 93%. Judging by the graph seen in Table III, this indicates that seven of the eight schools sort its rubbish.

Table III: Question Twelve Results
Does your school sort its rubbish?



Analysis of Data

i. Waste Production

Though students used to bring food from home,³⁰ the result from the first question shows that now the overwhelming majority buys food from the store. This is an example of how lifestyles have changed with the increase of packaged products. A reasonable conclusion from this would be that more non-biodegradable waste is being produced on school grounds as a result, since food items brought from home in the past may have been organic products from family plantations. This is made evident when looking at the compilations of food products mentioned by students in the next two open-ended questions (*What kinds of food do you buy at school?* and *What kinds of foods are available at the canteen?*), since most mentioned pre-packaged foods such as Twisties and noodles, and homemade food products that need packaging to be sold, such as *keke pua'a*.

Looking at what kinds of rubbish are produced during interval, and therefore on the compound outside the school, it is important to note that the top three categories, plastic, paper, and food, are most effectively disposed in different ways, since plastic cannot be burned like paper and food. This means that the kinds of receptacles outside on the school grounds would, in the best scenario, be labeled for different types of waste. Each individual school would have to evaluate the possibilities of managing each kind of

³⁰ Saivaise 7/5/08.

waste, to see if composting and recycling would be possible. Schools that have higher percentages of organic waste production, such as food and peels, could benefit from looking into composting. Paper is the most prevalent answer regarding waste production in the classroom, but again plastic is also widely noted, meaning that waste in the classroom might also benefit from bins that allow sorting upon disposal.

The question asking the type of rubbish produced most often connects the schools to the student's lifestyles outside of the compound, and therefore reveal the types of rubbish that should still be emphasized in management lessons. For instance, cans and bottles do not seem to be produced much on campus, most likely related to the selling restrictions placed on canteens by the schools. However, bottles are reported as more widely produced off-campus, so schools should note the importance of teaching students to return bottles to the store if possible for recycling. This question reveals the prevalence of plastic in modern life, and shows that it will be important to continue teaching students the proper disposal techniques for plastic.

ii. Waste Management and Awareness

The questions assessing the number of rubbish bins showed varied results. Two schools did not provide rubbish bins on the compound, which indicates that students are responsible for disposing of their rubbish in the school's dumpsite. Though it is a positive result that three-quarters of the schools provide bins, this is still an area to be improved. The high percentage of students indicating rubbish bins in classrooms, however, reassures the beliefs of many that awareness of waste management is present but not always implemented.³¹ An awareness of waste management at the classroom level gives hope that this can be expanded to include the compound as a whole. This is reflected in the high number of students indicating that their school taught waste management methods. As seen by the even spread for negative answers, this means that all of the schools have done waste management lessons.

Awareness also seems to exist with regards to the high number of schools that sort its rubbish, with sorting reported at seven out of the eight schools. One caveat to

³¹ One observation that can be mentioned is at Palauli Sisifo, a Design and Technology class made a classroom rubbish bin that is more permanent and sturdy than the cardboard boxes usually used in classrooms. The school paid the class ten tala for supplies, and benefits by having the students produce something that incorporates their technical skills with ideas about good waste management. Source: Poasa, Naomi. Teacher. 2/5/08.

remember about this question is that sorting is not the end of good waste management, but that the next important step is that the sorting is carried out all the time and is a part of other good waste management practices. This is in light of the school that sorts its rubbish, but at the end of most weeks burns all of it together, including plastics. If schools sort, hopefully the separated piles are disposed of properly.

Part II: Waste Management At Home

Data Results

The final question looked at “*How does your family dispose of rubbish at home?*” As mentioned, instructions were specialized at four schools, one to include a separate indication of recycling by returning bottles to the store, and three to include coastal locations such as *sami* and *matafaga*.

