【 Research Report 】**Improving an Existing Recycling System**

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Abstract

The recycling system running at the Graduate School for four years was in need of improved participation. A questionnaire survey was carried out within the school, and a recycling manual composed and distributed to every room on campus. Data provided on the weight and composition of the haul by the recycling company provided a means to discriminate any effect of this survey and the distribution of the recycling manual. An increase was observed, as well as seasonality in both the weight and composition of the haul of recycled materials and a bulge in the weight of the haul upon a change in the administration of the Graduate School. This last phenomenon is suggested to be similar to that of the waste bulge after a natural disaster.

Key words : recycle, questionnaire, improvement, manual

1. Introduction

Compared with the recycling activity generated by volunteer groups such as housewife brigades in Japan, resource recovery from waste in the Japanese university is surprisingly backward. As university students go on to hold influential leadership roles in society, and since in Japan the university student has a fair amount of free time, the goals of waste reduction and resource recovery would be much earlier achieved in Japanese society in general if students could learn how to recycle and why during their stay in university.

Four years ago a student at the Hokkaido University Graduate School of Environmental Earth Science persuaded the accounting office to

purchase and erect a prefabricated shed in order to start off a recycling programme. Every three months the local recycler (Higashi Recycling Service Co., Sapporo) came to pick up the cans, bottles, papers, and clothing that students and others had deposited in the shed. At the beginning there were several problems. The first was that students confused the idea of "recycling" with what they thought might be reusable, for example, three kotatsu table legs, with what could actually be disposed of on the materials recovery market. Second, those who did realize that certain materials were reprocessable into new products had no idea how to separate them for efficient collection. Third, when the collection truck drove up, only a very few students would appear to help prepare the materials and load them onto the truck. Fourth, although it was found early on that regular caretaking of the recycling shed was essential to prevent total chaos on the recycling day, only one student was willing to tidy the materials on a weekly basis. Fifth, educational efforts were limited to newsletters and posters

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produced (by the same single person) on an infrequent basis.

Thus it was that after three years, several students decided to embark upon an experiment in recycling education, to see whether the existing programme could be improved. This paper describes the execution and success of this social experiment.

2. Method

2.1 Background

Hokkaido University Graduate School of Environmental Earth Science (up until two years ago the Graduate School of Environmental Science) has about 180 inhabitants, approximately 140 of them graduate students, 20 faculty, and 20 staff. Despite the word "Environmental" in the name of the school, the level of volunteer activity in the School is extremely low, and interchange between the various labs almost absent. Other than these and the problems mentioned above, there are two other barriers to any educational effort. Students are almost all M.Sc. students and as such are only in the School for two years, and two, no educational materials suitable for the presumably highly educated scholars could be located.

Faced with these obstacles, the first step taken was to carry out a questionnaire to identify the level of recycling awareness, and specific problems people had with recycling. Thereafter a recycling manual was composed based on the results of the questionnaire. This manual was then distributed to every room in the School, where possible hanging it on the wall by the existing garbage bins. The effect of this education was then gauged by any change in the quantity of materials recycled in the following collection day. Although it would have been informative to also measure any change in the quality of separation of materials put out for recycling, the difficulty of quantifying this led to rejection of the consideration of this as a parameter.

2.2 The questionnaire and the execution of the survey

The questionnaire was very simple, consisting of an explanation of the objective of the questionnaire, three blank areas in which to write comments about problems with putting out for recycling paper, bottles, or cans, and a third, optional, section in which additional comments were invited. This took one side of one A4 page, written in Japanese. The designer of the questionnaire felt that the low level of interest in recycling reflected a low level of technical knowledge about the processes of recycling, and thus a sophisticated questionnaire would either not be answered out of a lack of interest, or be simply beyond the capacity of the respondent to answer.

The questionnaire was distributed between July and September of 1994. An astonishing 50.6%, or 91 students, staff, and faculty took the time out to fill in the questionnaire. The data was processed within the year to produce the recycling manual, the next stage of the experiment.

