Reduce, Reuse and Recycle (3r) Awareness Programme to Increase the Knowledge, Attitude and Practice on 3r among Primary School Students

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Abstract
One of the issues of ineffective solid waste management may be attributable by human behaviour is lack of education and ineffectiveness of reduce, reuse and recycle (3R) awareness programmes, which the solution may lie in changing that behaviour. Therefore, a 3R programme was conducted to increase the knowledge, attitude and practice (KAP) on 3R among 155 primary school students recruited by systematic random sampling from year one to six at a selected school in Tumpat, Kelantan. A set of questionnaire was given before and after the 3R programme to determine their KAP level and the effectiveness of the awareness programme in increasing their KAP on 3R. There was a significant difference in knowledge score (p = 0.030) but no significant differences in scores of attitude (p = 0.484) and practice (p=0.248) between before and after 3R programme. There was a weak correlation between knowledge and attitude (r=0.320) and between knowledge and practice (r=0.386) for before the 3R programme. There was also moderate correlation between attitude and practice (r=0.400) before the intervention programme. After the intervention programme, the correlation was increased from weak to strong correlation between knowledge and attitude (r=0.614) and weak to moderate correlation between knowledge and practice (r=0.476). There was moderate correlation between attitude and practice after the intervention programme (r=0.520). Hence, continuous awareness on 3R campaign and activities should be conducted at an early age among the students to increase their practices on 3R.
Keywords: Reduce, Reuse, Recycle, Intervention Programme, Primary School Students

Introduction

Solid waste disposal is a serious issue that all countries and municipal governments throughout the nation are facing, as humans generate solid waste almost every day. Researchers had reported that dumping and landfilling are the main disposal methods for solid waste management in Malaysia (Sakawi, 2011; Tarmudi et al., 2012; Jereme et al., 2015). This issue becomes more serious as landfills are rapidly filling up, yet there is increasing amount of waste generated and shortage of disposal land which eventually could led to environmental and human health impacts (Anuar & Haliza, 2014; Haliza & Aisyah, 2016). One of the examples of environmental impacts is leachates leak into water sources like rivers when rain falls wash away some of these waste. Thus, it gives more pollution risks to the environment (Pukkalanun et al., 2013). Greenhouse gases are also emitted into the atmosphere from these waste and contributing to climate change, which is another issue of serious concern.

The world population is expected to reach nine billion by 2050 hence the amount of municipal solid waste is expected to increase in parallel to such rapid development (Badgie et al., 2012; Fauziah & Agamuthu, 2012). Solid waste generation in Malaysia has shown a drastic increment from about 9.0 million tonnes in 2000 to about 10.9 million tonnes in 2010; to about 12.8 million tonnes in 2015 and finally to about 15.6 million tonnes in 2020. Generation of municipal solid waste has been continuously increasing and its management has been a big problem in Malaysia due to its rapid increase in the volume and composition (Agamuthu et al., 2011). It was reported in 2003 that the average amount of municipal solid waste generation per capita per day ranged between 0.5 - 0.8 kg but in the recent past decade, the range has increased to between 0.5 - 2.5 kg, especially in the major cities such as Kuala Lumpur and Petaling Jaya (Agamuthu et al., 2011). The national strategic plan on solid waste management estimated that the waste generation rate increases by 3.59 % per year based on the population growth projections for the period of 2002 - 2020. Thus, based on that projection, the total waste generated in peninsular Malaysia was 23000 tons/day in 2010 and 25000 tons/day in 2012. In 2020, the amount of waste to be generated has been estimated to reach 30000 tons/day (Abushammala et al., 2010) in which such figure was also reported by (Agamuthu and Fauziah, 2011). Selangor state of Malaysia produced the highest quantity of municipal solid waste, followed by Kuala Lumpur and Johor (Agamuthu & Fauziah, 2011). The trend shows that the waste generation keeps on increasing on yearly basis for all states including Kelantan. This high generation rate in Malaysia is attributed to the rapid economic growth, rural-urban migration, changing lifestyles that have been experienced in the recent past. Population growth and solid waste generation are directly related. In other words, as population increased, the generated amount of waste also increased. This drastic increasing of solid waste generation is expected to burden the resources and environment in managing these waste properly (Agamuthu & Victor, 2011). Unfortunately, the waste collected are about 70 % and the amount of collected waste being disposed in landfills are about 95 % with only about 5 % of waste are being recycled (Agamuthu et al., 2009). Thus, the efficient management method to control these waste is paramount important (Al Ansari, 2012).