The most popular answer for this question throughout all schools was Roadside bins, with 68% of students identifying this method of disposal. This choice was always either the first, second, or third-highest percentage for each individual school. This result confirms the claims found earlier by the short survey described, and extends it beyond the urban Upolu area where the survey was administered (Appendix I).³² The use of pits and burning was a method that was indicated by over half of the students overall, with 66% and 51%, respectively. Burial and dumpsites are also quite popular overall, with 48% and 41% respectively. These results stayed fairly consistent for individual schools. Sorting, on the other hand, was fairly spread. Though only 32% of students named sorting overall, it was the first choice in urban ‘Upolu, with 74%. Rural Savai’i, on the other hand, only had 9% of students report sorting at home. Rural ‘Upolu fell better those, at 39%. Oppositely, the use of forests for dumping was indicated by 47% of students in rural Savai’i, while only 19% use forests in urban ‘Upolu and 24% in rural ‘Upolu. The last four categories overall were composting with 25% indication, recycling at 22%, plantations at 19%, and littering with 6% indication.

³² Connecting these results back to schools, two of the schools themselves unfortunately did not use the bin services. At Aana (No. 1) in rural ‘Upolu, bins are not used because the collection service is unreliable and has not come for months. Despite complaints to the companies, this has still not been solved. Also, Alofi-o-Taoo in rural Savai’i cannot use the roadside collection because theirs was taken and has not yet been replaced.

Analysis of Data

The first trend to note about these results is that they indicate a level of awareness on the student's part as to appropriate spaces for waste management. Instead of answering natural spaces such as plantation or forest, students more often indicate areas that are waste-specific, such as pits or dumpsites. Only one exception exists, where the three rural Savai'i schools have a large percentage of students reporting the use of the forest. Even more intriguing was an interaction with students at Palauli Sisifo, a rural school in Savai'i, after completing the survey. Students vocally described using dumpsites in the forest but condemned throwing rubbish in the sea. This again shows an awareness of the concept of rubbish spaces. From their description, they recognized that disposing of waste in the forest was only acceptable if a dumpsite was used, where the waste could be contained. The sea, on the other hand, is not a place where rubbish can be contained, and therefore can pollute and harm more than just the location where it is thrown. The result of plantation always remains below 20% of students for each school, which indicates that they are aware of the useful nature of plantations. Also, littering is the choice that always remains at the bottom of the lists, with the lowest percentage of students overall identifying littering at home. While this result is most likely affected by the presence of my observer bias, like the answers previously mentioned, it does indicate that even if students were not truthful in their answer, they understand the negative connotation that exists regarding littering and also with regards to dumping in natural spaces as opposed to waste sites.

Perhaps the most vocal awareness existed with regards to burning. Over 50% of students identified burning rubbish at home in the survey results, though one limitation of the survey was that it did not require students to describe what their families burned. In schools where post-survey discussions occurred, all students would be very vocal about not burning plastics, though their answers often seemed recited. Yet upon further inquiry, one teacher admitted that while the school taught students not to burn plastics, they did in fact burn all its rubbish at the end of the week, including plastics, saying "We don't walk the talk."³³ This is one area where the awareness is definitely present, but implementation of the awareness is lacking greatly.

³³ Anonymous interview.

Oppositely, general awareness seems to lack with regards to composting, with 25% of students reporting these answers. One rural 'Upolu school, Aleipata, does report using composting techniques in order to maintain the gardens used by the agricultural science students. Unfortunately, after talking with two students who were not in the agriculture science classes, it became clear that awareness of composting did not exist throughout the school, but was probably still limited to just the students who were in those classes. This is an area that could use improvement, as composting seems to be a relatively useful and easy method to implement at home and at schools, since people are used to picking up leaves and other organic waste products.³⁴

The data also shows that waste management strategies sometimes differ by location. The variation for the results for sorting reveals that methods can sometimes differ quite a bit, where urban 'Upolu has the highest percentage identify sorting while less than ten percent identify sorting in rural Savai'i. Where collection services are best, sorting is the most popular choice. This means that perhaps awareness issues in rural areas have more to do with the deeper root of more unreliable collection services, where sorting is frustrating if collections are infrequent or if they do not also sort garbage on collection.