2.3 The composition and distribution of the recycling manual

The "RECYCLE SOURCE BOOK 1995" turned out to be an 18 page B5 manual with a few illustrations. Reference was made to the many recycling manuals put out by the Hokkaido and Sapporo Governments; however, it was deemed necessary to design a manual with the objective of improving the recycling system in the School made quite clear. For this reason, extensive use was made of the concerns of the students, faculty, and staff in explaining exactly the nature of recycling in the School and other related matters. In concrete terms, this consisted of:

- i) Arranging the queries asked by the respondents along with answers peculiar to the School's recycling system into sections according to the material in question.
- ii) Putting more weight on explanation in areas of most frequently expressed concern amongst the respondents.
- iii) Making a flow chart of the School's recycling process, and tables showing the change in

amount of materials recycled over the years. (Unfortunately data was not always complete for every recycling day).

3. Results

Reference to Table 1 and Figure 1 will reveal that the 1858.4 kg of materials recycled on the recycling day on May 18th, 1995 was the largest haul since the 2366 kg of material hauled away on May 12th, 1993. Closer inspection of the graph will show that the May 1993 haul was mostly composed of newspaper and other papers. These were principally the waste produced from the change of the School from the Environmental Sciences, including many labs using paper, to

Environmental Earth Sciences, where the written word is of diminished importance. In particular, a social science lab had accumulated thirty years' worth of newspapers and magazines for archival study, and then had no choice but to recycle them upon the removal of that lab from the School. (Pictures of Hara Setsuko were carefully preserved from recycling). It can be seen that all other categories of recycled goods were quite low in 1993.

In comparison to the recycling day immediately preceding the distribution of the handbook in February of 1995, where 1522.8 kg of material was hauled, the post-distribution haul represented an increase of 22%, 12% over the haul in June 1994, 30% greater than the mean of all previous

hauls, and 50% greater than the mean of all previous hauls made since the change to the Environmental Earth Science administration.

Figures 1 and 2 also demonstrate a clear seasonality to the haul size which had not been noticed by the organizer. Students and staff tend to be away in the sum-

Table 1 Amounts of Materials Recycled in the School (kg)

Item		1993.5.12	1993.9.22	1994.3.3	1994.6.8	1994.10.12	1995.2.22	1995.5.18
Papers	Newspaper	1,300	190	450	710	240	410	460
	Magazines	570	70	290	420	90	350	670
	Cardboard	60	70	50	60	60	80	90
	Milk cartons	6	10	5	7	0	9	15
	Office paper	270	60	190	170	30	160	190
Sub-total		2,206	400	985	1,367	420	1,009	1,425
Bottles	Returnable bottles	49	47.6	210	163.8	107.8	198.8	148.4
	Disposable bottles	65	155	200	75	150	165	150
Sub-total		114	202.6	410	238.8	257.8	363.8	298.4
Cans	Steel	30	50	80	35	100	120	100
	Aluminum	14	40	27	15	45	30	30
Sub-total		44	90	107	50	145	150	130
Clothing	Clothing	2	0	0	10	0	0	5
Total		2,366	692.6	1,502	1,665.8	822.8	1,522.8	1,858.4

Fig. 1 Amounts of Materials Recycled in the School (1)

Fig. 2 Amounts of Materials Recycled in the School (2)

mer, resulting in the haul minimums seen in the autumns of 1993 and 1994. Subsequent to their return recycling activity increases, reaching a maximum after the thesis writing period early in the year, explaining the recurring haul maximums in late Spring of 1994 and 1995. Contrary to this general trend is the peak in bottles and cans collected on the first recycling day following New Year's Day, in no doubt owing to much alcohol being consumed during the *bonenkai* and *shinnenkai* season.

This seasonality prohibits meaningful statistical confirmation of whether the increase in haul is significantly greater for the recycling day following the distribution of the handbook, as there are essentially only two samples, the autumn-winter-spring "haul set" of 1993-4 and that of 1994-5. The difference of the respective peak hauls of both 1994 and 1995 with the means of these two respective "haul sets" is 29.4% and 32.6% respectively, quite close.

