Keynote Lecture

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Need Oriented Development of Technical Devices for Disabled

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ABSTRACT

The increase of elderly in our society is welcomed trend for mature and developed country. One crucial problem to the elderly society is increase of medical expenses. Development of new scientific technology and introduction of new social care system are required. Also employment of community human resources in the various field are expected. In this paper, voluntary activities achieved by the human network in Nagasaki city are introduced. Members of the activities are not only medical staffs, architects, engineers and researchers. They offered welfare devices to the elderly based on their needs.

1. Introduction

As every knows in many Asian countries, ratio of elderly people is increasing because of improving medical care technologies. Of course, elongation of life span should be appreciated. However, it causes the excess financial expenses of the national budget. In Japan national gross income was 37 million dollars in 2014. And one thirds of the gross income was spent as social securities. Total expenses of social securities are divided into medical expense 3.7 million dollars, pension expenses 5.6 million dollars and welfare expenses 2.2 million dollars. Average medical expenses for one person younger than 65 years old amounts for 1.8 thousand dollars. But average medical expenses for elderly over 65 years old amounts for 7.2 thousands dollars. Medical expense is suppressing national activity. It should be noticed that the medical expenses consists of expenses for infectious disease and injury, and expense for daily life-style related diseases like diabetes and obesity, and expenses for aging related disease like cancer and Alzheimer. In order to cope with this situation, Japanese ministry of health, labor and welfare introduced the idea of integrated community care system. It means that the health care should be achieved by integrating the human and social resources in the community. Suppose one elderly is living alone in the community. His quality of life should be concerned in the community. And his physical and mental trouble should be treated in the community at early stage. Based on this idea citizens in Nagasaki city organized voluntary

organization called “Nagasaki Hill-side Association” and offered various kinds of helps responding the needs by the elderly and patients. Members of the organization are medical staffs, engineers, architects and citizens.

In this paper examples of technical aids offered by these members are shown.

2. Technical aid to assist daily life

People who have spinal cord injury are often obliged to live dependent on the caregivers. However, if they have some assistive devices, he can accept independent live. In the followings, some assistive devices are introduced to respond to the requests of the community.

2.1 Assist glove for grasping disability

An assistive globe was developed to assist grasping disability caused by the spinal cord injury. In Fig.1 a patient with spinal cord injury needs wheel chair and is unable to grasp the objects by his fingers. In this figure he wears a mechanical device designed in Nagasaki university.

Fig.1 User with assist glove

The configuration of the assist glove is shown in Fig.2. The user is requested to chew his jaws. Then the chewing action can be detected by the expansion of the temple muscle. The pressure sensor mounted on the user detects this chewing action. Once the chewing action is detected, the fingers of the assist glove are folded by the similar mechanism of the human hands. The actuator pulls the wire whose end is connected to inside the fingers.

A feature of this glove is that the device on the hand is compact and soft without using mechanical parts. In Fig.1 the patient had an experiment to transfer blocks from one box to the next box. He could transfer all blocks satisfactory.

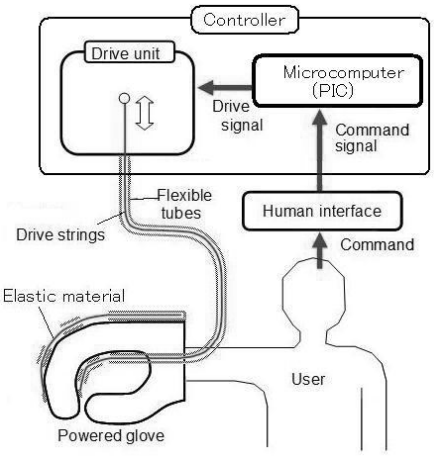

Fig.2 Assisit glove system

2.2 Chewing counter to promote sound dining

Our ministry of health, labor and welfare admitted that physical exercise, foods with sufficient nutrition and aural care are crucial measures to prevent care status. And chewing action is admitted

as an effective exercise to activate brain functi on and to stop obesity and, of course, to prevent care status. The society of dentist recommend even to younger to have sufficient chewing while they eat foods. They proposed 30 chewing actions for one mouth of food. The society required the chewing counter to analyze the effects of chewing action to the healthy conditions quantitatively.

Fig.3 Pressure sensor for chewing

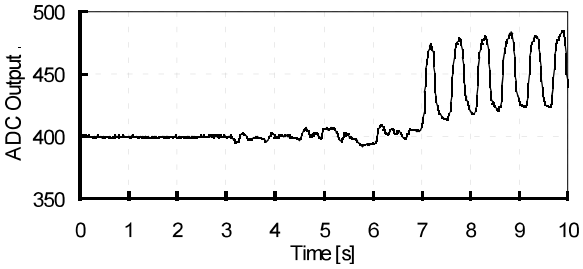

Fig.4 Chewing sensor

The device developed is shown in Fig.3 where chewing action can be detected by the expansion of the muscle on the temple. The user is requested to wear the pressure sensor on his temple. The data obtained by the pressure sensor is shown in Fig.4. By processing the data by one chip computer the number of chewing actions can be counted with accuracy.

Fig.5 User with electrical catheter

2.3 Training device of swallowing action

Swallowing action is an essential physical action for human being to keep healthy conditions. Some training method to activate swallowing function are proposed. These training make the muscles around tongue and mouth tough.

But more efficient training method should be focused on the muscle in the pharynx. Considering this idea, a training method to stimulate the muscle with electricity is proposed. In Fig.5 a trainee is shown, where the catheter is inserted into the lower part of pharynx through the nose. The tip of the catheter is attached to the rear side of pharynx.

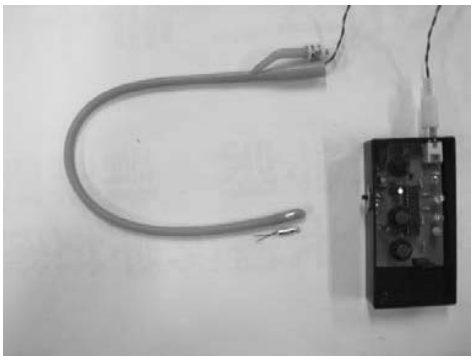

Fig.6 Catheter with vibration motor

This device has been tested clinically. V

A catheter to give mechanical stimulus is shown in Fig.6. At the end of the catheter a compact

vibration is installed, which causes vibration. This catheter has been tested clinically.

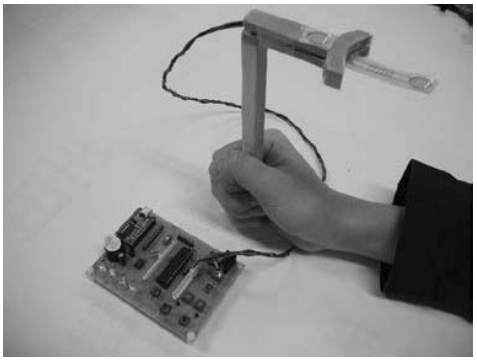

Fig.7 Swallowing muscle sensor

For the healthy swallowing action, many muscles around mouth and tongue collaborate. Fig.7 shows chewing muscle tester. The tester measure the pressure caused by the closing action of jaws, closing action of the lips and levitating action of the tongue. The pressure can be measured by the pressure sensor.

2.4 Long term care for spinal cord injured

An engineer in Fig.8 had a falling accident in 2010. Due to damage on his spinal cord. His physical abilities are limited only to his neck and above. And he lost the ability of breathing so that he needs an artificial respirator. It means that he could not phonate by himself and could not move his arm and legs. It was impossible for him to live independently and others have to take care of his daily essentials.

Fig. 8 Serious spinal cord injury

A laboratory in Nagasaki University offered him a communication device and emergency call that are controllable by his head movement. The used can operate the computer by using the interface device as follows.

1) Position of the computer cursor on the computer monitor could be moved by nodding and swing action of his head.

2) Clicking action of the computer can be activated by chewing action of the user.

Using this interface, he could control many kinds of home electric appliances, like TV, telephone, video, lights, emergency call. Maintenance of his device has been conducted by the collaboration of

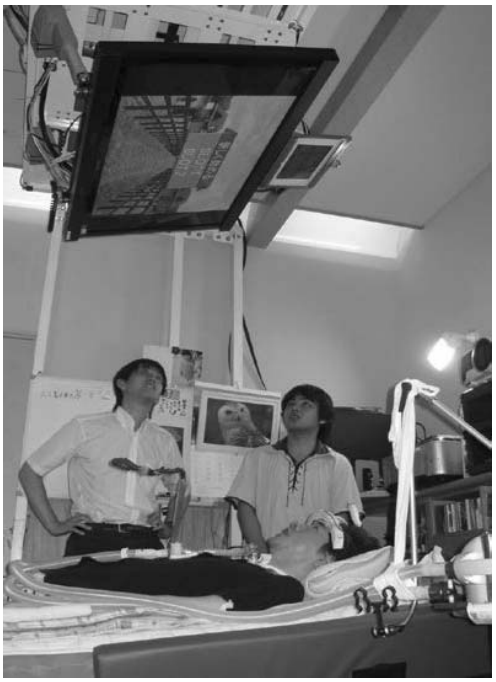

Fig.9 Computer controlled

the laboratory and company.

3. Conclusions

Four examples of voluntary activities in Nagasaki for about 20 years are explained. A feature of these activities is that activities are conducted by many members. They are medical staffs, researchers, engineers and elderly peoples. By the collaboration of these members we could deal with many kinds of needs from the elderly and patient. Many of the needs came from the patients suffered by serious diseases like ALS(Amyotropic lateral sclerosis) and SCD(Spinal Code injury).

By using advanced sensor and computer technologies many kinds of devices could be offered to those demands.

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Reuse of Dredged Harbor Sediments by Admixing with Basic Oxygen Furnace Steel Slag

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ABSTRACT: The objective of this study was to enhance bearing capacity of dredged harbor sediment by admixing with steelmaking byproducts - basic oxygen furnace (BOF) slag. Different mixing ratios (100:0, 70:30, 50:50, 30:70, 0:100) of dredged sediment and BOF slag were examined by the standard Proctor compaction test and California bearing ratio (CBR) test. According to the compaction test, the optimal moisture contents of the studied sediment and BOF slag were 24.43% and 4.16% respectively. Under the optimal moisture contents, the California bearing ratio (CBR) of the sediment-slag mixtures showed a significant increase as compared with the pure sediment samples, especially the sediment-slag mixture with ratio of 30:70 was strong enough as bottom grading material (CBR $\geq$ 80%). Dredged sediments admixed with BOF slag can effectively strengthen the originally weak sediment structure to form a green backfill material for road construction and land reclamation.

Keyword: Dredged sediment; Steel slag; California bearing ratio

1. INTRODUCTION

Due to the harbor operation and construction, huge amounts of sediments are dredged annually to maintain the depth of water channels and wharf for ship navigation. For example, Kaohsiung Harbor, the largest harbor in Taiwan, have to be dredged approximately 500 thousand tons of sediments every year [1]. Those dredged sediments are commonly considered as waste which are mostly dumped into ocean disposal site and only a small portion is used for land reclamation [2]. However, dredged harbor sediments may adsorb great amounts of anthropogenic contaminants such as heavy metals, which can release into marine environment during disposal process, and cause significant impact on marine ecosystem [3]. Moreover, dredged sediments are difficult to reuse directly for road construction because they are mostly consist of high proportion of clay with limited strength and high water content, resulting in poor bearing capacity and easy subsidence [4]. On the other hand, up to 50 million tons of steel slags, an industrial waste resulting from the process of steelmaking either the conversion of iron to steel in a basic oxygen furnace (BOF) or the melting of scrap to make steel in an electric arc furnace (EAF), are produced worldwide every year [5,6]. Re-utilization technology of steel slag has been developed for the last couple of decades. Recently, steel slag becomes a reusable resource as a substitute of aggregates in different applications, for example granular base or subbase materials in highway construction [7]. However, the fact is that up to 35% of the steel slag produced is still dumped in landfills, which are not extensively used in construction [3,7]. Therefore, this study intends to improve the reusability of dredge sediment and steel slag. Considering the

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characteristics of steel slag with high compressive strength and hardness, dredge harbor sediment was admixed with basic oxygen furnace (BOF) steel slag to enhance its bearing capacity and improve its engineering properties for re-utilization in road construction and land reclamation.

2. MATERIALS AND METHODS

The sediment sample was dredged from the Love River Mouth in the Kaohsiung Harbor and the BOF slag sample was collected from CHC Resources Corporation. The basic properties of the studied dredged sediments and BOF slag were shown in Table 1. The studied sediment was mixed with the BOF slag at mass ratios of sediment/slag = 100:0, 70:30, 50:50, 30:70 and 0:100. Each test specimen of sediment-slag mixtures were examined by the standard Proctor compaction test and California bearing ratio (CBR) test, which were carried out by referring the protocols of Standard Methods ASTM D698 and ASTM D1883, respectively.

Table 1 Basic properties of the studied dredge sediment and BOF slag

Properties	Dredged Sediment	Properties	BOF Slag
Clay (%)	2.7	Clay (%)	0.6
Silt (%)	28.2	Silt (%)	7.6
Sand (%)	69.1	Sand (%)	91.8
pH	7.6	pH	12.2
Specific Density	45.7	Specific Density	2.5
Water Content (%)	2.1	Free-CaO+$Ca(OH)_2$ (%)	6.0
Total Organic Carbon (%)	2.98	Theoretical Volume Expansion (%)	5.7

3. RESULTS AND DISCUSSION

Results of the standard Proctor compaction test are showed in Fig. 1. The compaction curve showed a bell-shaped variation for the relationship between moisture content and dry unit weight (dry density). The moisture content of the sample which can be compacted to its greatest density is defined as the optimal moisture content (OMC). Base on the compaction curves (Fig. 1), the maximum dry densities of the studied sediment, BOF slag and sediment-slag mixtures with ratio of 50:50 were 1.563, 2.255 and 2.020 g/cm^3 with their optimal moisture content which were 24.43%, 4.16% and 15.37% respectively. The mixing water content for the CBR test specimen preparation was based on the optimal moisture content obtained by the standard Proctor compaction test. Results of the CBR test are shown in Fig. 2 and Fig. 3. The load-penetration curve of the CBR test (Fig. 2) almost showed a logarithmic increase of load stress with the depth of penetration. Compare the load stress of the different sediment-slag mixture under the compaction with 56 blows per layer, approximately 20 kg/cm^2 of load stress were obtained from the sediment-slag mixture with ratio of 70:30 and 50:50 when the piston penetrated 5 mm into the test specimens, which were higher than the pure sediment sample (~5 kg/cm^2). In particular, up to 80 kg/cm^2 of load stress was obtained from the sediment-slag mixture with ratio of 30:70. According to the comparison of the CBR-dry density relations among the sediment-slag mixtures (Fig. 3), the slope of the CBR-dry density relations showed a significant increase of sediment-slag mixture as compared with the pure sediment samples, indicating improvement in the bearing capacity of dredged sediment with addition of the BOF slag. Under the compaction with 56 blows per layer, the CBR of the sediment-slag mixture with ratio of 70:30 and 50:50 were approximately 25%, which can comply with the prescribed value of quality specification for base grading material (CBR $\geq$ 20%). The CBR of the sediment-slag mixture with ratio of 30:70 was as high as 86%, which was strong enough for bottom grading

material (CBR ≥ 80%). In addition, the time evolution of pH in mixtures of dredged sediment with BOF slag immersed in seawater was monitored (Fig. 4). The initial pH value of the sediment-slag mixtures with ratio of 50:50, 30:70 and 0:100 were in the range of 9.0 to 9.4, which were higher than those with ratio of 70:30 and 100:0. During the first 7 days, the pH value of the sediment-slag mixture with ratio of 70:30, 50:50 and 30:70 displayed a decrease trend, whereas the pH value of the pure sediment and pure BOF slag sample were slightly varied. The final pH of the sediment-slag mixtures immersed in seawater after 21 days displayed a positive linear relationship with the proportion of slag.