The results for recycling are probably the most complex in terms of revealing awareness levels. First, it is important to note that at the first school, Aana, students were told to write *fale'oloa* if they returned bottles back to the store. Therefore, results were hugely biased towards recycling, with the highest percentage of students indicating this method (85%). Yet in the post-survey discussion with the class, it was very apparent from their questions and reactions to my answers that students did not actually understand the process or importance of recycling. Due to the overwhelming popularity of this distinction, this was not repeated at other schools because it did not necessarily reveal awareness of recycling. My suspicions were correct, for recycling remains within the bottom four percentage categories at all other schools. This includes Leifiifi, which has a recycling bin on the compound that students are encouraged to use since the school benefits monetarily from its use. At Falealili, students vocally reported in discussion that they returned bottles to the store, though only seven percent of students indicated that

³⁴ Saivaise 7/5/08.

they recycled at home in the survey. In many situations, there was confusion as to why this could be an important part of good waste management.

In an interview with a Samoan language instructor, Silao Kasiano, he notes that recycling remains a difficult concept for people at all levels to grasp, often confusing recycling to literally mean reusing something.³⁵ Yet this is understandable, as the most effective types of recycling in Samoa remains the return of bottles to the Vailima plant. Another area that is improving is the recycling of materials such as heavy metals by selling them to companies that sends them overseas. These companies work in conjunction with the landfill, but awareness of their existence still seems to be limited to those who use this type of recycling for a small source of income by buying other people's rubbish to sell for recycling.³⁶ Even though the method of recycling is still developing, clarification of what does exist needs improvement. It seems that many people are doing small things like returning bottles to the store but not understanding why they should continue to do so, which is an integral part of keeping this practice a part of waste management in the future.

Part III: Reflections on Interactions within the Schools

When looking at the state of waste management in schools, one must keep in mind that the school system in Samoa has many other concerns and issues that it must tackle everyday. The first is that many schools in Samoa are understaffed. One must wonder if this has any effect on the successful teaching and implementing of waste management in schools. Second, science training, even more broadly than environmental education training, is often far from adequate. Again, a difficulty remains in teaching science topics in particular due to the fact that many scientific concepts only have English translations, which means science lessons often become more focused on memorizing the English vocabulary than actually focusing on whether the students understand the concept.³⁷ This type of rote memorization as a form of learning often leaves out the deeper awareness needed to understand how and why the concepts are important instead of just focusing on what they are. Waste management education falls into this category,

³⁵ SIT Office. 5/5/08.

³⁶ Kasiano, Silao. 1/4/08.

³⁷ Anonymous interview.

where students have memorized that burning plastic is harmful for the atmosphere, but it does not mean they will sort out plastics from burn piles at home. Waste management lacks in the area of behavior change, where students can tell you about the negative impacts of actions like littering, but do not practice the knowledge they know. A sense of relevancy and connection to daily life is necessary in order to bridge that gap.

One interaction that has so far gone unmentioned reveals one of the keys to a successful awareness program. At the conclusion of the survey in Aleipata, two girls approached me with questions and revealed that their interest in my survey was sparked by their work with the Marine Protected Area (MPA) in their village. An MPA is a specific site chosen by the MNRE that is deemed to be sheltered from use by people and it is the responsibility of the village to care for the area. MPAs include coral reef and mangrove areas, and people in the village are taught to do coral monitoring programs. Aleipata is unique in that it also has a turtle protection program as well. The MPA has seen much success in the last year, as people report seeing a positive difference in the area.³⁸ It is the sincerity of the interest in this area that is the most striking. The girls were so passionate talking about how important it is to keep rubbish out of the sea, coral reefs and the mangroves. Their principal, Mili Matila, also praised their work, since they just recently won a Peace Corp mangrove competition. Twelve students are involved with the program, and they are involved in doing awareness programs with the village, making signs and doing speeches for the heads of the village, including the *pulenu'u* (village high chief), *matai* (village chiefs), *faiifeau* (village pastors), Women's Committees, and even beach fale owners, on the important issues.³⁹ This is an amazing opportunity for these students, as it is very relevant to their lives and gives them creative ways to promote knowledge. Furthermore, it enhances their educational experience by having to give speeches in Samoan and English to important community members. This is a perfect example of how making lessons interactive and relevant to life outside of the classroom can enhance the success of the awareness level.

³⁸ Ward, Juney. Senior Marine Conservation Officer. MNRE, DEC. 31/3/08.

³⁹ Aleipata Secondary School. 29/4/08.