One approach that can be utilised to manage municipal solid waste in preventing environmental pollution is 3R principle that are referred to reduce, reuse and recycle. Reduce, reuse and recycle help to save natural resources for the future (Mohan et al., 2011; Lino & Ismail, 2012). It helps in reducing the amount of waste that need to go to the landfill and incinerator, hence can save the costs of landfill and incineration as well as can save space of the landfill (Lino & Ismail, 2012). Furthermore, recycling and reuse can create more job

opportunities, as recycling continue to grow, more workers will be needed to collect, sort, and process recyclables and reuse centres can also be used as means of creating job opportunities (Kun, 2012). 3R also contribute in reducing air pollution and climate emissions, such as CO_2 and greenhouse gas emissions (Conrad & Jan, 2010; Mohan et al., 2011; Lino & Ismail, 2012). Other than that, recycling also saves energy (Conrad & Jan, 2010; Kun, 2012; Sifang et al., 2012). There are countries that do not have their own natural resources but they can import waste material, such as paper as raw material for their manufacturing industries. Agamuthu et al (2011) reported that in order to increase the awareness among the public on the importance of 3R, about 60 % of the budget allocation has been used (RM70 million or US$18 million) every year. However, based on a survey by the Ministry of Housing and Local Government, there were only 80 % of the public who are actually practicing the 3R even though their level of awareness was 100 % (Agamuthu et al., 2009). This is due to the insufficiency of facilities, including collection centres coupled with the inappropriateness in the location of recycling facilities and the schedule of collection.

Hence it is vital that environmental education should begin in early childhood years since children's basic values, attitudes, skills, behaviours and habits are formed during these years (Kara et al., 2015; Ardoin & Bowers, 2020). Thus, students must have awareness about environmental problems so that they can play their role very effectively in proper waste management (Tartiu, 2011). Therefore, this study in conducting the 3R awareness programme is important to increase the knowledge, attitude and practice on 3R the among primary school children.

Methodology

This research was an interventional study where the purpose was to increase the awareness on 3R among primary school students in Tumpat, Kelantan. This research was conducted at Sekolah Kebangsaan Bendang Pa'Yong where it was chosen based on the selection criteria; located in rural area and 3R programme has not been conducted before. Fish bowl technique was utilised in which the list name of schools (fulfilled selection criteria) were put in a bowl and randomly selected. The first school that was willing to participate in the research was assigned as the intervention school.

A systematic random sampling method was used to select the study participants. A list of students was obtained from the selected intervention school. Students that fitted the inclusion criteria such as (i) able to understand, read and write in Malay; (ii) do not have learning disorders i.e. dyslexia, autism, attention-deficit / hyperactivity disorder (ADHD) or slow learner were chosen for the study. The new list of students fulfilling the inclusion criteria (were determined by asking their teachers and after obtaining the parental consent) were numbered and the multiple intervals was calculated. Then, a stone was tossed on a piece of paper with numbers written on it. The number that the stone will fall on was chosen as the first student and the next students was chosen according to the interval. Students that fitted the inclusion criteria were gathered in a hall to brief about the purpose of the research. Information sheets and consent forms were distributed to the students for their parent's approval. A day after, the consent forms were collected, and verbal consents were obtained from the students. Two weeks after that, the students were given pre-questionnaires on 3R.

A self-administered and self-developed questionnaire (copyrighted under MyIPO *"Soal Selidik Pengetahuan, Sikap dan Amalan tentang 3R dalam kalangan Pelajar Sekolah Rendah"* (LY2018004547)) based on SWCorp module (2015) consisted of 33 questions was used in this study. The questionnaire had undergone content and expert validity, as well as

has been piloted to test its reliability and suitability. There were four parts (Part A, B, C and D) that asked on socio-demographic information, knowledge, attitude and practice of students on 3R, respectively.