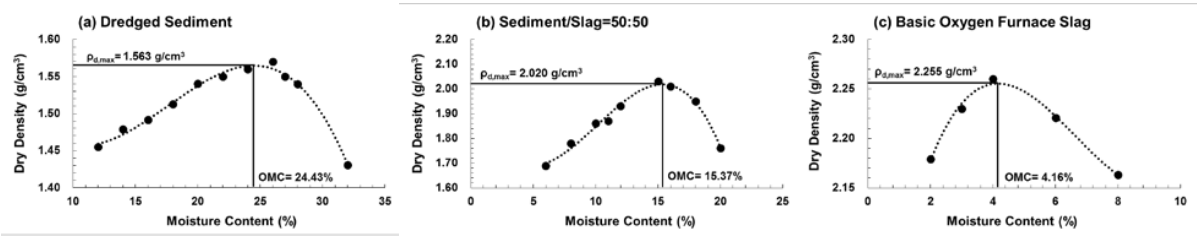

Figure1 Compaction curves for the relationship between moisture content and dry density

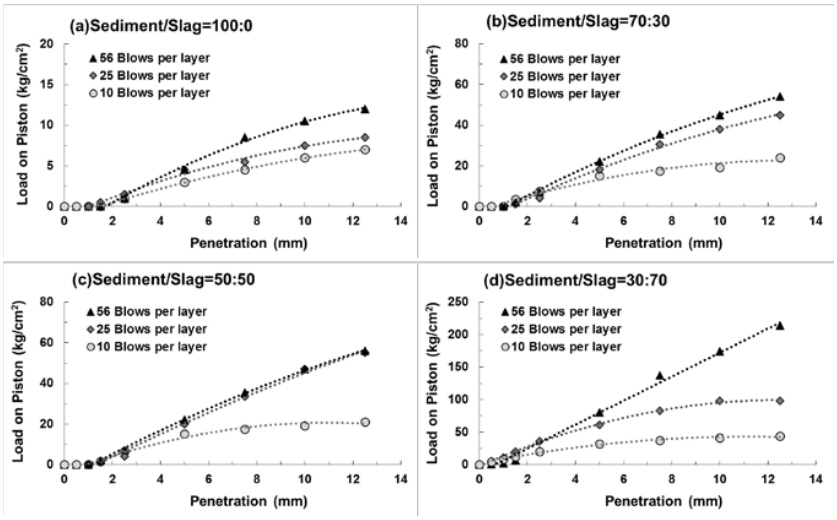

Figure 2 Load-penetration curves of the CBR tests

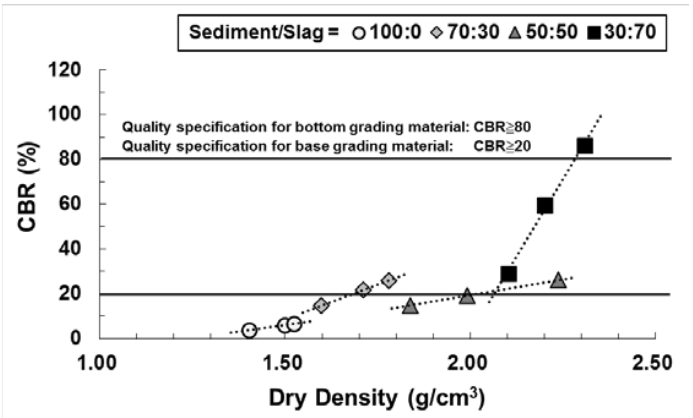

Figure 3 Comparison of the CBR-dry density relations among the sediment-slag mixtures

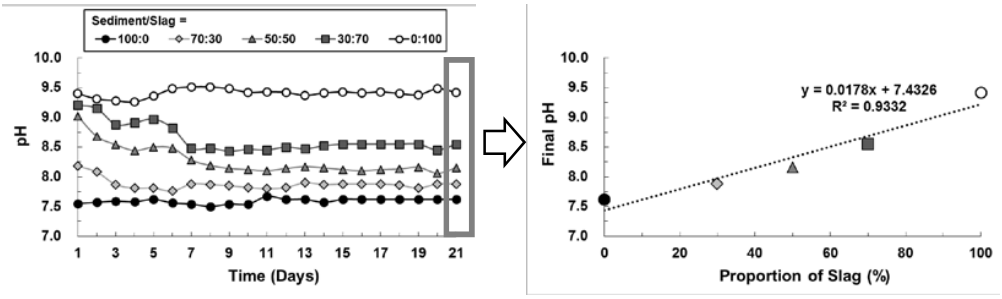

Figure 4 Evolution of pH in the sediment-slag mixtures immersed in seawater

4. CONCLUSION

Dredged sediments admixed with BOF slag can effectively strengthen its bearing capacity, especially the sediment-slag mixture with ratio of 30:70 was strong enough as a bottom grading material for road construction. However, higher proportion of BOF slag in the mixed material results in higher alkalinity, which may affect the environmental compatibility and be limited the re-utilization of dredged sediment and BOF slag.

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Iron Oxide-immobilized Carbon Black Nanocomposites for Benzene Liquid-phase Persulfate Oxidation

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ABSTRACT: Chemical oxidation has emerged as an effective technology for the remediation of groundwater contaminated with petroleum hydrocarbon compounds. This study evaluated the use of iron oxide-immobilized carbon black (Fe_3O_4–CB) nanocomposites activated persulfate (PS) for oxidation of benzene in an aqueous solution. The effects of various operating parameters were evaluated to optimize the oxidation process, including the amount of PS (0.6–30 g/L) and nanocomposites (0.02–0.56 g/L), initial pH (pH_0 3.0–9.0) and various benzene initial concentrations (10–50 mg/L). The results indicate that Fe_3O_4–CB/PS processes are effective in degrading benzene when Fe_3O_4–CB concentrations increased to 15 g L^{-1} at a pH of 3.0. The mechanism for activating PS with Fe_3O_4–CB nanocomposites involved in their special interphase surface produced Fe(II) species through an efficient electron transfer process that initiated the reaction to generate $SO_4^{-\bullet}$. Overall, Fe_3O_4–CB assisted PS oxidation and that it is feasible to treat benzene-contaminated groundwater, which would provide a potent system for site remediation in field application.

Keywords: Benzene; Persulfate; Iron oxide; Carbon black; Nanocomposites

1. INTRODUCTION

Worldwide concern is increasing over the environmental pollution by the gasoline and diesel fuel leaking and resulted in soil and groundwater contaminations from underground storage tanks (UST) [1]. Thus, understanding the distribution, composition and potential biological impacts is essential and important for the management benzene in the environment. Therefore, remediation of benzene contaminated soils and groundwater is an issue of great interest for the public and private sectors [2]. Advanced oxidation processes (AOPs), refers to a set of chemical treatment procedures designed to remove organic materials in media by oxidation through the formation of highly reactive radicals. Recently, persulfate (PS), as an emerging oxidizing agent for the destruction of a broad range of contaminants, has gained much attention due to its unique characteristics environmental application but iron catalyst is easily precipitated to ion oxy hydroxides under neutral pH. Therefore, many chelating agents were employed to maximize catalytic activity of dissolved iron and to prevent iron lost due to binding with hydrophilic sites of natural organic matter [3]. Magnetite (Fe_3O_4) is a promising heterogeneous catalyst due to its natural abundance, low-cost and environmental non-toxicity properties can be used as an activator of PS [4]. Fe_3O_4 improves the PS oxidation properties by accelerating the degradation rate via the formation of $SO_4^{-\bullet}$. In this study, the experiments were conducted to evaluate the ability of Fe_3O_4-based nanocomposites to activate PS oxidation, factors affecting the benzene removal capacity of PS oxidation, including PS and nanocomposites dose, and initial pH were assessed.

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2. MATERIALS AND METHODS

2.1 Material and chemicals

Magnetic Fe_3O_4 particles and Fe_3O_4−CB nanocomposites used in this work were prepared by the chemical co-precipitation of $FeCl_3 \cdot 6H_2O$, $FeCl_2 \cdot 4H_2O$ and carbon black in deionized water by adding NH_4OH under continuous stirring for 30 min until the pH value greater than 9.0 at room temperature. The mixed solutions were heated at 353 K for 4 h. The precipitates were washed and freeze-dried. Composites thus obtained were black and exhibited a strong magnetic response. Sodium persulfate ($Na_2S_2O_8$, 98%) was purchased from Showa Chemical Industry Co. (Japan). All other reagents were of analytical grade. Deionized water was used throughout the experiments for the preparation of stock solutions.

2.2 Experimental methods

Stock of all the chemicals used were freshly prepared in deionized water before the experiment. Borosilicate glass vials (40 mL) with screw caps were used as batch reactor. The initial concentration of benzene was 10–50 mg/L. The amount of PS added to the vial was 0.6–30 g/L, and the concentration of Fe_3O_4-based nanocomposites was 0.05–1.0 g/L. For the degradation experiments, the vials were mounted on a shaking incubator and mixed at 150 rpm and 303 K. All batch experiments were conducted in duplicate. Besides, control runs without oxidant were also conducted.

2.3 Instrumental analyses

For each sample, 0.1 mL test solution was injected in the headspace (HS) of an autosampler analyzer (Teledyne Tekmar HT3, USA) and analyzed by GC on a HP 5890 Gas Chromatography (Hewlett-Packard Company, USA) coupled with flame ionization detector (GC−FID). Temperature profile in the oven started at 313 K, was ramped first to 373 K at 283 K/min, and then to 473 K at 298 K/min. The detector temperature was set at 523 K. The carrier gas was nitrogen at a flow rate of 15 ml/min.

3. RESULTS AND DISCUSSION

Higher PS concentration resulted in greater benzene degradation as shown in Fig. 1(a). The removal efficiency was 40–70%, 48–81% and 22–90% for Fe_3O_4/PS, CB/PS and Fe_3O_4−CB/PS processes at a PS concentration of 15 g/L, respectively (Fig. 1(b–d)). Adequate PS (15 g/L) must be present to provide the source of the $SO_4^{-\bullet}$, which is responsible for the degradation of benzene. Figure 2(a-d) shows plots of the effect of the initial pH value on benzene degradation. These plots were obtained during PS, Fe_3O_4/PS, CB/PS and Fe_3O_4−CB/PS runs over the nanocomposites. The effect of pH value on benzene degradation was significant at pH_0 near 3.0 and 6.0, whereas benzene removal was suppressed at pH_0 9.0 for Fe_3O_4/PS, CB/PS and Fe_3O_4−CB/PS processes. Moreover, the aforementioned results thus indicate that the Fe_3O_4−CB/PS process can be successfully applied at a wide initial pH range of 3.0–9.0. We selected pH_0 6.0 in all the experiments because it is the natural pH value of the benzene. Overall, the favorable degradation performance characteristics observed in this study confirm Fe_3O_4-based nanocomposites as a suitable catalyst and an activator of $S_2O_8^{2-}$ for the catalytic degradation of benzene. Figure 3(a-d) depicts the degradation rate of benzene increased sharply with a decrease in the benzene concentration from 10 to 50 mg/L. Therefore, a sufficient amount of Fe_3O_4−CB can produce adequate $SO_4^{-\bullet}$ for increasing the activation activity, thereby enhancing the degradation of benzene.

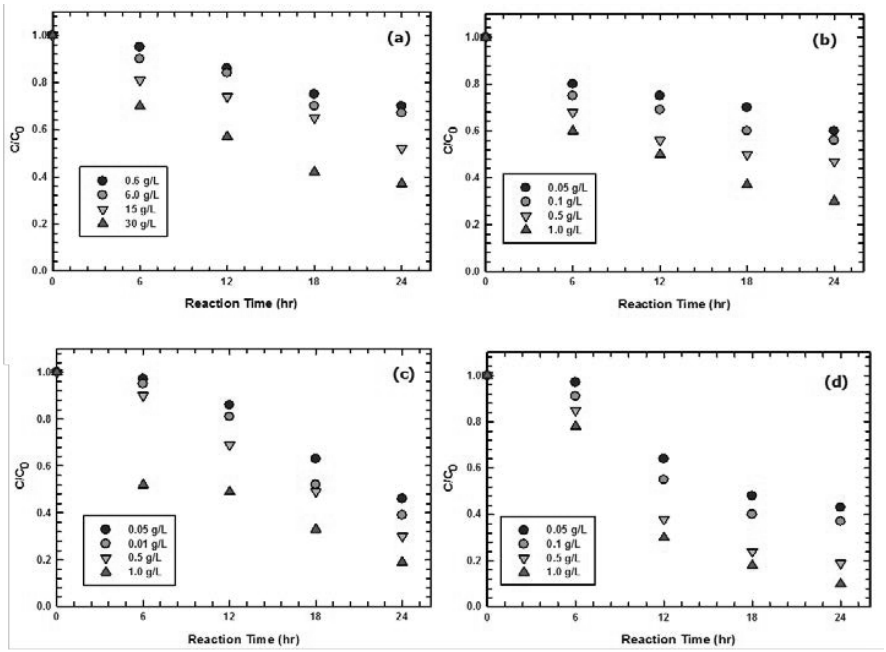

Figure 1 Effect of persulfate and nanocomposite dosage under the different treatment with (a) PS, (b) Fe_3O_4/PS, (c) CB/PS, and (d) Fe_3O_4−CB/PS processes for benzene removal in aqueous system. Experimental conditions: $[benzene]_o$ = 10 mg/L; reaction time = 0–24 hr; reactor volume = 40 mL; temperature = 303 K; pH = 6.0; [persulfate] = 0.6–30 g/L ; $[Fe_3O_4]$ = 0.05–1.0 g/L ; [CB] = 0.05–1.0 g/L ; $[Fe_3O_4$−CB] = 0.05–1.0 g/L.

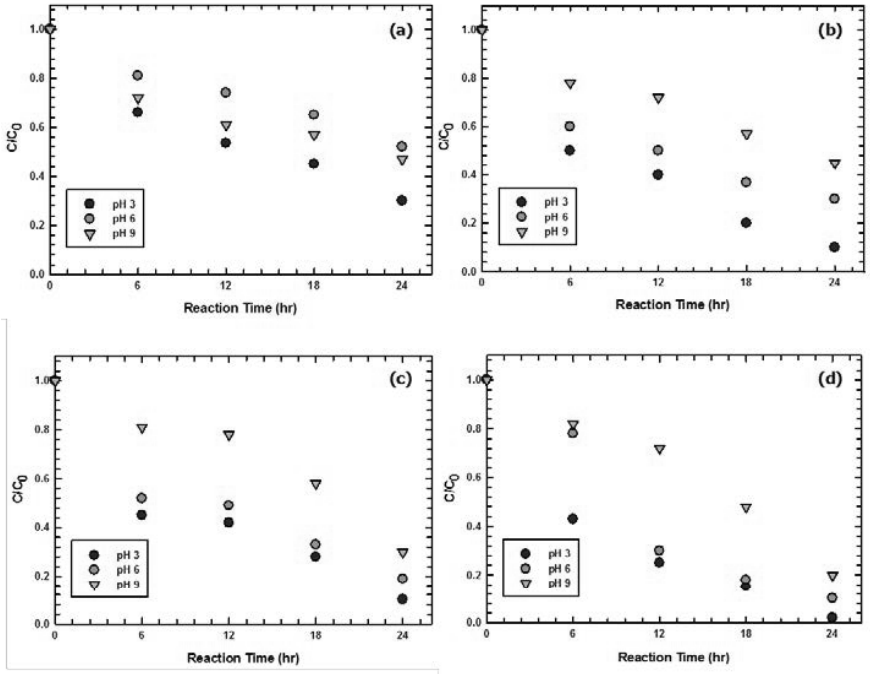

Figure 2 Effect of pH under the different treatment with (a) PS, (b) Fe_3O_4/PS, (c) CB/PS, and (d) Fe_3O_4−CB/PS processes for benzene removal in aqueous system. Experimental conditions: $[benzene]_o$ = 10 mg/L; reaction time = 0–24 hr; reactor volume = 40 mL; temperature = 303 K; pH = 3.0–9.0; [persulfate] = 15 g/L ; $[Fe_3O_4]$ = 1.0 g/L ; [CB] = 1.0 g/L ; $[Fe_3O_4$−CB] = 1.0 g/L.