Recommendations

It is clear from this data that evaluating awareness levels becomes very complex, even when breaking down the sample of evaluation. Many conclusions can be drawn from this data, the most useful being how to use these results to make positive changes for the future.

One theme that runs through this study is that awareness is often present but not fully implemented into daily life. For the most part, schools are teaching secondary students about rubbish disposal and making them act on it in school by having compound cleanup times and by providing rubbish bins in the classroom. What students do outside of the compound has yet to be determined. Discussions with students and teachers suggested that even if people know what should or should not be done, sometimes convenience or laziness leads to bad habits. For instance, few students report that they litter, but littering is still an issue in Samoa. Even if the result is biased, students are aware of the negative connotations and implications of littering, and though behavior change has yet to be implemented, knowledge is key to action later. The same is true for burning plastic wastes. If schools are teaching students not to burn plastics, it is in their best interest to do the same. As mentioned, schools face many complex issues that may stand in the way of always practicing good waste management techniques, but this is a goal to work towards in the future.

Schools should also look into acquiring more rubbish bins, most specifically for the outdoor compound area and near the canteens. This often requires addressing *matai* or other village leaders. One suggestion is that students are given the opportunity to ask village leaders themselves. This would be an excellent way to incorporate the student's educational experience with the needs of their schools. This suggestion stems from the work done by the students working with the MPA in Aleipata. Students could put together speeches, posters, or do creative shows such as plays or songs about waste management, and could request help from *matai* to help them acquire more rubbish bins or roadside platforms. This kind of community work would not have to be limited to requests for help, but could even be general environmental awareness for all levels of society. Any opportunity for students to be creative might help give a sense of relevancy

to their work, and having to produce for an audience such as women's committees or churches would give students a sense of purpose.

In the classroom, it is also important to teach waste management with hands-on or interactive methods. Since waste management is ultimately about action, students should not only learn about waste management as a set of requirements to be memorized. Laufasa Pouesi, a teacher at Alofi-o-Taoa, recognized "the importance of seeing and doing" in the classroom, where students are much more likely to retain lessons if they have hands-on ways of learning about the topic.⁴⁰ Field trips are another way to engage students and connect the classroom to their everyday lives. As in Palauli Sisifo, classes like Design and Technology can also be used to do projects to promote good waste management or other environmentally friendly behavior. Perhaps one of the best suggestions to involve the students would be to ask them to come up with projects on their own, to see where their interests lie. The most effective knowledge will be genuine, so finding students that are passionate about caring for the environment could lead to new ideas for the future as well.

One positive outlook is the launching of the "Environment Education Resource" in June 2008, with teacher training sessions to be held in July. This will focus on consolidating information for easy access for busy teachers, as well as training teachers how to most effectively convey lessons on environmental education. Waste management is one of the six topics in this new resource, indicating its importance for the future. This resource also champions the importance of interactive teaching methods and lessons, such as experiments and labs.

In terms of methods of waste management in schools, schools must be honest about the types of rubbish that are produced on their grounds. For instance, since plastics are quite often produced but cans are not, it would mean that if the school have the initiative and the funds to look into recycling, they should focus on recycling plastics. Another suggestion for schools that have the resources is to compost. All schools have organic wastes, from leaves, cut grass, to students' fruit peels. Composting should only be attempted if resources are available to carry it through, as either way it will serve as an example to the students. Schools carry the burden of this role, and should be more

⁴⁰ (paraphrased) 1/5/08.

concerned with doing waste management properly than trying to implement multiple methods.

It is important to look at the big picture as well. Many times, environmental organizations target the source of waste, trying to persuade people to buy less packaged goods or buy in bulk.⁴¹ Another way to look more deeply at the source of waste is to promote small-scale agriculture.⁴² Local agriculture would mean that more families are providing for themselves and requiring less purchased, and therefore packaged food. Also, plantations are seen as useful plots of land, and may be less likely to be littered. Plantations might also encourage more people to compost waste, as it can then be used to fertilize plots. This kind of thinking benefits waste management because it attacks more than just the surface level causes for waste production. Recommendations that address multiple facets of waste management will ultimately help schools continue to promote awareness.