After two days, the 3R programme was conducted where intervention was given to all students on the capacity of health education and health promotion. 3R programme was held for three hours which involved talk on 3R, audio-visual on 3R obtained from youtube and games on 3R which were conducted at their respective classroom. The games involved 36 facilitators and five lecturers in which the students were divided into five groups at each classroom. Two weeks after the intervention programme, the students were given post-questionnaires. They were provided 15 minutes to answer the questionnaires given. A token of appreciation was given to each student after completion of the post-questionnaires.

Data collected were analysed using Statistical Package for Social Sciences Software (SPSS) version 24.0. The socio-demographic data such as age, gender, and races were analysed using descriptive test. In this study, the level of knowledge, attitude and practice among intervention group before and after 3R programme were compared by using Paired T-test. Relationship between KAP on 3R among intervention group were analysed by Pearson Correlation test.

The knowledge, attitude and practice scoring was calculated as follows; (i) knowledge part – there were 15 questions, a score of 1 was given for correct answer and 0 for wrong answer (the total score point was 15 and the minimum was 0); (ii) attitude part – there were 10 questions, a score of 1 was given for correct answer and 0 for wrong answer (the total score point was 10 and the minimum was 0); and (iii) practice part - there were three questions in this part that ranged using scale: never or do not bring anything scored as 0, sometimes, bring a few and once a month scored as 1, always, bring all and once a week scored as 2 and every day scored as 3. For a question that the students need to choose either 'yes' or 'no' for the answer, the correct answer was given a score of 1 while the wrong answer was given a score 0. The total score point were 14 and the minimum was 0.

Results and Discussions
Sociodemographic Data
Altogether there were 155 primary school students (100% response rate) had participated in this study. The analysis of socio-demographic data showed that 59 students (38.1 %) were male while 96 students (61.9 %) were female. All students were among standard one to six. They were divided into two levels. Level one comprised of standard one to three while level two comprised of standard four to six. There were 80 students (51.6 %) in level one and 75 students (48.4 %) in level two. Standard four has the highest frequency with 31 students (20.0 %) while the lowest frequency was standard five with 21 students (13.5 %). All of the students were Malay.

Table 1
Socio-demographic data of students (N=155)

Variables	Frequency (*f*)	Percentage (%)
Gender		
Male	59	38.1
Female	96	61.9
Standard Level		
Level one	80	51.6
Level two	75	48.4
Standard		
One	24	15.5
Two	29	18.7
Three	27	17.4
Four	31	20.0
Five	21	13.5
Six	23	14.8

Percentage of correct answers for the domain of knowledge, attitude and practice response towards 3R

Table 2 shows that there were 10 out of 15 questions on knowledge domain that showed increasing percentage of correct answer after the intervention programme. This indicates that the content of the 3R talk and games had increased their knowledge towards 3R after the intervention programme. However, the percentage for another five remaining questions seemed dropped after the 3R programme. Three out of that five questions were about the correct 3R elements according to different situations. Two more questions were about the effect of waste disposal and the effect when waste are thrown to the river and sea. It can be assumed that the students were confused with the application part of the 3R elements in different situations and might not have been exposed toward environmental effects.

Table 2
Frequency and percentage of correct answers for knowledge domain on 3R (n=155)

Question No.	Knowledge	Before 3R programme		After 3R programme	
		n	%	n	%
1	Materials that cannot be recycled	95	61.3	111	71.6
2	Recycling logo	134	86.5	138	89.0
3	Colour of recycling bin for ice cream wrapper.	77	49.7	82	52.9
4	Colour of recycling bin for glass bottle	69	44.5	95	61.3
5	Colour of recycling bin for used drawing paper	46	29.7	62	40.0
6	Element which is not 3R element	39	25.2	48	31.0
7	Materials that cannot be throw away into recycling bin	111	71.6	120	77.4
8	Correct 3R element when back of a used paper is used to jot down notes	123	79.4	117	75.5
9	Correct 3R element when bring your own bag when shopping	113	72.9	101	65.2
10	Correct 3R element when separating waste according to their types and colour of recycling bins	96	61.9	96	61.9
11	Effect to the Earth when full with waste	68	43.9	89	57.4
12	Effect when people used contaminated water	135	87.1	137	88.4
13	Effect to the river and sea when waste are thrown into them	131	84.5	125	80.6
14	Effect of waste disposal	135	87.1	129	83.2
15	Effect of open burning to human health	126	81.3	128	82.6

For attitude part, there was only two questions that had increased in percentages after the intervention programme (Table 3). Questions 17 asked about the attitude toward empty chocolate bottle and question 22 asked about buying plastic bag when shopping during weekend. It can be assumed that the students had been through these two situations so they knew how to react and responded to the statements. Another eight remaining questions, they seemed to have no increment or do not have any changes in their percentages.