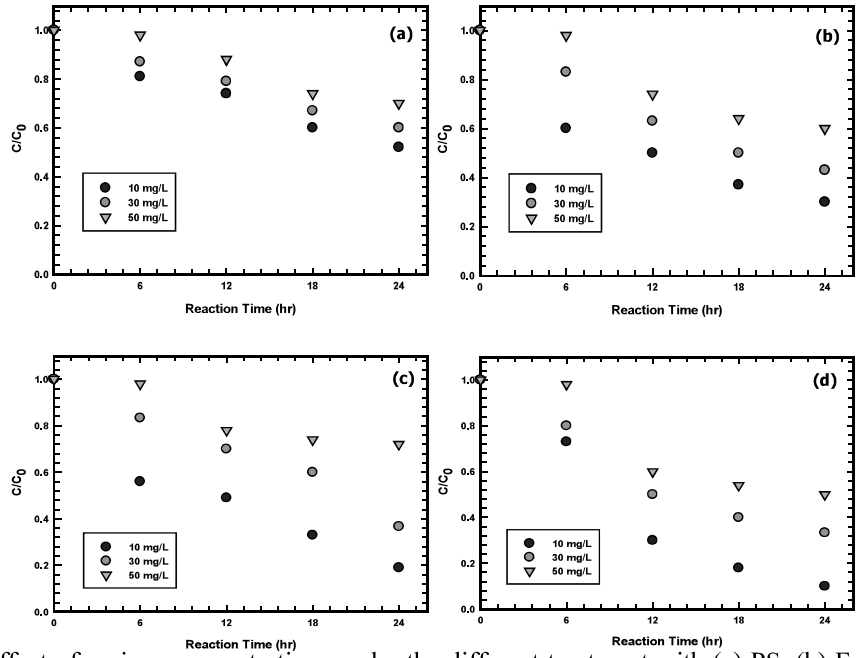

Figure 3 Effect of various concentrations under the different treatment with (a) PS, (b) Fe_3O_4/PS, (c) CB/PS, and (d) Fe_3O_4−CB/PS processes for benzene removal in aqueous system. Experimental conditions: $[benzene]_o$ = 10–30 mg/L; reaction time = 0–24 hr; reactor volume = 40 mL; temperature = 303 K; pH = 6.0; [persulfate] = 15 g/L; $[Fe_3O_4]$ = 1.0 g/L ; [CB] = 1.0 g/L ; $[Fe_3O_4$−CB] = 1.0 g/L.

4. CONCLUSION

In this study, we developed an efficient catalytic system used Fe_3O_4-based nanocomposites to activate PS for the oxidation of representative benzene in aqueous system. Over 50% of the PS still remained in the aqueous system after 24 h at an initial PS dose of 30 g/L in the presence of PS only. The results indicated that benzene degradation efficiency was obviously increased in the aqueous system as the PS concentration was increased. Adequate PS (15 g/L) must be present to provide the source of the $SO_4^{\bullet-}$, which is responsible for the degradation of benzene. Increased Fe_3O_4-based nanocomposites dosage resulted in enhanced benzene degradation efficiency due to increasing the activation of PS by Fe_3O_4 and carbon black. As a PS–activating agent, Fe_3O_4-based nanocomposites is more effective and potentially more suitable for treatment of benzene in aqueous system.

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Hydrocyclone Separation for the Remediation of Harbor Contaminated Sediments

Chun-Lun Lin • Chih-Feng Chen • Chiu-Wen Chen • Cheng-Di Dong *

ABSTRACT: The present work is a preliminary test for hydrocyclones as a primary process in reducing volume of harbor sediments. The contaminated harbor sediments were collected form Kaohsiung Port during dredging operations. The hydrocyclone was used to separate sediments and determine the optimal operating parameters. The results showed that the heavy metals concentrated in fine sediments particles (<30 μm). After hydrocyclone separation, the efficiency of volume reduction for sediments was 27.8%. The efficiency of volume reduction was depended on the distribution of particle size in the original sediments. The heavy metal concentrations in the underflow that was discharged using hydrocyclone was under the Soil Pollution Control Standard in Taiwan. The results indicated that the hydrocyclone separation system has good performance on reducing the volume of contaminated sediments.

Keywords: Sediments; Hydrocyclone; Heavy metals; Volume reduction

1. INTRODUCTION

Sediments dredged from the harbor entrance, main area, and navigation waterways must be treated, because it contains the highly contaminated materials. Due to treating the contaminated sediments is expensive, reducing the volume of sediments would be a effective pre-treatment for decreasing costs. The United States Environmental Protection Agency (USEPA) found that most of the organic and inorganic pollutants often attached to the surface of fine particles (clay and silt).The large-size particle can be separated by the physical characteristics such as particle size and specific gravity to reduce the volume of sediments to be treated. Therefore, hydrocyclone could be a potentially to reduce volume of the contaminated sediments. The aim of the present study is to use hydrocyclone reducing the volume of dredged sediments by optimal operation parameters, which are also determined in this study.

2. MATERIALS AND METHODS

2.1 Contaminated sediments

Contaminated sediments were collected during dredging operations in the Kaohsiung Port that is located near the Kaohsiung city in Taiwan. The property of the contaminated sediments is shown in Table 1. Analyzed results showed Cu concentration of contaminated sediments was 485 mg/kg, which was higher than the Soil Pollution Control Standards of 400 mg/kg. For other metals, the concentrations were below the Soil Pollution Control Standards.

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Table 1 The property of the contaminated sediments (S1)

Items	Clay (%)	Silt (%)	Sand (%)	Organic matter (%)	Metal contents (mg/kg)					
					Cu	Zn	Pb	Cr	Cd	Ni
S1	21.4	71.3	7.3	3.45	485	844	80	156	1.7	59
SPCS[1]	-	-	-	-	400	2000	2000	250	20	200

[1]Soil Pollution Control Standard (TWEPA, 2000)

2.2 Cyclosizer testing

Cyclosizer is a group of five small fixed-size hydrocyclones connected in series (Fig.1). In the fixed inflow flow condition (11.2 L/min, thin pulp), a total of five underflow (UF1 ~ UF5) and an overflow (OF) were collected Cyclosizer test can collect separately sediment samples in different ranges of particle size for analyzing the physical and chemical properties.

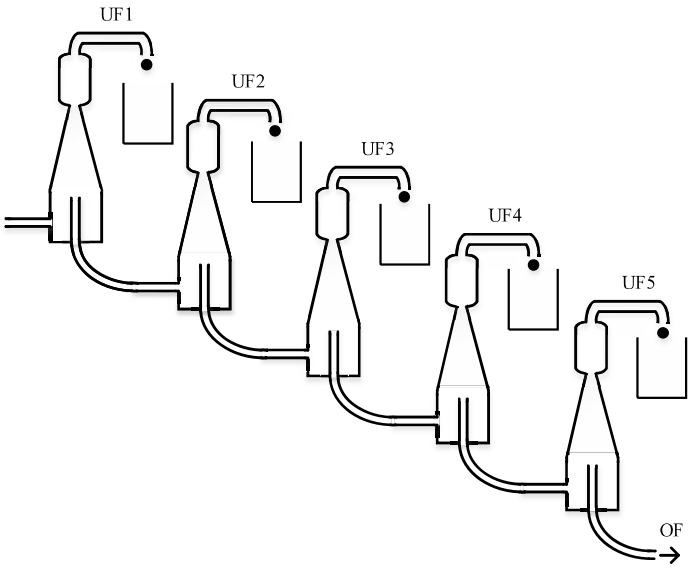

Figure 1 Schematic of the cyclosizer

2.3 Hydrocyclone testing

Hydrocyclone separation equipment is shown in Fig. 2. The diameters of hydrocyclone and its underflow are respectively 100 and 45 mm. The angle of hydrocyclone's cone is 180^{o} (Part A). The separation of particle size was depended on adjusting the inflow pressure (Part K) and flow rate (Part F).

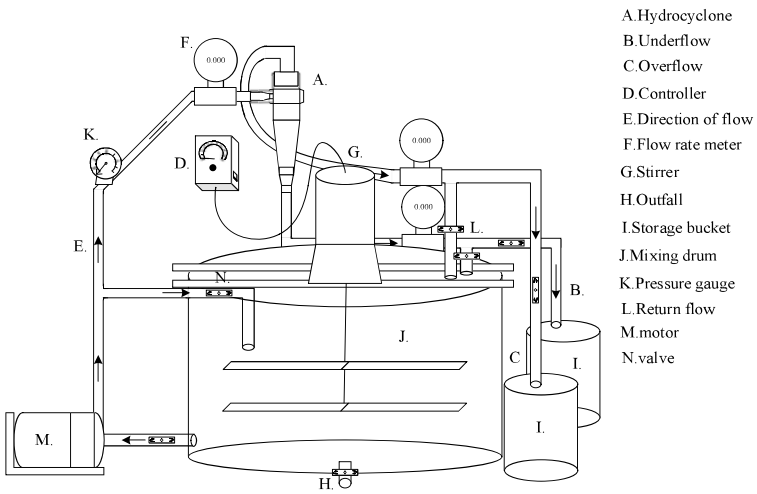

Figure 2 Schematic of hydrocyclone separation equipment

3. RESULTS AND DISCUSSION

3.1 Relationship between pollutant and particle size

Table 2 shown the characteristics of sediments after separation by cyclosizer. The results showed that most of the heavy metals were enriched in the sediments with particle size below 30 μm. Based on the aforementioned information, the pre-set separating particle size of sediments was designed of 30μm and then used hydrocyclone to find the operation parameters to its presetting.

Table 2 The characteristics of sediments after Separation by Cyclosizer

Group	Particle size (μm)			Metal contents (mg/kg)					
	d_{25}	d_{50}	d_{75}	Cu	Zn	Ni	Cd	Cr	Pb
UF1	85	129	195	76	315	29	<0.05	54	24
UF2	40	57	90	335	348	52	1.24	116	41
UF3	30	39	62	356	556	46	0.56	110	40
UF4	20	26	40	374	489	41	0.53	79	37
UF5	12	19	30	428	562	51	0.64	123	39
OF	3.2	6	10	938	1205	63	1.58	211	162

d_{25}, d_{50}, and d_{75} represent the particle sizes at 25, 50, and 75% of each sample.

3.2 Influence of different hydraulic separation parameters on classification of contaminated sediments

Table 3 shown the influence of inflow pressure on hydrocyclone separation sediments of 10% pulp concentration, with underflow/overflow flow ratio of 1/40. Results indicated that the separation particle size were 65, 40, and 29 μm at inflow pressures of 2, 2.5, and 3 kg/cm^2, respectively. The volume of contaminated sediments was decreased with the increasing inflow pressure.

3.3 Classification efficiency

Particle size distribution of inflow, overflow and underflow from hydrocyclone was shown in Table 4. The particle size less than 30 μm was accounted for 88.1% of the overflow sediments, whereas particle size greater than 30 μm was accounted for 74.8% of the underflow sediment. Results showed that high separation efficiency was obtained after hydrocyclone treating. After volume reduction by hydrocyclone, the volume of contaminated sediments decreased about 28% and Cu concentration of the underflow sediments was 201 mg/kg.

Table 3 Performance of sediments separation using hydrocyclone under different inflow pressures at 10% pulp concentration and underflow/overflow ratio of 1/40

Inflow pressure (kg/cm^2)	Separation particle size (μm)	Yield of Underflow sediments (%)	Cu Concentration in underflow sediments (mg/kg)
2 kg/cm^2	65	35	170
2.5 kg/cm^2	40	42	211
3 kg/cm^2	29	48	250

Table 4 Particle size distribution of inflow, overflow and underflow from hydrocyclone

Particle size (μm)	Inflow		Overflow		Underflow	
	F* (%)	C (%)	F (%)	C (%)	F (%)	C (%)
0 < d≦5	21.4	21.4	29.0	29.0	4.3	4.3
5 < d≦10	17.8	39.2	23.0	52.0	2.9	7.2
10 < d≦20	20.8	60.0	25.2	77.2	8.6	15.8
20 < d≦30	10.7	70.7	10.9	88.1	9.4	25.2
30 < d≦50	10.9	81.6	7.2	95.3	20.8	46.0
50 < d≦100	11.2	92.8	4.0	99.3	30.0	76.0
100 < d≦600	7.2	100	0.7	100	24.0	100
Weight yield (%)	100		72.2		27.8	
Cu (mg/kg)	485		1079		201	

Operating conditions: Pulp concentration 100 g/L, inflow maximum particle diameter 0.6 mm, inflow pressure 2.7 kg/cm^2, inflow rate 0.40 m^3/min

* F and C represent the fraction and cumulative probabilities, respectively.

4. CONCLUSION

Hydrocyclones can be a potentially for physical separation tool reducing volume reduction of the contaminated sediments. In the cyclosizer assay, most of the heavy metal was enriched in the particle size of sediments below 30 μm. Therefore, the pre-set separating particle size for subsequent separation by hydrocyclone was setting at with 30 μm, with pulp concentration 100 g/L, inflow maximum particle diameter 0.6 mm, inflow pressure 2.7 kg/cm^2, inflow rate 0.40 m^3/min. The volume of contaminated sediments can be effectively reduced about 28%, hence reduce the cost of follow-up remediation.

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Korea and It's a outlook from Japan

～Utilizing public opinion and a questionnaire surveys～

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ABSTRUCT : According to Japan-Korea joint public opinion surveys about relationship between Japan and Korea these days, the rate of "like the other country" is decreasing each other. The reason why there is conflict about issue especially recognition of history between Japan and Korea. Furthermore Japanese historical textbooks write few about the history between Japan and Korea, so most of Japanese don't know a lot of Korean history. After analyzing the public opinion survey, we took a questionnaire survey to University Students. According to these surveys, there is need the action of civilians, reform historical education and fairness of the news of media in order to escape from present situation.

1. INTRODUCTION

There are various problems among Japan and Korea such as recognition of invasion of Japan, territory, the issue of apology to "comfort women". First author used to have an intense aversion to Korea and Korean because of the media news. He dislike Korea, but his image of Korea greatly turned into good by visiting Korea twice in university life. In Korea, He realized that there are many civilians who want to build good relationship with Japan in there. Through this experience, he began to think about how to build better relationship between Japan and Korea.

Based on his experience, he wants to know about consciousness for Korea and Korean of Japanese through analyzing this theme and wants to find something which can improve the relationship between Japan and Korea.

2. METHODOROGY

In this paper, we analyze consciousness for Korea with public opinion surveys and a questionnaire with Nagasaki university students. In addition, we survey how changes the image for Korea and Korean.

The first step to analyze the image for Korea collected by media with Japan-Korea joint public opinion survey by *Asahi Newspaper Publishing Co* (Japan) and *Dong -a -il -bo Newspaper publishing Co (Korea).* We also referred the survey by *The Genron NPO* and *Yomiuri Newspaper publishing Co (Japan ,2014)* as another material.The second step to take a questionnaire from 162 Students of Nagasaki University for the image of Korea and Korean.Through these surveys, we can find that how negative images for Korea established in Japanese and think about the way to improve the relationship between Japan and Korea.