Conclusions

With these recommendations and the thoughts they pose, it is clear that the initiative for awareness exists, but bringing these lessons out of the classroom needs to continue to be a focus for schools. Yet it is important to remember the difficulty in bridging the gap between awareness and behavior change. Since the goal for waste management is behavioral actions, solutions are not simple and require constant work and change.⁴³ One must not overlook the importance of starting with a base in awareness before expecting people to change their routines and maintain this change.

One exciting thing about the breadth of this research is that it paves the way for further research. Certainly other surveys could be done at other levels in society. Focusing on schools still, looking at the Primary level would evaluate the basis for knowledge, while looking at Tertiary students would evaluate whether the knowledge they gained in childhood was retained as they reached adulthood and gained more independence over their life. Studies could look at how waste management is being

⁴¹ *What a Waste: An Environmental Comic Book*. SPREP. Marfleet Printing Co.: Apia, Samoa, 2001.

⁴² Faalua, Norma. Assistant Programs Officer and Finance and Administration Officer, OLSSI Office. 6/5/08.

⁴³ Ricketts, Mark. SPREP. 30/4/08.

taught in order to evaluate which methods are the most effective. Also, this study allows for more effective environmental lessons in the classroom. Knowing the issues for individual schools provides teachers and other educational bodies insight into what kinds of knowledge needs to be built up for the future.

Samoa has made a significant effort to promote good waste management to all levels of society. While many issues and challenges remain in the future, people are passionate about continuing to promote awareness, and remaining optimistic about preserving Samoa's natural resources. Instilling good waste management practices into the daily lives of citizens will help all facets of environmentalism.

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Interactions at Schools

I. 421 surveys conducted at Aana (Number One), Lefaga, Falealili, Aleipata, Leifiifi, Alofi-o-
taoa, Savai'i Sisifo, and Palauli Sisisfo secondary schools.

II. Four formal interviews

Fui, Sara. Principal, Aana (No. 1). 28 April 2008.

Leiataua, Makereta. Principal, Lefaga. 28 April 2008.

Matila, Mili. Principal, Aleipata. 29 April 2008.

Tamamasui, Falefata Pakisa. Vice Principal, Falealili. 29 April 2008.

III. Four informal interviews

Kalolo, Ana. Teacher, Aana (No. 1). 28 April 2008.

Poasa, Naomi. Teacher, Palauli Sisifo. 2 May 2008.

Pouesi, Laufasa. Teacher, Alofi-o-Taoa. 1 May 2008.

Tuanui, Petain. Principal, Leifiifi. 30 April 2008.

IV. Four personal communications

Two students, Aleipata. 29 April 2008.

Two Teachers, Savai'i Sisifo. 2 May 2008.

Glossary

<i>fa'asamoa</i>	Samoa way of life
<i>fai'feau</i>	village pastor
<i>fale'olua</i>	store or canteen
<i>lapisi</i>	rubbish, usually referring to non-biodegradable (ie plastics)
<i>matai</i>	village chiefs
<i>otaota</i>	rubbish, usually referring to biodegradable waste (ie leaves)
<i>pulenu'u</i>	village high chief