Table 3

Frequency and percentage of positive attitude towards 3R (N=155)

Question No.	Attitude	Before 3R programme		After 3R programme	
		n	%	n	%
16	Attitude when saw empty Vitagen bottle outside the class	149	96.1	137	88.4
17	Attitude toward empty chocolate bottle	118	76.1	128	82.6
18	Attitude when the back of a used paper is not used	119	76.8	116	74.8
19	Attitude when to post letter	62	40.0	62	40.0
20	Attitude toward towel that cannot be used anymore	134	86.5	129	83.2
21	Attitude toward empty chili sauce bottle	131	84.5	123	79.4
22	Buy plastic bag when shopping during weekend	61	39.4	70	45.2
23	Good attitude	143	92.3	141	91.0
24	Attitude when saw chocolate's wrapper under the table in the class	135	87.1	135	87.1
25	Attitude toward several used school's attires	130	83.9	125	80.6

Practice part consists of 10 questions with measurable of 17 items (Table 4). There were 10 items out of 17 (58.8%) that do not have increment in their percentages after the intervention programme with item 11 (the amount of recyclable materials that was brought to school during recycling activities) had the lowest percentage of response (11.6%). Question 27 which asked about choosing the correct items that can be thrown into orange recycling bin also showed no difference in the percentage (40%) before and after the intervention programme. This indicates that the students were not practicing 3R in their daily lives, so they failed to differentiate materials that were supposed to be thrown in the orange recycling bin. Percentage of question 35 which was regarding the frequency of waste separation at home specifically for item (never separate waste at home) and (once a month separate the waste at home) were decreased after the intervention programme. It can be assumed that their parents also never separate the waste at homes according to their types correctly. Hence, the students were not familiar with 3R.

Table 4
Frequency and percentage of practice response towards 3R (n=155)

Question No.	Practice	Before 3R programme		After 3R programme	
		n	%	n	%
26	Choosing type of food containers	144	92.9	130	83.9
27	Choosing correct items that can be thrown into orange recycling bin	62	40.0	62	40.0
28	Action taken when saw drains at school were full with trash.	126	81.3	117	75.7
29	Action taken when saw people thrown rubbish into the river	122	78.7	121	78.1
30	Action taken when pant torn	136	87.7	133	85.8
31	Action taken when saw trash beside the class	138	89.0	132	85.2
32	Frequency of bringing own bag when shopping				
	Never	37	23.9	39	25.2
	Sometimes	61	39.4	62	40.0
	Always	57	36.8	54	34.8
33	Action taken when get a new shoes	125	80.6	123	79.4
34	Amount of recyclable materials that are brought to school during recycling activities				
	Do not bring any recyclable materials	18	11.6	18	11.6
	Bring a few of recyclable materials	39	25.2	56	36.1
	Bring all recyclable materials	98	63.2	81	52.3
35	Frequency of waste separation at home				
	Never	67	43.2	53	34.2
	Everyday	21	13.5	28	18.1
	Once a week	21	13.5	30	19.4
	Once a month	46	29.7	44	28.4

Comparison of Level of KAP on 3R Before and After the Intervention Programme

According to Tan et. al (2013), the key for youths to practice recycling was by gaining the knowledge first. Interestingly, there was a significant increase in score of knowledge before and after the 3R programme with $p = 0.030$; the mean score of knowledge before the 3R programme was 64.43 ± 17.92 while the mean score of knowledge after the 3R programme was 67.87 ± 20.00 (Table 5). This can be assumed that the content of the intervention programme had given some impact towards the knowledge of the students. A study by Jasmine (2012) also said that campaigns, teaching in schools and learning institutions may be one of the key that can increase the knowledge in recycling.