3. RESULTS OF PUBLIC OPINION SURVEYS

In this study, we refer to eleven-survey data of *Asahi Newspaper Publishing Co and Dong-a-il-bo Newspaper publishing Co*(1984～2015). In addition, we also use *The Genron NPO's surveys(2014～2016)* and *Yomiuri Newspaper publishing Co 's survey(2014)* as a reference material.

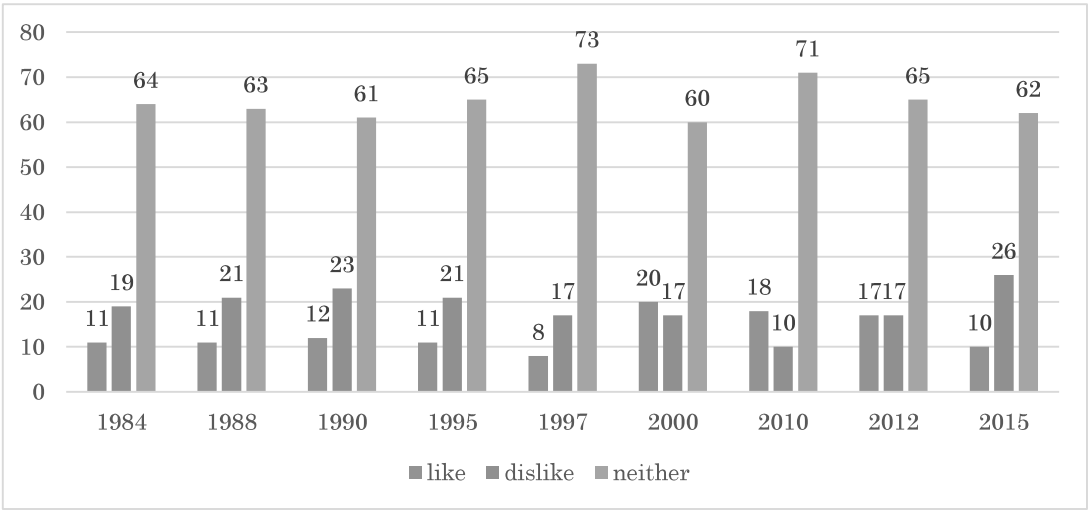

Figure 1. The likability for Korea to the Japanese

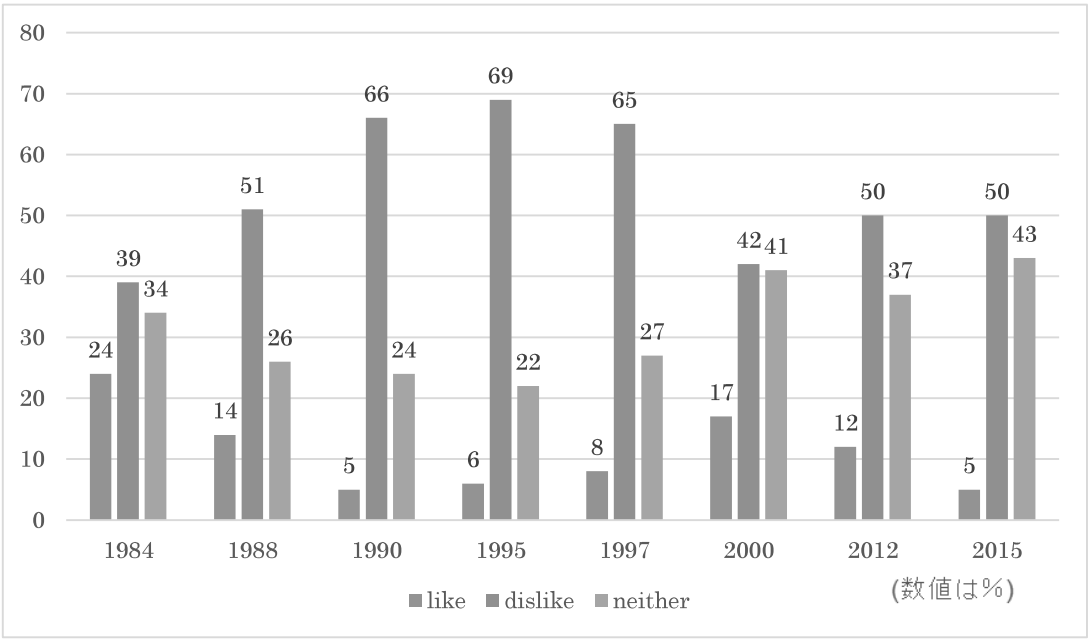

Figure 2. The likability for Japan to the Korean

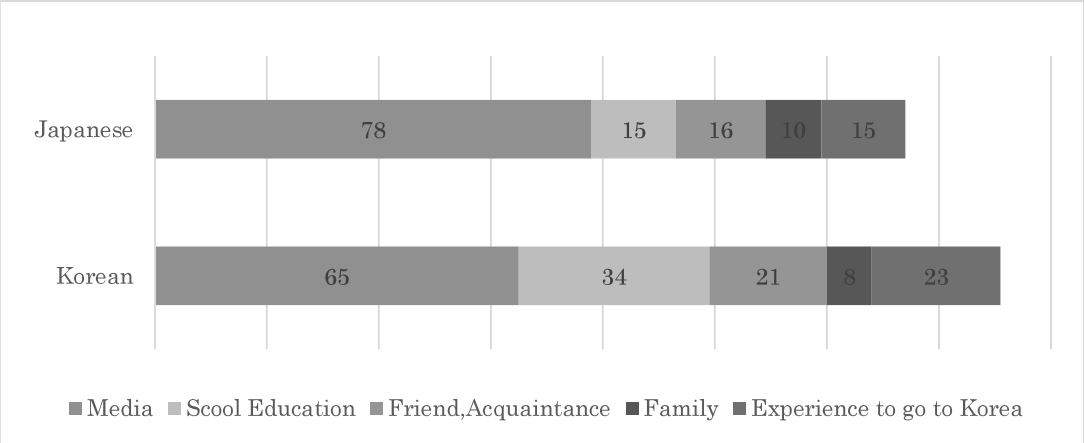

Figure 3. The most affected image between Korean and Japanese (2015)

Especially, the results of "The likability for Korea to the Japanese" and "The thing most affected the image for Korea to the Japanese (the image for Japan to the Korean)" are interesting. At first, 60% of Japanese say "neither" to the question about the likability for Korea. In the other hand, 50% of Korean say "dislike" to the Japan in 2015.It may have reason that there are difference of historical education system.

It is clear that "media" is the most influential thing to the image for Korea to the Japanese (see figure3). Thorough figure3, we realize that there is a big difference between Japan and Korea about the influence items to the image to each other country. The result of the difference between Japan and Korea about contents of historical education have a connection with the number of lesson of history between Japan-Korea. That is because there is an influence of pre-war Japan and it hold about 10% of whole contents of Korean historical textbooks than Japanese textbooks say hold in a few pages(It rely on our survey). Almost Japanese don't know Korean history of these countries because of the system of education of Japan.

4. THE RESULT OF A QUSTIONAIRE TO STUDENTS

The questionnaire survey with 162 students of Nagasaki University was carried out.

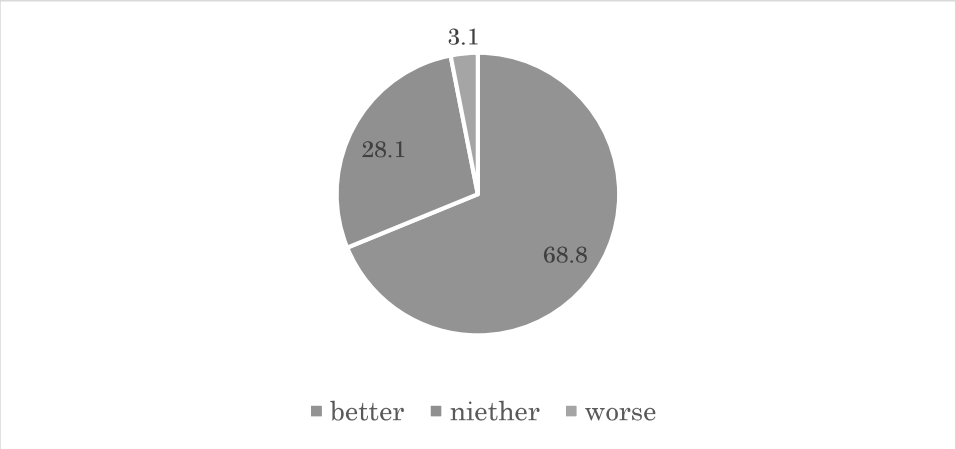

Figure4. Change the image of Korea and Korean by visiting Korea

According to our research 32 students in all1 62 students have been to Korea and 68, 8% of them answered that their image for Korea changed “better”. The next largest answer is “neither” and it has 28, 1%.It was surprised that almost people who had been to Korea got to have a good image. Only 9 students answered “neither”, but many students evaluate Korea depend on Korean culture like K-POP.

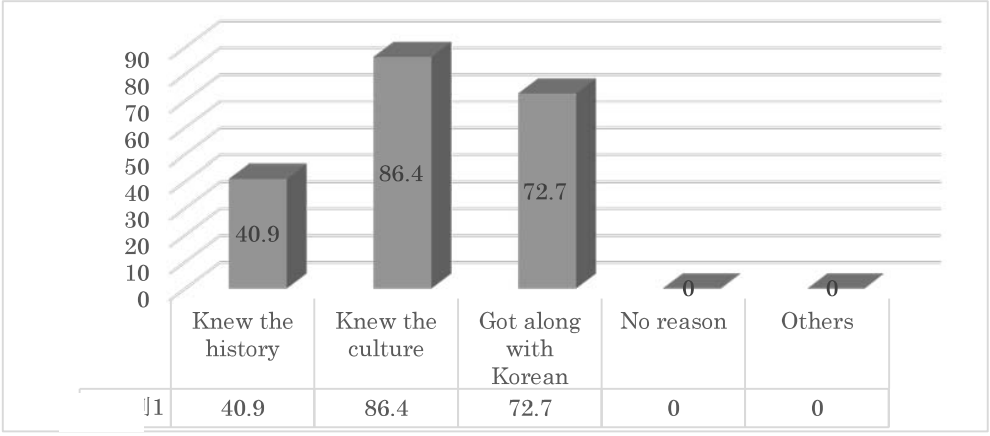

Figure5.The reason why change the image of Korea

We asked the question to 22 students who were answered “better” and then almost all of them said “culture” what is the image changed to the Korea. First author is also one of the Japanese impressed Korean culture. People who answered “got along with Korean” is also over 70%, but if they went to Korea as travel. This result showed that there are many Japanese who went to know about Korea and meet and talk to local people.Disappointing result is the rate of “knew the history” wasn’t over 50%. Compared to “knew the culture” and “got along with Korean”, it is relatively low.

After this question, we asked “Do you want to go to Korea?” and then 51, 9% of students said “Yes”. It became clear that less than 1/4 of students went to Korea in the question “Have you ever been to Korea?” When we asked, there are young people who want to go to Korea munch more than the number of people who have been to Korea.

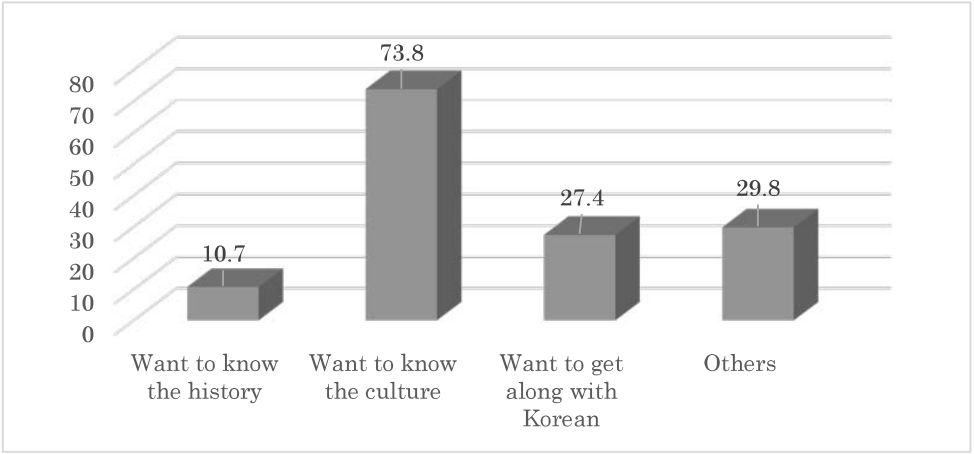

Figure6. The reason why students want to go to Korea

Why Japanese students want to go to Korea? About 73, 8% of them said that “want to know the culture” and about 30% of them selected “Others” in this question. There were various answers in “Others”, but they are roughly divided into the following: “Travel”, “Sightseeing”, “Go shopping”. On the other hand, the rate of “want to know the history” was worst as 10.7% only. According to result of these question, we can understand that interest for Korean history of Japanese is low.

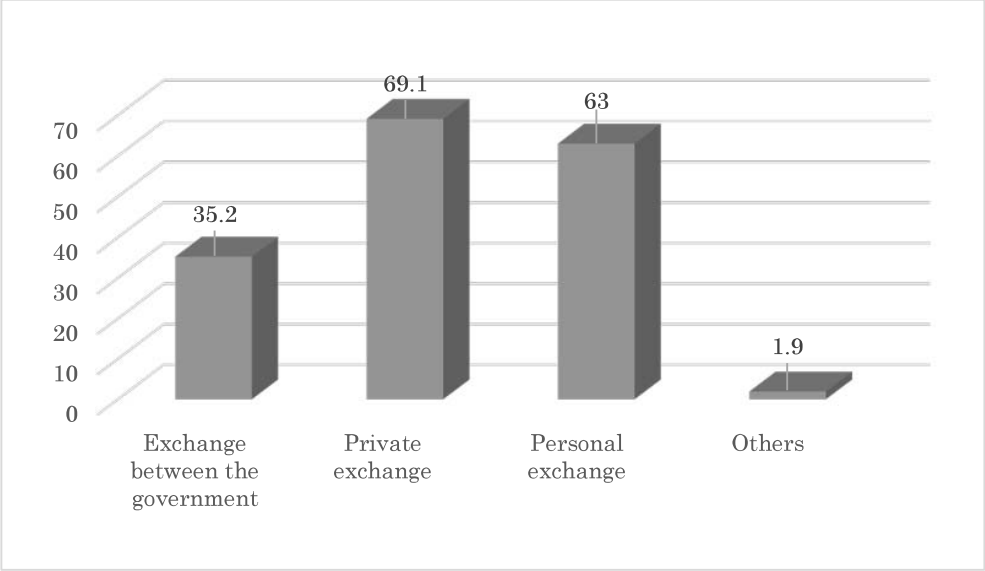

Figure7. The way to improve the relationship between Japan and Korea

Lastly, we asked the way to improve Japan-Korea relationship and the categories of choices are divided into “Exchange between the government”, “Private exchange”, “Personal exchange”. Most popular choice is “Private exchange” and it has almost70%.It is clear that private exchange is the most efficient way to improve relationship because it have opportunity to have interest for Japan and Korea to people live in each country.

The second most answer is “Personal exchange” and it got 63%. It will be connected to create new network Japanese – Korean beyond border that the answer has been supported than 60% students. On the other hand, only 35.2% students support “Exchange between governments.” In addition, there are some interesting opinion like “anti-Japan and anti-Korea report should be decreased”.

5. PROPOSAL TO CREATE JAPAN-KOREA RELATINSHIP

First, it is so effective way to promote “Private Exchange” .It is good to improve the relationship between Japan and Korea certainly that young people can go to such a great country cheaply and know “the real Korea” to join the program of private groups. It is good way that if participants of study tour have more interest to Korea, it promotes “personal exchange” and they can exchange more. In order to do that, University and private companies should support students economically and promote cultural exchange.