Appendix I: Survey: Waste Management / Lafoaiina o Lapisi

- 1) Age/Tausaga _____ 2) Level/Vasega _____ 3) Male/Alii ___ Female/Tamaitai ___
 4) Village / Nu'u _____ 5) School / A'oga _____
- 1) Do you bring food to school from home or do you buy it at the canteen?
E te sau ma lau mea'ai mai le fale pe fa'atau i se fale'oloa? _____
- 2) What kinds of food do you buy at school?
O a itu'aiga mea'ai e fa'atau i le a'oga? _____
- 3) What kinds of foods are available at the canteen?
O a itu'aiga mea'ai e maua i le fale'oloa i le a'oga? _____
- 4) Where do you eat at school, inside or outside?
E te ai i totonu o le lotoa po'o fafo o le lotoa? _____
- 5) What kinds of rubbish are leftover after you eat at school?
O a lapisi e lofoa'i pe a uma ona e ai i le a'oga?
 _____ Food / *Fasimea'ai* _____ Peels or fruit skins / *Pa'u (mago, fa'i...)*
 _____ Foil / *Pepa afifi* _____ Plastic / *Taga pepa i'ila*
 _____ Cans / *Atigi apa* _____ Bottles / *Atigi fagu*
 _____ Paper / *Pepa*
- 6) Does the school provide rubbish bins?
E iai ni kalone lapisi a le a'oga? Yes/*Ioe* No/*Leai*
- 7) If yes, how many rubbish bins are on the school grounds outside?
Afai e iai, e fia ni kalone lapisi e i totonu o le lotoa o le a'oga? _____
- 8) How many rubbish bins are in your classroom?
E fia ni pusa lapisi e i totonu o le potua'oga? _____
- 9) Does your school teach you how to dispose of rubbish?
E a'oa'o i le a'oga pe fa'apefea ona lafoa'i lapisi? Yes/*Ioe* No/*Leai*
- 10) What kinds of rubbish are produced in the classroom?
O a lapisi e maua itotonu o le potua'oga?
 _____ Food / *Fasimea'ai* _____ Peels or fruit skins / *Pa'u (mago, fa'i...)*
 _____ Foil / *Pepa afifi* _____ Plastic / *Taga pepa i'ila*
 _____ Cans / *Atigi apa* _____ Bottles / *Atigi fagu*
 _____ Paper / *Pepa*
- 11) What kind of rubbish do you produce most often?
O a ituaiga lapisi ta'atele?
 _____ Food / *Fasimea'ai* _____ Peels or fruit skins / *Pa'u (mago, fa'i...)*
 _____ Foil / *Pepa afifi* _____ Plastic / *Taga pepa i'ila*
 _____ Cans / *Atigi apa* _____ Bottles / *Atigi fagu*
 _____ Paper / *Pepa*
- 12) Does your school sort its rubbish?
E fa'avasega e le a'oga ituaiga lapisi eseese? Yes/*Ioe* No/*Leai*
- 13) Where do you throw out your rubbish at school?
O fea e lafoa'i ai lapisi a le a'oga? _____
- 14) Where do you throw out your rubbish at home?
O fea e lafoa'i ai lapisi a lou 'aiga? _____
- 15) How does your family dispose of rubbish at home? (Check all that apply)
E fa'apefea ona fa'avasega me lafoa'i lapisi i lou 'aiga?
 _____ Roadside bins / *Kalone lapisi i tafa ala* _____ Sorting / *Fa'avasega*
 _____ Recycling / *Toe fa'afu'i* _____ Burning / *Susunu*
 _____ Burial / *Tanu* _____ Littering / *Fa'alapisi*
 _____ Composting / *Fa'apalaga* _____ Pit / *Pū po'o se lua*
 _____ Forest / *Togavao* _____ Plantation / *Maumaga*
 _____ Dumpsite / *Nofoaga faapitoo*

Appendix II: General School and Student Information (421 Surveys Total)

<i>i) Rural 'Upolu (RU)</i>							
	Total:	LEVEL			Male	Female	NA
Aana (No. 1)	60				24	36	
28-Apr		Level 9	32		13	19	
		Level 10	28		11	17	
Lefaga	48				24	22	2
28-Apr		Level 9	29		12	15	2
		Level 12	19		12	7	
Falealili	50				22	28	
29-Apr		Level 11	50				
Aleipata	47				23	23	1
29-Apr		Level 10	17		8	9	
		Level 11	29		14	14	1
		NA	1		1		
<i>ii) Urban 'Upolu (UU)</i>							
Leifiifi	53				27	26	
30-Apr		Level 9	53				
<i>iii) Rural Savai'i (RS)</i>							
Alofi-o-taoa	77				37	40	
1-May		Level 10	77				
Savai'i Sisifo	40				18	22	
2-May		Level 9	40				
Palauli Sisifo	46				19	27	
2-May		Level 10	46				
TOTALS		Level 9	154		Male	194	
		Level 10	168		Female	224	
		Level 11	79		Blank	3	
		Level 12	19				
		NA	1				