4. Discussion

The very high return rate of 51% of the questionnaires indicates a high latent level of interest in recycling and confirms the frustration of the desire to dispose of waste through reuse and recycling by a lack of information on just how to do it. This supposition is strengthened by the fact that only 2 of the 91 respondents failed to give additional comments in the optional third category provided at the bottom of the questionnaire, as well as an overwhelming number of questions on how to prepare paper, bottles, and cans in a manner suitable for efficient resource recovery. These questions were clearly divided into questions about *what* could be recycled and *how* it could be recycled.

It can be stated with certainty that the process of carrying out the questionnaire survey and the distribution of the handbook to all rooms in the School did not harm the efficiency of the recycling process. However, the season-

ality of the size of the haul discovered when graphing the data indicates that the effect was not marked. A noticeable improvement was made in the quality of the separation of materials, but this was judged qualitatively and could again be the result of a gradual learning curve amongst the students of the School, some of whom have now been here for many years indeed.

Another interesting phenomenon of waste production was demonstrated in this experiment—the immense amount of waste generated upon a change in administration. This is similar to the bulge in waste production following natural disasters, and also reflects the vast amount of potentially recyclable material that has accumulated within the laboratories of the universities of Japan, owing perhaps to the dearth of females who generally drive recycling activity within Japan.

Finally, it is very important to realize that the "recycling activity" at the School was just that, a recycling activity. It is now generally accepted that recycling is a less effective tool of reducing waste than reuse and refilling, particularly concerning beverage containers. After the May 1995 collection, another shed was added to recycle beverage containers with clear signage indicating where and how to dispose of cans. This had the unintended and unwelcome effect of acting like a magnet to anonymous groups outside the School who dumped quantities of used beverage cans without permission. The provision of facilities for recycling is probably a mistake in the waste management for a university if not preceded by a vigorous and severe reuse and refilling campaign. Such a campaign has been suggested by one of the authors to the President of the University, a sanitary engineer.

Note

Anyone wishing to receive a copy of the "RECYCLE SOURCE BOOK 1995" should write to H. Aoi or C. McLeod at the School, Sapporo.

(English Translation of the Questionnaire Used)

— A Request for Your Cooperation With This Questionnaire —

We've been recycling here at the School since 1991, recycled materials being hauled away for us once every few months. With everybody's help the size of the haul has continued to increase, and we know a lot more now about how to recycle. However, the separation of each material (paper, glass, and so on) could still be improved.

On this point we would like to take this opportunity to ask you what problems you have with recycling, or with separation of materials to be recycled. Any questions about the details of recycling are welcome, for example, "Is it o.k. to leave staples in copies?".

We are thinking to make a basic recycling pamphlet based on the results of this questionnaire. Therefore we would truly appreciate your cooperation.

Please note that, as of 1995, our recycling activity has been officially registered with Sapporo City Hall.

What about BOTTLES:

What about CANS:

What about PAPER:

Anything else? (For example, "Are PET bottles and aluminum foil burnable garbage?", "What happens to the materials we recycle?", etc.)

既存のリサイクル・システムの改善実験

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【要 旨】 既存のリサイクル・システムに数々の問題点が存在することは明らかである。本研究では、問題点の指摘だけにとどまらず、既存のリサイクル・システムを実質的に改善しようと試みた。

本研究では、アンケート調査を通じてリサイクル・システム改善のために必要な情報を明らかにし、その情報を適切な形で取り入れたハンドブックを作成配付した。

このアプローチによる改善効果の有無は、ハンドブック配付後のリサイクルにおいて回収される資源の量の増減によって評価される。

ハンドブック配付後のリサイクルにおいて、回収される資源の量は増大した。このことから、本研究で採用されたアプローチによる改善効果が存在することが示された。

キーワード: リサイクル, アンケート, 改善, ハンドブック