Secondly, it should be changed that historical education in Japan. It is difficult to change the historical education curriculum. It is because Japan-Korea relationship is bad because of the issue of

historical recognition. However if this curriculum don't ready for youth like us and don't learn the Japan-Korean history, the good relationship for the future will be no way.

Lastly, the way to report of media should be changed is. The main contents which media reports are about "culture" and "the issue of historical recognition include anti-Japan and anti-Korea". There are many reports which shows "hate Korean and hate Japan" .To make friendly Japan-Korean relationship, it is necessary for mass media to do fairly reports and make civilians to create good relationship with Korean.

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Bioaccumulation of Heavy Metals in Tilapia Aquacultured in Southwest Taiwan and Implication for Human Health Risk Assessment

Xiang-Ying Chuang • Yun-Ru Ju • Cheng-Di Dong • Chiu-Wen Chen*

ABSTRACT: This study aims to determine the metal concentrations in tilapia and assess the health risk for human consumption. Tilapia is one of the main species cultured in Taiwan. The metal contents (As, Cd, Cr, Cu, Pb, Ni, Zn, and Hg) in tilapia tissues of liver, kidney, gills, muscle, and gastrointestinal tract were analyzed using Atomic Absorption Spectrophotometer. Results showed the metal concentrations in tilapia were varied based on different tissues. Most of heavy metal was accumulated in kidney, while the high contents of Cu and Zn were in liver. The muscle of tilapia showed the metal contents were lower than the Sanitation Standard for Aquatic Animal in Taiwan. The calculated hazard quotients (HQ) of all metals were smaller than 1, suggesting that these metals in tilapia could pose the minimum hazard to local residents. Although the results indicated that the muscles of tilapia are safe for human consumption, it needs to continue monitoring the metal concentration in fish and aquatic environments.

Keywords: Tilapia; Aquaculture; Heavy metals; Bioaccumulation; Food safety

1. INTRODUCTION

Taiwan is a densely populated island, of which 2/3 area is mountainous terrain. The land available for use is limited, thus most aquaculture farms on the southwest of Taiwan are near to the industrial zone. Industries directly discharge effluents, which contain metals, into seawater. The effluent entering the seawater causes the pollution. The fish farms may be polluted causing by receiving the industrial, agricultural effluent, and sewage discharge. Heavy metal concentration in aquaculture organisms along with bioaccumulation have been extensively studied in the world [3]. Tilapia is one of the aquaculture species in Taiwan, and is commonly consumed by Taiwanese. Because aquatic products are the most preferred food among the local people, it is important to study the bioaccumulation of heavy metals in aquaculture tilapia in southwest Taiwan. Although tilapia of this study only cultured in ponds, they may accumulated metals from the metal-contaminated environments. Therefore, the objectives of this study are: (1) to investigate the distribution of heavy metals in five tissues of tilapia, (2) to evaluate the ability of metal accumulation in tilapia through calculating BCF (Bioconcentration factor), and (3) to assess the health risk for human consuming the farmed tilapia.

2. MATERIALS AND METHODS

2.1 Sample collection and chemical analysis

Tilapias were sampled on January and July in 2015. Samples of water, sediments, and tilapia were

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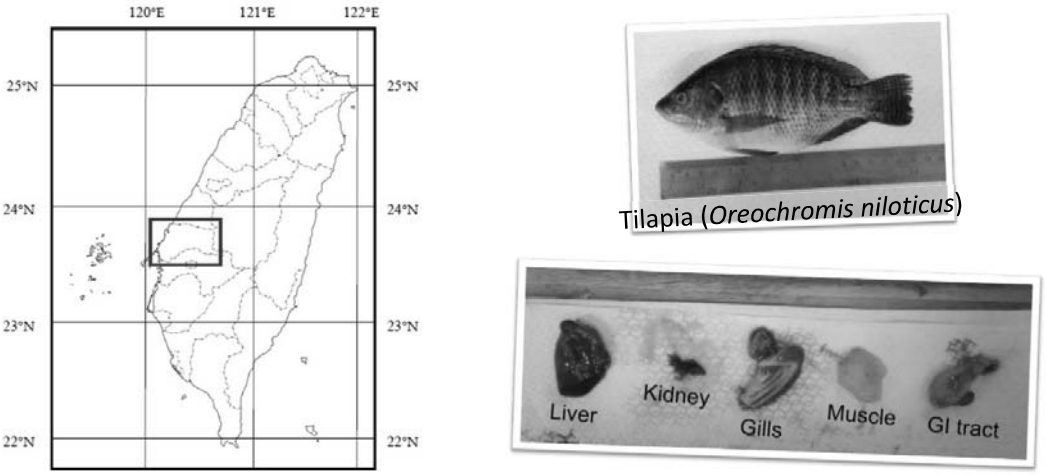

Figure 1 Region of study area

collected at 9 aquaculture ponds from Yunlin County (Fig. 1).

Five tissues (liver, kidney, gills, muscle, and gastrointestinal tract (GI tract)) of tilapia were taken by clean stainless steel instruments. The samples were put in a glass vial and dried with a freeze dryer for 4 days. Dried samples put in an independent tube, added the nitric acid (HNO_3) 10 mL, and left 4 h in the hood at room temperature. Samples were digested by the graphite heater setting temperature at 125°C, then heated until all the tissues dissolved. The digested solution was made up to 25 mL with deionized distilled water. Concentration of Pb, Cd, Cr, As, Cu, Zn, and Ni in digested solutions was analyzed by flame atomic absorption spectrophotometer (FLAAS). The total mercury (Hg) concentration was measured using cold vapor atomic absorption spectrometry (CVAAS).

2.2 Bioconcentration factor (BCF)

The BCF was calculated as the ratio of the metal concentration in an organism to the metal concentration in the water as the following equation,

$$\mathrm{BCF} = \frac{C_{organism}}{C_{water}}$$

where $C_{organism}$ and C_{water} are the mean metal concentrations in the tilapia (μg g^{-1} wet weight) and water (μg L^{-1}), respectively.

2.3 Human health risk assessment

It is necessary to consider the metal intake that caused the adverse effect in human by consuming tilapia. Metal exposure through tilapia ingestion can be expressed as following [3],

$$\mathrm{E} = \frac{CW \times FIR \times GI \times EF \times ED}{BW \times AT}$$

where E is the ingestion exposure level of the metal (mg kg^{-1} day^{-1}), CW is the metal concentration in muscle of tilapia (mg kg^{-1} wet wt.), FIR is the mean daily ingestion rate (kg day^{-1}), GI is the gastrointestinal absorption factor for metal, EF is the exposure frequency (days $years^{-1}$), ED is exposure duration (years), BW is the body weight (kg), and AT is averaging time (days). The potential health risks associated with metal exposures are expressed by hazard quotient (HQ). The equation is defined by the ratio of the estimated daily ingestion exposure level of the metal (E) to the oral reference dose (RfD) for the metal (mg kg^{-1} day^{-1}), expressed as following [5],

$$\mathrm{HQ} = \frac{E}{RfD}$$

3. RESULTS AND DISCUSSION

3.1 Metal concentration and accumulative tendency in tissues of tilapia

Table 1 summarizes the concentration in tissues of tilapia collected from the sampling site in this study. Results indicated the metal concentrations in tilapia were varied based on different tissues. Kidney is the tissue of most metal accumulation, Cu and Zn prefer to accumulate in liver. Muscle of tilapia showed the metal contents were lower than the Sanitation Standard for Aquatic Animal in Taiwan (Cd and Pb <0.3 ppm, express by wet weight). Cu and Zn are essential elements for physiological function processes in fish. The accumulation of essential metals in the liver is likely linked to its role in metabolism [1]. However, essential metals at high concentration can affect circulatory and heart system of fish [2]. Kidney is the gateway for heavy metal detoxification in organisms [6]. Some metals such as Hg, Pb, Cd, Cr, and As are non-essential elements for organisms, hence excessive intake those metals may cause adverse effects on nerve, blood, and respiratory systems [4].

Table 1 Metal concentration (mean±SD, μg g^{-1} wet wt) in tilapia in southwestern Taiwan (n=19)

Tissue	Hg	Pb	Cd	Cr	As	Cu	Zn	Ni
Liver	0.06±0.05	0.13±0.20	0.13±0.21	0.26±0.18	0.03±0.07	**41.59±47.72**	**22.68±22.05**	0.26±0.26
Kidney	**0.87±1.32**	**1.14±1.14**	**0.78±1.04**	**6.81±15.52**	**0.46±0.67**	8.92±16.03	20.77±12.39	**4.15±5.83**
Gills	0.05±0.08	0.24±0.12	0.01±0.01	0.44±0.30	0.03±0.02	0.49±0.29	13.23±5.57	0.35±0.42
Muscle	0.05±0.05	0.14±0.12	0.01±0.01	0.49±0.35	0.02±0.01	0.42±0.31	5.53±2.43	0.37±0.30
GI tract	0.19±0.35	0.24±0.35	0.05±0.05	0.62±0.58	0.09±0.11	1.75±1.05	13.81±6.14	0.65±0.78

*Values in bold mean the maximum.

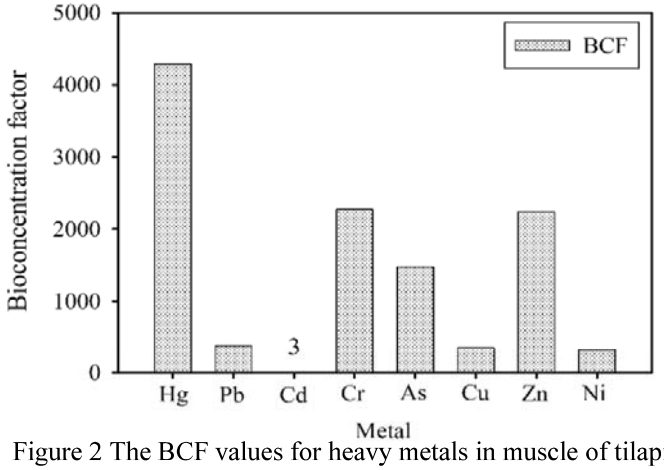

Figure 2 The BCF values for heavy metals in muscle of tilapia

The BCF values in muscle of tilapia with the averages of 4293 in Hg, 386 in Pb, 3 in Cd, 2274 in Cr, 1480 in As, 355 in Cu, 2240 in Zn, and 313 in Ni. Results indicated that tilapia accumulated higher Hg, Cr, and Zn from the aquaculture environments (Fig. 2).

3.2 Risk assessment for human consuming farmed tilapia

Human health risk assessment has been estimated from the HQ. The estimation was based on the metal exposure of ingestion pathway. The estimates of HQs for human consumption were showed in Fig. 3. The observed HQs of all metals were far smaller than unity, suggesting that these metals in tilapia could pose the minimum hazard to local residents.

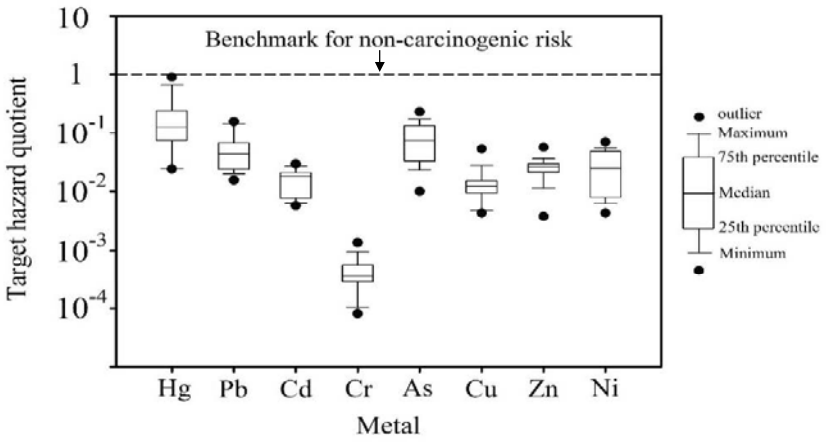

Figure 3 The HQ of metals estimated by human consuming tilapia cultured in southwestern Taiwan for human intake eight heavy metals.

4. CONCLUSION

Tilapias in this study can be safe to consume by human, because the metal contents in them were lower than the standards in Taiwan. The calculated HQ of all metals were smaller than 1, indicating the intake of tilapia does not cause harmful effects to Taiwanese. Although the results indicated that the muscles of tilapia are safe for human consumption, it needs to continue monitoring the metal concentration in fish and aquatic environments.

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Removal of Polycyclic Aromatic Hydrocarbons (PAHs) from Harbor Sediments by Anionic and Nonionic Surfactants

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ABSTRACT: Various commercial surfactants, such as anionic sodium dodecyl benzene sulfonate (SDBS) and sodium dodecyl sulfate (SDS), nonionic surfactants Triton X-100 (TX-100) and Simple Green® (SG), were carried out to treat harbor sediments that were contaminated with polycyclic aromatic hydrocarbons (PAHs) and dredged from Kaohsiung Harbor in Taiwan. Due to the high organic matter content in the sediments that competed with PAHs for the presence of surfactants, thus increase the difficulty in mobilizing PAHs, a low desorption efficiency, and a large excess of experimental parameters was required. Experimental results revealed that TX-100 and SDS were the most effective (70%) of the tested surfactants in PAHs desorption. The optimal conditions were conducted after 20 times washing cycles while adding 10 CMC surfactant concentration to liquid/solid ratio of 20 in a shaker at 150 rpm and room temperature for 1 hour. Increasing the molecular weight and number of rings of PAHs did not significantly influence whole removal efficiencies. The data implied that the use of surfactant has shown to enhance the ability for PAHs desorption from sediments, potentially available for the remediation of PAHs-contaminated sediments.

Keywords: Polycyclic aromatic hydrocarbons; Contaminated sediments; Surfactants

1. INTRODUCTION

Owing to polycyclic aromatic hydrocarbons (PAHs) high hydrophobic nature and affinity for the solid particles, PAHs preferentially deposit onto the bottom of aquatic environment, where PAHs are strongly adsorbed to sediments [1]. The sediments may act as a long-term pollutant reservoir and lead to bioaccumulation and biomagnification in the food chain directly or indirectly, results in pollutants (e.g. PAHs) exposure to human and other living organisms [2]. Approximately hundred different types of PAHs have been identified, U.S. Environmental Protection Agency (US EPA) has categorized the most essential 16 PAHs as priority control contaminants [3], because of their carcinogenic, mutagenic and teratogenic properties [4]. Hence, considering environmental and health quality it is essential to clean up PAHs contaminated sediments and to investigate appropriate removal process. Surfactants are originally used in detergent products, mining activities, and enhanced oil recovery. Surfactants are currently employed to counter the low solubility of PAHs and to enhance the desorption efficiency of remediating contaminated sediments [5]. Surfactants present in liquid-solid systems have several mechanisms for the treatment of PAHs such as mobilization by lowering interfacial tension, solubilization by surfactants micellar, and the phase transfers from solid partitioning onto the micellar pseudo-phase [6]. The main advantages of surfactants are the simplicity application, economy, time-efficient, and technicality feasible means for the remediation

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of PAHs contaminated sites [7]. Surfactant based remediation for PAHs contaminated sediments has received little attention. For the practical treatment of harbor sediments, organic matters are more complex and recalcitrant than other freshwater systems. This study investigation demonstrates two different types of surfactants, which including anionic and nonionic, as washing reagents for remediating contaminated sediments. Experimental parameters that impact the efficiency of removal of 16 PAHs include surfactants selection, surfactants concentration, liquid/solid (L/S) ratio, washing cycles. Several commercial surfactants, sodium dodecyl sulfate (SDS), sodium dodecyl benzene sulfonate (SDBS), Triton X-100 (TX-100), and Simple Green® (SG), were used to compare the desorption efficiency of PAHs, and to evaluate the optimal condition that effects of impact factor on effectiveness of the surfactants were also investigated.