Table 5

Comparison of mean score of knowledge, attitude and practice on 3R before and after the intervention programme

Variable	Mean (SD)		Mean difference (95% Cl)	t statistic (df)	p-value
	Before	After			
Knowledge	64.43 (17.92)	67.87 (20.00)	- 3.441 (-6.54, -0.34)	-2.193 (154)	0.030*
Attitude	76.26 (17.99)	75.23 (20.52)	1.03 (-1.87, 3.94)	-0.702 (154)	0.484
Practice	67.47 (18.80)	65.71 (19.34)	1.75 (-1.23, 4.73)	1.161 (154)	0.248

Statistical test-Paired t test, *<0.05

Attitude was reflected by self-motivation where it push someone to perform specific behaviour (Jasmine, 2012). Table 5 shows that the mean and standard deviation of score of attitude for before and after the 3R programme were 76.26 ± 17.99 and 75.23 ± 20.52, respectively. There was no significant difference in percentage of attitude before and after 3R programme, p = 0.484. It may be caused by the habit of the students. Norizan (2012) said that normal practice of many residents in rural areas are burn or bury their waste so it was so hard to change their habits drastically.

This study also found that the mean score for practice was higher before the intervention programme compared to after intervention, with no significant difference (p = 0.248). It can be assumed that the students were not practicing 3R in their daily life after the intervention programme. It was contradicting with the findings from a study done by Embong et. al (2013) found that school students have a good understanding and do practice 3R. In addition, a study by Anuar and Haliza (2014) reported that 31.8 % of their respondents practiced recycling which was higher than our study (19.4 %). One of the factors that might be the reason contributing to poor practice level among the students was the unavailability of recycling bin at the school. Based on our observation, there was no recycling bin provided in this school so the students cannot practice the 3R. Rural people will dispose the waste properly depends on the availability of facilities and distance of collection bins located whether they were too far away or not (Norizan, 2012).

Correlation between Knowledge, Attitude and Practice on 3R before and After the Intervention Programme

Table 6 shows the correlation between knowledge, attitude and practice. For before the intervention programme, there was significant, weak and positive correlation between knowledge and attitude (r=0.320, p < 0.001) and between knowledge and practice (r=0.386, p < 0.001). There was also a significant, moderate and positive correlation between attitude and practice (r=0.400, p < 0.001). Whereas after the intervention programme was conducted, there was significant, strong and positive correlation between knowledge and attitude (r=0.614, p < 0.001). There was also a significant, moderate and positive correlation between knowledge and practice (r=0.476, p=0.001) and between attitude and practice (r=0.520,

p=0.001). The result was supported by the study by Tan et. al., (2013) which reported that having high knowledge on a subject tend to have a positive attitude, and in turn make someone practicing it.

Table 6

Correlation between knowledge, attitude and practice on 3R before and after the intervention programme

Variables			Attitude	Practice
Before 3R programme	Knowledge	r	0.320	0.386
		p-value	<0.001*	<0.001*
	Attitude	r	-	0.400
		p-value	-	<0.100*
After 3R programme	Knowledge	r	0.614	0.476
		p-value	<0.001*	<0.001*
	Attitude	r	-	0.520
		p-value	-	<0.001*

Statistical test - Pearson Correlation, *$p<0.05$

The limitations that are identified in this research is the assessment of practice among the students was done in a short duration of time. Practice actually needs longer duration of time to assess. Other than that, it should also be assess through real practice rather than questionnaire only. Moreover, education for students are based on cognitive level. Intervention programme needs more sessions and frequent because it does not easy to change attitude and practice just based on three hours programme. The strength of this study is it gives the information on the level of KAP among the primary school students towards 3R. Then, most of the previous studies only studied among level two but this study was conducted among both level one and two. This study gave information on level of KAP on 3R for all students in the school. Other than that, it can act as the reference for further study on interventional study.

Conclusion

Findings from this study showed that the knowledge on 3R among the students were significantly increased after the intervention programme. The attitude among the students also seemed to have improvement after they were given exposure about the 3R, although not significant. However, the practice of 3R among them are just satisfying. The correlation between knowledge, attitude and practice were significant before and after the intervention programme. Practice was actually influenced by the knowledge and attitude of the students. There were many ways to increase awareness among them and one of them was by giving intervention. Recycling programme was more effective when the students get more knowledge and practicing it. Thus, it was encouraged for the school to have more recycling activities in order to increase the awareness towards 3R. Moreover, the school's management should provide recycling facilities such as recycling bins.

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