Appendix III: SURVEY RESULTS

Question 1	Do you bring food to school from home or do you buy it at the canteen?			
	Home 31 (7.4%)	Canteen 367 (87.2%)	Both 18 (4.3%)	NA 5 (1.2%)
Question 4	Where do you eat at school, inside or outside?			
	Inside 339 (81%)	Outside 62 (15%)	NA 10 (2%)	
Question 6	Does the school provide rubbish bins?			
	Yes 273 (65.1%)	No 141 (33.5%)	NA 6 (1.1%)	
Question 7	If yes, how many rubbish bins are on the school grounds?			
1 bin (93)	2 bins (116)	# > 2 bins (25)	Yes (3)	TOT (+): 237 (56.3%)
	0 bins (47)	No (106)	Blank (26)	TOT (-): 179 (42.5%)
				NA 5 (1.2%)
Question 8	How many rubbish bins are in your classroom?			
1 bin (197)	2 bins (185)	# > 2 bins (22)	Yes (1)	Yes, unsure (7)
			0 bins (4)	Blank, no (4)
				TOT (+): 412 (97.9%)
				TOT (-): 8 (1.9%)
				NA 1 (0.2%)
Question 9	Does your school teach you how to dispose of rubbish?			
	Yes 401 (95.2%)	No 13 (3.1%)	NA 7 (1.7%)	
Question 12	Does your school sort its rubbish?			
	Yes 329 (78.1%)	No 83 (19.7%)	NA 9 (2.1%)	

Question 5: What kinds of rubbish are leftover after you eat?

	Aana	Lefaga	Falealili	Aleipata	Leifiifi	Alofi-o-T.	Savaii S.	Palauli S.	TOTAL:
plastic	88%	94%	84%	60%	94%	95%	80%	100%	87%
paper	95%	94%	72%	55%	81%	86%	65%	96%	81%
food	72%	96%	60%	34%	55%	71%	3%	96%	61%
peels	70%	54%	16%	23%	62%	27%	30%	85%	46%
foil	53%	67%	22%	13%	79%	55%	43%	11%	43%
bottles	43%	35%	10%	11%	57%	39%	13%	9%	27%
cans	22%	21%	10%	6%	43%	4%	10%	7%	15%

Question 10: What kinds of rubbish are produced in the classroom?

	Aana	Lefaga	Falealili	Aleipata	Leifiifi	Alofi-o-T.	Savaii S.	Palauli S.	TOTAL:
plastic	98%	85%	84%	68%	81%	69%	65%	96%	81%
paper	95%	98%	80%	89%	96%	100%	80%	76%	89%
food	90%	77%	38%	23%	45%	36%	3%	70%	48%
peels	90%	19%	8%	13%	40%	12%	30%	83%	37%
foil	55%	60%	24%	26%	57%	21%	43%	87%	47%
bottles	63%	27%	20%	11%	38%	16%	13%	30%	27%
cans	27%	23%	6%	4%	8%	8%	10%	13%	12%

Question 11: What kind of rubbish do you produce most often?

	Aana	Lefaga	Falealili	Aleipata	Leifiifi	Alofi-o-T.	Savaii S.	Palauli S.	TOTAL:
plastic	97%	94%	92%	85%	98%	88%	88%	100%	93%
paper	93%	94%	70%	55%	92%	83%	60%	89%	80%
food	63%	63%	10%	9%	58%	39%	30%	26%	37%
peels	77%	40%	10%	4%	51%	29%	33%	24%	34%
foil	47%	52%	16%	26%	79%	36%	35%	39%	41%
bottles	73%	58%	36%	36%	60%	53%	43%	15%	47%
cans	62%	58%	48%	30%	47%	62%	53%	15%	47%

Appendix IV: Short Survey on Garbage Collection Services, with Data

Questions:

- 1) Tausaga_____ 2) Alii____ Tamaitai_____ 3) Nu'u_____
- 4) Where do you dispose your garbage? (*Ofea e tia'i ai lapisi/otaota?*)
 Roadside: 8 Burn: 1 Sort (roadside, burn, compost): 1
- 5) How often does the garbage collection come? (*E fa'afia ona ao le lapisi?*)
 1 x week: 5 2 x week: 3 3 x week: 1 3-4 x week: 1
- 6) Is it reliable? (*E fa'amoemoe ina le aoga o le lapisi?*)
 Yes/Ioe: 9 No/Leai: 0 "Somewhat": 1
- 7) Do you litter? (*E te fa'aotaota?*)
 Yes/Ioe: 2 No/Leai: 6 "Sometimes": 2