2. MATERIALS AND METHODS

The sediments sample was collected from the industrial port in Kaohsiung city, Taiwan. Sample was air-dried, ground and passed through 1-mesh sieve previous to use. The physicochemical properties of sediments were as follows: sand (>63 μm) 9.7%; silt (2-63 μm) 83.1%; clay (<2 μm) 7.2%; pH 6.95; organic matter (OM) content 7.7%; Total PAHs concentration approximately 58 μg/g. The surfactants were selected as follows: anionic surfactants SDS ($CH_3(CH_2)_{11}OSO_3Na$) and SDBS ($C_{18}H_{29}NaO_3S$), nonionic surfactants TX-100 ($C_8H_{17}C_6H_4O(OCH_2CH_2)_{9.5}H$) and SG ($C_5H_{16}O_2$), the critical micelle concentration (CMC) of surfactants were 7.85, 2.80, 0.19, 9.45 mM, respectively. Batch experiments were conducted to determine the desorption efficiency of PAHs in the presence of surfactants. 0.4-5.0 gram of the contaminated sediments was weighed into 40 mL borosilicate glass vials with Teflon-lined septa and screw caps, to which 20 mL of surfactant solution with prescribed concentrations. The mixtures were conducted in a reciprocal shaking water baths at 200 rpm and room temperature for 1 h, which was the optimal washing time to reach the equilibrium in our preliminary test. After washing, the solution and sediments were separated by centrifugation at 2000 rpm for 5 min and the residual sediments were collected for PAHs concentration analysis by gas chromatography-mass spectrometry (GC-MS).

3. RESULTS AND DISCUSSION

Removal of PAHs from the sediments by varying the surfactant concentrations from 10 to 100 CMC, the L/S ratio between surfactant solution and sediments was varied from 4 to 50, and the washing cycles with 1 to 20 times (1 hour per each time). The results indicated that the extent of total PAHs desorption from the sediments was in the order of TX-100 ≈ SDS > SG ≈ SDBS for washing process under optimal conditions of surfactant concentrations = 10 CMC; L/S = 20; washing cycles = 20 times. According to the desorption capacity of PAHs which are listed the LPAHs, the HPAHs, and 16 individual PAHs (see Table 1); the efficacy of selected surfactants performance was not significantly related to the molecular weight of PAHs: the three highest achieved using TX-100 were 94% and 86%, for dibenz[a,h]anthracene (5-rings), anthracene (3-rings), and benzo[a]anthracene (4-rings); those achieved using SG were 93%, 80%, and 76% for dibenz[a,h]anthracene (5-rings), indeno[1,2,3-c,d]pyrene (6-rings), and benzo[a]anthracene (4-rings); those achieved using SDS were 94%, 92%, and 90% for same compounds with TX-100; and those achieved using SDBS were 94%, 84%, and 81% for dibenz[a,h]anthracene (5-rings), benzo[a]anthracene (4-rings), and indeno[1,2,3-c,d]pyrene (6-rings), respectively. Overall, with respect to the optimized treatments, TX-100 and SDS greatly desorb PAHs. The removals of LPAHs, HPAHs, and total PAHs by TX-100 were 60%, 77%, and 69%; those were 64%, 79% and 71% by using SDS, respectively. For the remediation of real sediments, which have more OM can strongly influence the affinity of PAHs into hydrophobic pores of sediments phase [8]. The used surfactants

are primarily consumed by natural OM and other hydrophobic organic contaminants. Hence, all of the respective surfactants were performed under an excessive the critical micelle concentration. With increased L/S ratio, the repulsions decrease significantly between the negatively charged sediments particles and surfactants, and thus increased interaction of the surfactant molecules with PAHs [9]. The increased interaction also causes an increased PAHs partition onto micellar pseudo-phase. However, ring structures, aqueous solubility, and octanol-water partition coefficients cannot always explain the desorption of individual PAHs because the concentrations of the PAHs in studied sediments vary. On average, at excessive operating parameters, the desorption capacity of PAHs with four, five, and six rings is better that of those with two and three rings. Consequently, HPAHs were desorbed more efficiently than LPAHs with increasing the surfactants concentration, L/S ratio, and washing cycles. This result is contrary recently published [10].

Table 1 The initial concentration of individual PAHs and desorption efficiencies achieved with optimal conditions

PAHs	Chemical formula	Rings	Conc., ng/g (C_0)	Desorption efficiency, % (R_t)			
			Control sample	TX-100	SG	SDS	SDBS
Naphthalene (NA)	$C_{10}H_8$	2	7,306 ± 1,088	50	53	57	54
Acenaphthylene (ACY)	$C_{12}H_8$	3	569 ± 104	48	46	46	41
Acenaphthene (ACE)	$C_{12}H_{10}$	3	4,061 ± 339	59	64	70	56
Fluorine (FL)	$C_{13}H_{10}$	3	5,413 ± 683	64	64	65	58
Phenanthrene (PHE)	$C_{14}H_{10}$	3	8,882 ± 388	64	53	62	49
Anthracene (AN)	$C_{14}H_{10}$	3	2,303 ± 126	86	67	92	69
Fluoranthene (FLU)	$C_{16}H_{10}$	4	5,772 ± 744	81	55	83	63
Pyrene (PY)	$C_{16}H_{10}$	4	4,781 ± 449	69	54	76	49
Benzo[a]anthracene (BaA)	$C_{18}H_{12}$	4	3,310 ± 233	86	76	90	84
Chrysene (CH)	$C_{18}H_{12}$	4	3,098 ± 185	76	66	80	70
Benzo[b]fluoranthene (BbF)	$C_{20}H_{12}$	5	2,048 ± 219	66	42	60	46
Benzo[k]fluoranthene (BkF)	$C_{20}H_{12}$	5	1,514 ± 265	79	58	77	62
Benzo[a]pyrene (BaP)	$C_{20}H_{12}$	5	2,676 ± 249	83	62	80	66
Indeno[1,2,3-cd]pyrene (IP)	$C_{22}H_{14}$	6	2,601 ± 501	82	80	83	81
Dibenzo[a,h]anthracene (DA)	$C_{22}H_{12}$	5	1,579 ± 198	94	93	94	94
Benzo[g,h,i]perylene (BP)	$C_{22}H_{12}$	6	2,149 ± 402	74	70	68	69
2-rings	-	2	7,306 ± 1,088	50	53	57	54
3-rings	-	3	21,228 ± 1,514	65	59	67	55
4-rings	-	4	16,961 ± 1,506	78	61	82	65
5-rings	-	5	7,817 ± 323	80	62	77	66
6-rings	-	6	4,750 ± 848	78	76	76	76
Light PAHs (LPAHs)	-	2-3	28,534 ± 2,455	60	56	64	53
Heavy PAHs (HPAHs)	-	4-6	29,528 ± 1,288	77	62	79	65
Total PAHs (ΣPAHs)	-	2-6	58,062 ± 2,073	69	59	71	59

* PAHs desorption percentage was calculated using equations: R_t (%) = [1-(C_t/C_0)] ×100, where C_r is the remaining PAHs concentration and C_0 is the initial PAHs concentration (ng/g) in sediments.

4. CONCLUSION

Surfactants were found to have great potential for desorption and solubilization PAHs, particularly HPAHs from contaminated sediments. Due to a large amount of organic matter in the sediments, surfactants desorbed the PAHs when a large excess of surfactants concentration (10 CMC), liquid/solid ratio (20), washing cycles (20 times) was utilized; after washing, removal efficiencies of PAHs were in the order of TX-100 ≈ SDS (71%) > SG ≈ SDBS (61%). Considering that only batch at lab-scale experiments were performed in this current study, more study experiments such as a continuous column for closely simulate in-situ remediation or mixed surfactants are needed to investigate with improving the efficiencies of the washing process in the future study.

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Calibration of a Non-Metric Camera for Close-range Photogrammetry

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ABSTRACT: In order to heighten the accuracy of the three-dimensional information that was obtained by utilizing a camera for the use other than the surveys for the close-range photogrammetry, the camera calibration that can calculate the relationship between the non-metric camera for the use other than the surveys and the object must take place, without fail.

As the interior orientation element obtained through the calibration has the influences on the accuracies of the matched photo materials, it can be said that how accurately the calibration must take place in order to get the interior orientation element is an important element that can improve the degrees of the accuracies of the photographic materials.

In this research, each of the interior orientation elements was obtained by carrying out the self- and field-calibrations. By applying the interior orientation elements that were obtained in this way to the Simultaneous Bundle Adjustments, the coordinates of the checkpoints installed on the object were calculated. And, by comparing these coordinates with the coordinates of the checkpoints calculated in the total station, the degrees of the accuracies were evaluated through calibration.

1. Introduction

Although the photogrammetry technique has been steadily developing until now, arriving at the present, when the photogrammetry obtained through the close-range photogrammetry of the small scales are analyzed, the high-priced equipments and the well-trained, high-class manpower are inefficient and not economical. As a result, a photogrammetry method using a non-measurement purpose camera which does not need a high-priced analytical plotter and the well-trained technicians has been coming to the fore.

In order to heighten the accuracy of the three-dimensional information that was obtained by utilizing a camera for the use other than the surveys for the close-range photogrammetry, the camera calibration that can calculate the relationship between the non-metric camera for the use other than the surveys and the object must take place, without fail.

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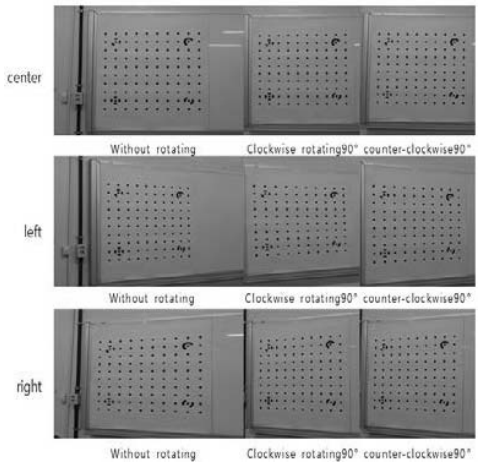
And, by comparing these coordinates with the coordinates of the checkpoints calculated in the total station, the degrees of the accuracies were evaluated through calibration.

2. Experiment and data analysis

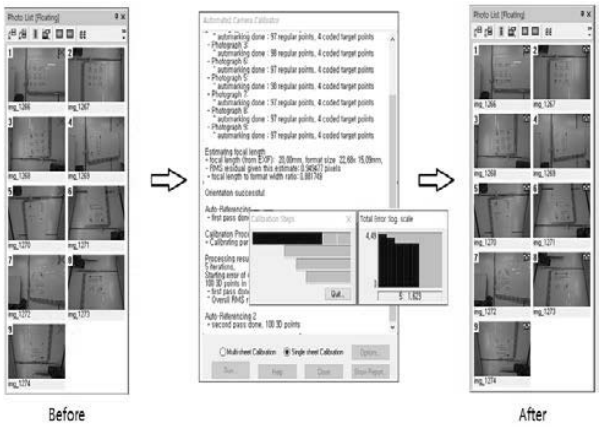
2.1 Self calibrations

In order to carry out the self-calibrations, the paper sheets for the exclusive use with the self-calibrations which are provided by the PhotoModeler Scanner S/W were stuck to the wall surfaces. And, by using a single lens of which the focusing distance was 20mm, the photographs were taken at a place that was 3 m away.

As in Picture 1, regarding the paper sheets that were attached to the wall surfaces, their photographs were taken once without rotating the camera to the center, left, and right, once by rotating 90° clockwise, and once by rotating 90° in the counter-clockwise direction. The photographs were taken for a total of 9 times.



Picture 1 Sheets shooted in 3 directions



Picture 2 Self calibration process

Regarding the 9 photographs acquired in this way, the self-calibrations were carried out automatically by using the PhotoModeler Scanner S/W. Picture 2 represents the process of the automatic progress of the self-calibration.

As the time before the calibration is marked with a red-colored 'X' in the upper part of the right side and, after the calibration, it is marked with the black-colored 'camera' shape in the upper part of the right side, the condition of the progress of the calibration can be understood easily at one eye.

In case, after the calibration, an 'X' was marked, instead of the 'camera' shape, in the upper part of the right side, the process as in Picture 3 was repeated after removing the photograph and taking a picture again.

The interior orientation elements obtained in this way (The focal length, the principal points, and the lens distortions) are as in Table 1.

Table 1 Interior orientation elements Unit: mm

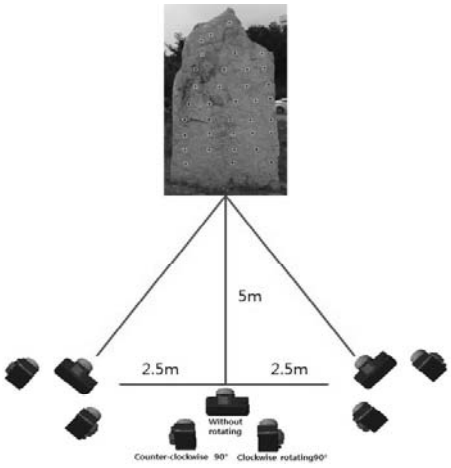
Article	Factor	Correction result
Focal length	f	20.7446
Principal points	C_x	11.3414
	C_y	7.3861
Lens distortions (radial distortions)	k_1	1.519e-005
	k_2	1.749e-006
Lens distortions (tangential distortions)	p_1	-1.954e-005
	p_2	-3.119e-005
Pixe Squareness	F_w	22.6305
	F_h	15.0876

2.2 Field calibrations

I intend to present a field calibration method that possesses the conditions that are similar to the actual close-range photogrammetry by using the interior orientation elements acquired through the self-calibration method.

As a result, the photographing took place by producing a regular hexahedron box with the width of 50 cm, the length of 50 cm, and the height of 70 cm and by attaching the target as in Picture 3. By applying the interior orientation elements that were self-calibrated to the photographs that were taken, the field calibration was proceeded with.

Picture 3 Field calibration object



Picture 4 Camera shooting method and location

By using a digital camera onto which a 20mm single lens was attached as in the self-calibration, the photographs were taken at a point that was 3 m away from the front of the object and at the points that were 1.5m away each on the left and the right sides from the point.

Regarding the photographing method, the photographing took place with the method that was the same as the self-calibration.

And the photographing took place for a total of 9 times in the 3 directions, including 1 time without rotating the camera in one direction, 1 time by rotating in the clockwise direction, and 1 time by rotating in the counter-clockwise direction. Picture 4 represents the method and the location of the photographing with the camera with which the photographing took place in the 3 directions.

Regarding the field calibrations, the work was proceeded with by manually matching the targets and not automatically matching the targets.

It can be said that taking the pictures by including as many target points as possible in one photograph is the method for heightening the degrees of the accuracies.

The interior orientation elements regarding the field calibrations that were proceeded with in the environments that were similar to those of the actual, close-range photogrammetry were represented in Table 2.

Table 2 interior orientation elements Unit: mm

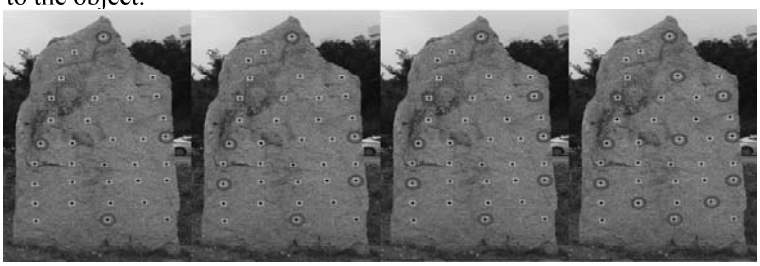
Article	Factor	Correction result
Focal length	f	20.6384
Principal points	C_x	11.3408
	C_y	7.4416
Lens distortions (radial distortions)	k_1	9.110e-005
	k_2	-2.033e-006
Lens distortions (tangential distortions)	p_1	-3.284e-005
	p_2	6.839e-006
Pixel Squareness	F_w	22.6384
	F_h	15.0876

2.3 Evaluations of accuracies

In order to evaluate of the accuracies according to the calibration method, the photographs were taken by installing the cameras at three places that were 5 m away from the front of the object. Regarding the methods of the photographing, the photographing took place at each location, including 3 times for each direction for a total of 9 times in the 3 directions, which included 1 time without rotating the camera, 1 time by rotating the camera 90° clockwise, and 1 time by rotating the camera 90° counter-clockwise.

By applying the interior orientation elements obtained by carrying out the self- and field-calibrations and by having the numbers of the reference points among the 36 target points of the object as 4, 6, 8, and 12, the checkpoint coordinates were calculated. And the RMSE's that were obtained by comparing these coordinates with the checkpoint coordinates calculated in the total station were shown in Table 3.

Picture 5 represents the distribution of the reference points that were applied among the 36 target points attached to the object.

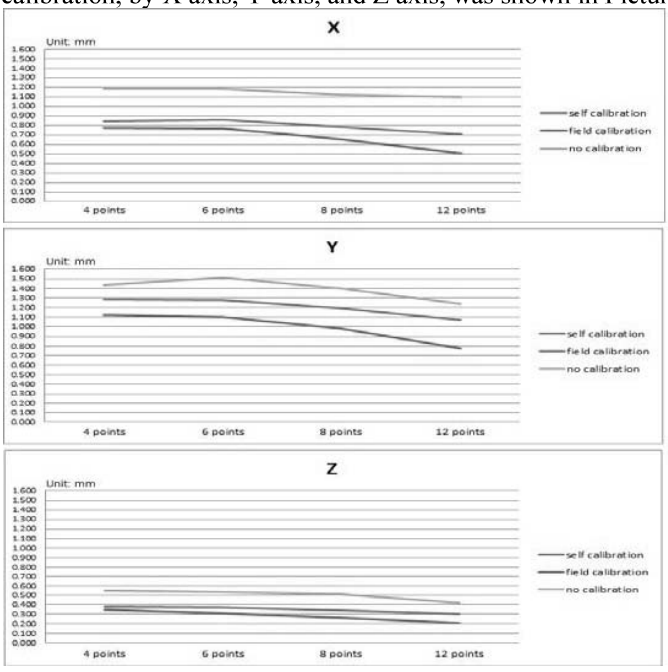


(a) 4Points (b) 6Points (c) 8Points (d) 12Points
Picture 5 Distribution of control points

Table 3 RMSE according to the number of control points and calibration method Unit: mm

Method \ Points		4Points	6Points	8Points	12Points
X	No calibration	1.188	1.189	1.124	1.103
	Self calibration	0.846	0.865	0.789	0.706
	Field calibration	0.779	0.771	0.652	0.508
Y	No calibration	1.439	1.511	1.399	1.238
	Self calibration	1.285	1.273	1.197	1.070
	Field calibration	1.126	1.099	0.977	0.776
Z	No calibration	0.550	0.534	0.508	0.417
	Self calibration	0.379	0.370	0.342	0.303
	Field calibration	0.348	0.307	0.262	0.208

The distribution of the RMSE's according to the number of the reference points and the method of the calibration, by X axis, Y axis, and Z axis, was shown in Picture 6.



Picture 6 RMSE distribution according to the number of control points and calibration method

In the case of not having done the camera calibration, the RMSE values of 1.1mm~1.2 mm with the X axis, 1.2mm~1.5mm with the Y axis, and 0.4mm~0.5mm with the Z axis were shown.

When considering the resolution 0.9 mm of the photographs taken at a place that was 5 m away, we were able to find out that all of them got out, excluding the Z axis.

However, as a result of analyzing the checkpoints of the object by applying the result value that was self-calibrated, the RMSE values of 0.7mm~0.88mm with the X axis, 1.1mm~1.3mm with the Y axis, and 0.3 mm~0.4mm on the Z axis could be obtained. Regarding this, only the Y axis got out of the resolution of 0.9mm with the photograph that was taken at a place that was 5 m away.
And the remaining X and Z axes had the photograph resolution of 0.9mm.

Also, as a result of analyzing the checkpoints of the object by applying the result value that was field-calibrated, it was 0.5mm~0.8mm with regard to the X axis, 0.8 mm~1.1 mm with regard to the Y axis, and 0.2mm~0.3mm with regard to the Z axis.
With only the result value that was self-calibrated, the results that were better than the RMSE's, which analyzed the checkpoints of the object, could be obtained.

Also, we were able to find out that, although it looks as though the increase of the number of control points does not have any big influences on the improvement of the accuracies, the more the number of the control points increased, the more minutely that RMSE values decreased on the X, Y, and Z axes.

3. Conclusion

In this thesis, by carrying out the self- and field-calibrations, each interior orientation element was obtained. By applying the interior orientation elements obtained in this way to the Simultaneous Bundle Adjustments, the coordinates of the checkpoints installed on the object 5 m away from the camera for the use other than the survey were calculated.

And we were able to obtain the following conclusions by comparing the coordinates with the coordinates of the checkpoints calculated in the total station and by evaluating the degrees of the accuracies.

Firstly, regarding the three-dimensional coordinate values obtained with the Simultaneous Bundle Adjustments, the RMSE's of the case in which the self-calibration was done improved more than those of the case in which the camera calibration was not done at 0.1 mm~0.4 mm.

And the case in which the field calibration was done improved more than the case in which the self-calibration was done at 0. mm~0.3mm.

Secondly, we were able to find out that, although acquiring the three-dimensional coordinates through the field calibration is minuter than doing only the self-calibration, the degree of the accuracy gets enhanced.

Also, we were able to find out that, although it seems that the increase of the number of the control points does not have any big influences on the improvement of the degree of the accuracy, the more the number of the control points increases, the RMSE value minutely decreases on the X, Y, and Z axes.

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Network Data Model for Visually Impaired People

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ABSTRACT: Since pedestrian navigation services are mainly for the general public, there is a growing need for pedestrian navigation services for the transportation vulnerable. Unlike hearing impaired people, visually impaired people among the transportation vulnerable need assistance in walking and development of a navigation or data model that can support them is urgent. As early work, this study proposed a pedestrian network data model for the visually impaired who are the transportation vulnerable. The data model is divided into two parts: walking space for the visually impaired and additional walking information. The walking space is composed of direct elements such as sidewalk, entrance, and landmark related to walking, and additional walking information consists of the route guidance and risk element information. It is expected that the network data model for visually impaired people can be used as basic information for practical route guidance.

1. Introduction

The development of IT technology and GNSS enables various pedestrian route guidance services as well as car navigation. Unlike car navigation system, it is essential to build pedestrian network data such as sidewalks, pedestrian crossings, overpasses and underpasses for pedestrian navigation services. Also, the transportation vulnerable, such as the visually impaired, needs this service more. Therefore, it is necessary to build network data that can recognize various facilities including road obstacles to guide roads in detail. Thus, this study is to propose a pedestrian network data model for visually impaired people through domestic and foreign literature research and pedestrian network data modeled in Korea.

2. Needs information for visually impaired people

In Korea, NGII(National Geographic Information Institute, 2013) defined geographic features such as curb height, sound signaler, and rain gutter cover to create a navigation road map for pedestrians. In order to allow the visually impaired to perform the same behavior as the general public in terms of walking, it is necessary to construct more detailed geographic features for walking safety as well as information required for the general public to walk.

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The results of analyzing Tactual Maps for Supporting Walking of the Visually Impaired and GPS Navigation Seminar Data of Japan showed that roads, intersections as well as whether they are in contact with the railway is indicated in pedestrian route maps

In Korea, on the other hand, it can be seen that the cross information about the railroad is not inputted into the node attribute information as the database (Figure 1). Therefore, it is necessary to additionally build and input the rail cross information in the node attribute code.

Figure 1. Railroad Crossing Information

The left figure in Figure 2 shows the node-link for the pedestrian route guidance piloted in Korea. In the figure, the circled part represents the curve section and the short road section and it can be seen that there is no separate node configuration in domestic data. As shown in the right figure of Figure 2, however, the paper of Kammoun et al. (2010) separately configures the nodes in order to guide the visually impaired in the vicinity of intersections, curved sections, and short roads etc.

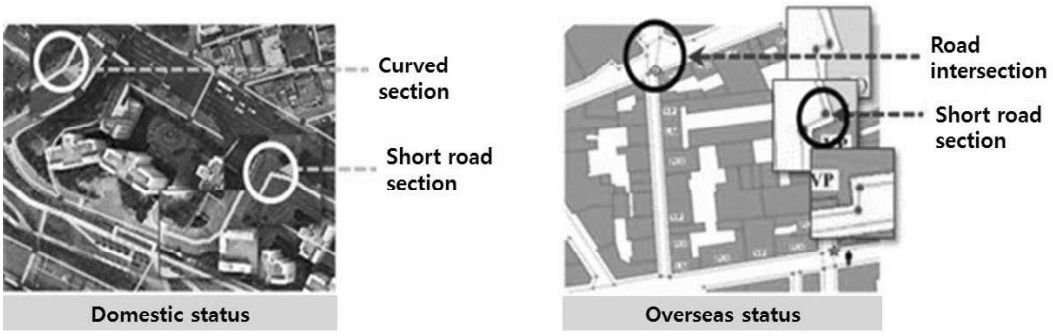

Figure 2. Walking Section Requiring Node Configuration

The European HaptiMap project has established a road network for people with disabilities to improve the accessibility of pedestrian. Figure 3 shows a part of the data model for the road network construction for the disabled of the HaptiMap Project.

It can be seen that the figure includes Tactile Paving, Pavement, and Foot And Cyclingway in the FootPath. Therefore, it is necessary to build and input Tactile Paving, Pavement, and Foot And Cyclingway in the attribute information for guiding pedestrian routes for the blind in Korea.

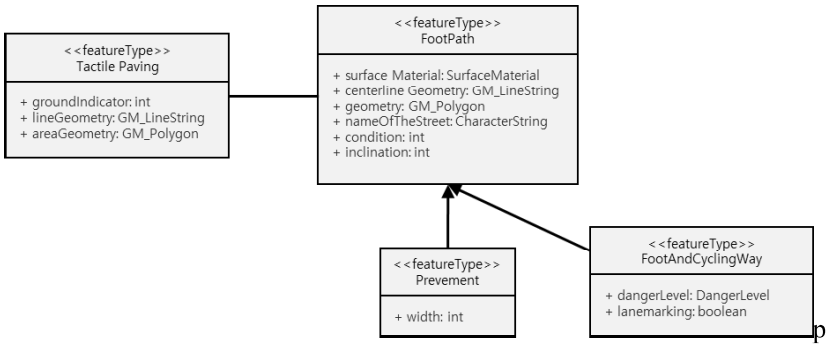

Figure 3. Part of HaptiMap DataModel

The HaptiMap Project developed a network data model for the disabled based on the international standards. The data model shown in Figure 4 consists of sub-objects for building a walking network based on accessibility. The sub-objects of pedestrian accessibility consist only of general walking related objects.

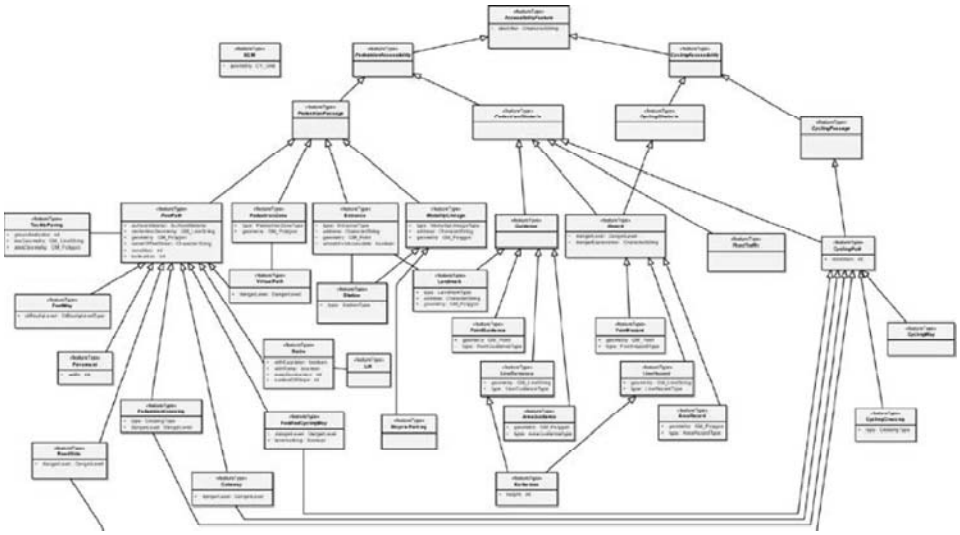

Figure 4. HaptiMap DataModel

Figure 5 shows the NGII's the data model for the navigation service of for the disabled made by using wheelchair-related objects of the Haptimap data model of Figure 4. As can be seen in Figure 5, it can be seen that objects for facilities for the disabled such as wheelchair only lane and wheelchair storage are added compared to Figure 4.

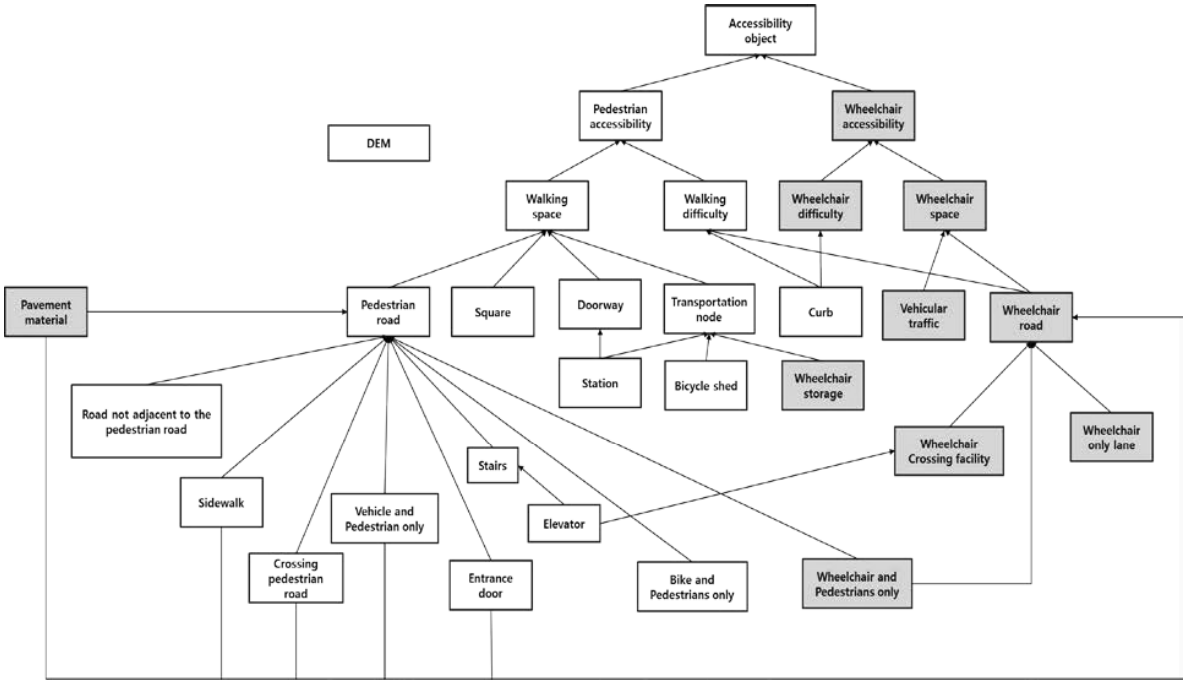

Figure 5. Data Models for the Handicapped Navigation Services by NGII

3. Data model for guiding a route for the visually impaired people

Hearing-impaired persons can walk the same way as ordinary people in terms of walking, whereas unlike ordinary people, the visually impaired should get someone's help or use aids to replace sight while walking for walking directions. In addition, visually impaired people do not need to consider the part for wheelchair because they have no trouble walking except for visual limitation.

To propose a data model for guiding a route for the visually impaired, this study referred to geographic features for making navigation road network maps for route guidance, Japanese tactual maps for the visually impaired, and the European Haptic data model etc. In this study, we proposed a data model for road guidance as shown in Figure 6 by considering the pedestrian characteristics of visually impaired people. The route guidance data model for the visually impaired was divided into two parts based on pedestrian accessibility: walking space and additional walking information. The walking space is composed of direct elements such as sidewalk, doorway, and landmark related to walking, and additional walking information consists of guidance for the visually impaired and risk element.

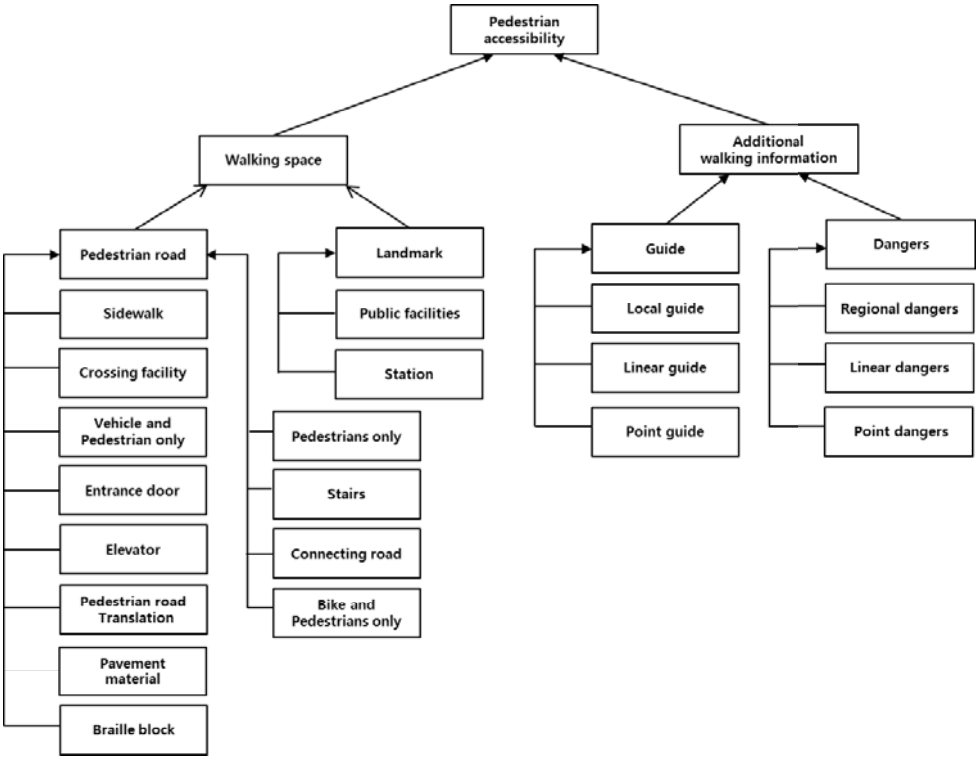

Figure 6. Data Model for Visually Impaired People

5. Conclusion

This study proposed a network data model that can be used for the effective walking of the visually impaired.

Through this study, it was found that it is necessary to create nodes even in short intervals unlike the existing node-link structure to guide the visually impaired unlike ordinary people and consider geographic features such as Tactile Paving, Pavement, and Foot And Cyclingway etc. In addition, the data model consisted of walking space with direct elements related to walking based on walking accessibility and additional walking information containing additional information for walking such as walking guidance, walking hazard information by considering international standards

We hope that this will help to develop navigation for the blind who are transportation vulnerable.

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Questionnaire Survey for the future of foreign language education in Japan

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ABSTRACT: In this paper the first author decided to study about the problems in Japanese foreign language education which she found during language training program in USA. Authors focus on especially the stage of primary education that is first author's major. In this research, we carried out research by literature and questionnaire for Japanese, foreigners who do not have English as their mother tongue. From the result of comparison, it's clear what lack of foreign language education in Japan. First one is an early stage of foreign language education, and the other one is establishing the standards for foreign language education.

1. INTRODUCTION

The first author was a sophomore, she went to United States of America for joining program of language training. Then she got some hints that decide this final report's title. The place where she chose to learn English is University of Montana, and she had studied for about a month. In the program, I belonged to 4C class that is composed Japanese, Chinese, Korea, Taiwanese, Brazilian and Saudi Arabian.

One day she talked with my friend who is from Saudi Arabia in a brake time. Then he said that he started to study English only one year ago. She was very surprised because he spoke English actively. After they chatted, she was very interested in his words, and decided to study about education of foreign language. In Japan student usually have started to learn English since junior high school, so if they were 20 years old, student had studied English for 8years. They had a lot of time to learn study, but they often hesitate and cannot speak English well.

The first author found another interesting things in her English learning program. In English class, many students spoke English positively like her friend from Saudi Arabia. They were composed by many nations, and then they felt that generally weak point to learn English different from each other. From this point, she guessed that foreign language education makes difference their strong and weak

point to learn English of each country. Through this my experience, she also noticed some problems of foreign language education such as Japanese's communication skills in English. In this reason, she decided her final report titled "Questionnaire Survey for the outlook for the future of foreign language education in Japan".

To proceed this study, we need to understand that how current foreign language educations are carried out first. Using the clue "Course of Study (Gakushu-shidoan)" which is stipulated by the Enforcement Regulations of School Education Law is to promote uniform education at elementary schools around Japan.

Or the future's teacher and English class, we have to consider how to promote fulfilling foreign language education in a limited time. The differences in consciousness of learning English between Japanese and foreigners (without people who speak English as their mother tongue) are conducted in the study.

2. RESEARCH METHOD

2.1 RECOGNITION OF TASKS

In this research, there are three tasks mainly.

First is the recognition of tasks for foreign language education. According to the Ministry of education of Japan, it is clear that how images do teachers and parents have about foreign language education and what is the issue do they think.

Next is the teaching skills of teachers. According to the Ministry of education of Japan, the most part of task in foreign language education is the teaching skills of teachers. In Japan, foreign language have been taught for only 6 grade in elementary school. It is depend on each school that how many times they treat foreign language per week. Every school must treat foreign language in 45 minutes per week; for 5 and 6 grade students. Although foreign language education was introduced, there are not many teachers in the field. And also, all teachers are worried about how to teach them well.

Lastly, it is the task of children. According to the Ministry of education of Japan, even though children are becoming familiar with voice of languages and actively do good communication, there are still a problem with the attitude of actively seeking communication from the answer of children.

2.2 PREPARATION FOR RESEARCH

Japan started foreign language education in elementary school was very late compared with other countries. There are many clues how to teach in this reason. Comparing with other countries about foreign language education have merits for thinking about the future way of foreign language education of Japan. In this paper we propose issues that comparing foreign language education as

one of considering effective learning for reinforcing and extending to the Japanese weak point of foreign language.

Through this research, we tried to use questionnaire seat to pursue these questions,

・What is the weak point to learn English as a foreign language for Japanese?

・When and what kinds of difficulties to learn English for Japanese?

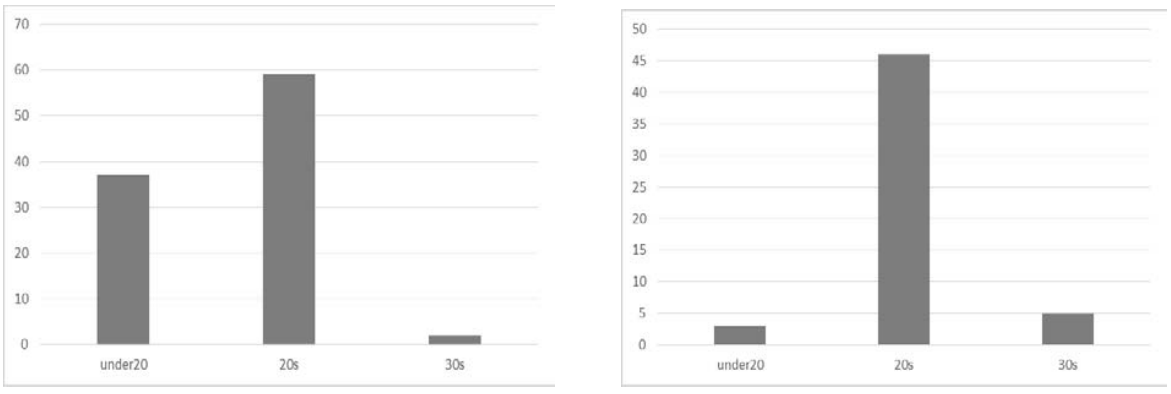
・What do you think about the effective learning English to improve Japanese ability as a foreign language education?

We Japanese have more difficulties "speaking" and "writing" than "listening" and "reading". And they have a stumbling of English learning as a foreign language. It may be difference between grammar and pronunciation of Japanese and English. English has many and rich pronunciations rather than Japanese. English has more than 10 vowels compare to Japanese which has only 5 vowels. And the other differences between English and Japanese is the position of verb in grammar. Foreigners such as German or Chinese whose grammar is similar to English. They do not have difficulties about learning English as a foreign language.

3. RESULTS

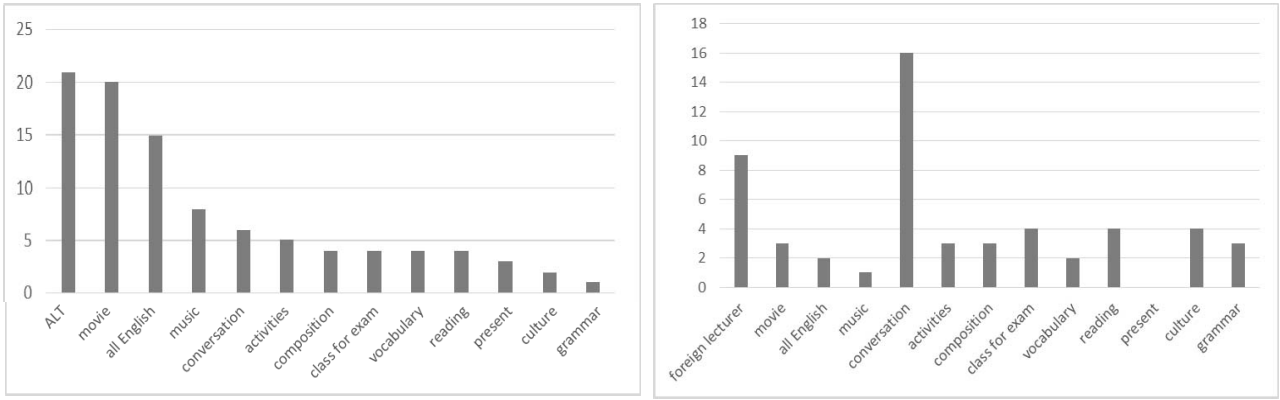
A total of 155 people (99 Japanese and 56 foreigners) answered to the questionnaire about learning English. The result is as follows.

Questionnaire about English (left:Japanese right:Foreigner)



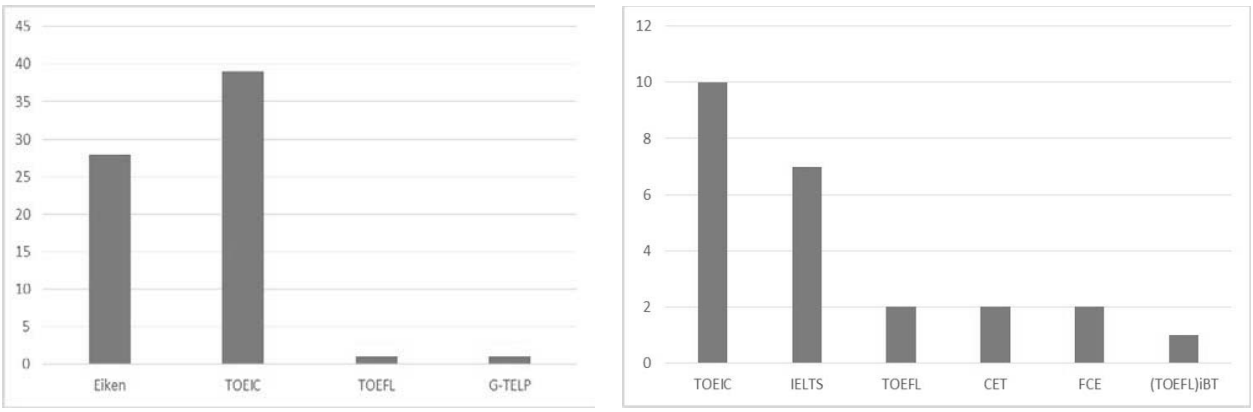
(a) Japanese (b) Foreigner

Figure1. Age



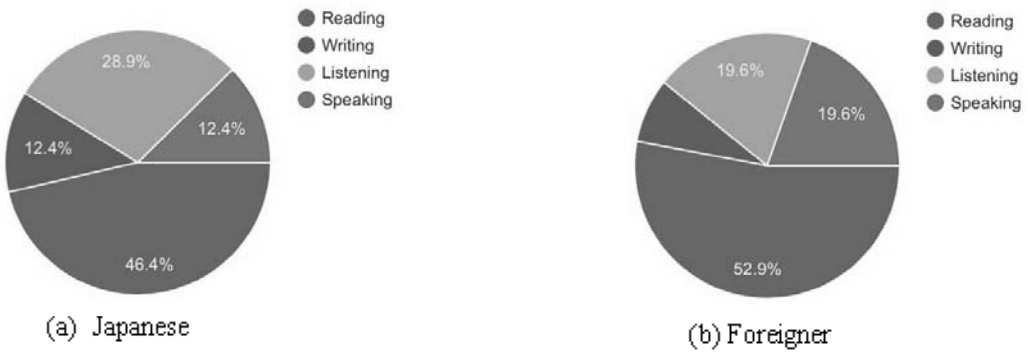
(a) Japanese (b) Foreigner

Figure2. Most impressive English class



(a) Japanese (b) Foreigner

Figure3. Do you have any scores about English exam?



(a) Japanese (b) Foreigner

Figure4. Strong Point

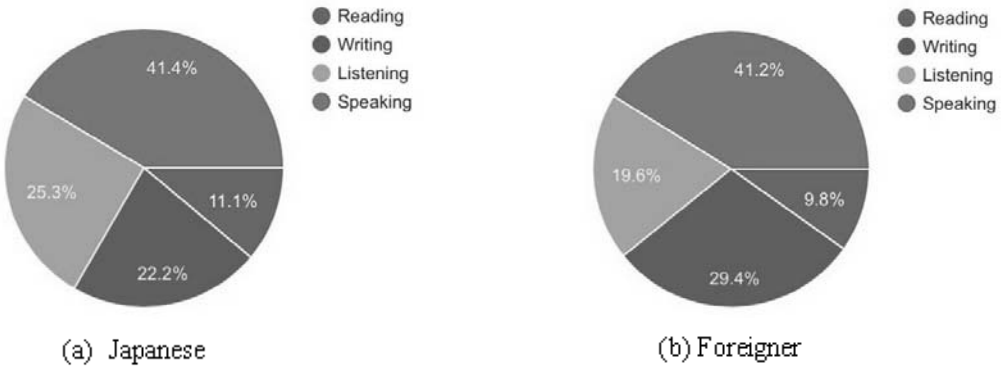


Figure5. Weak point

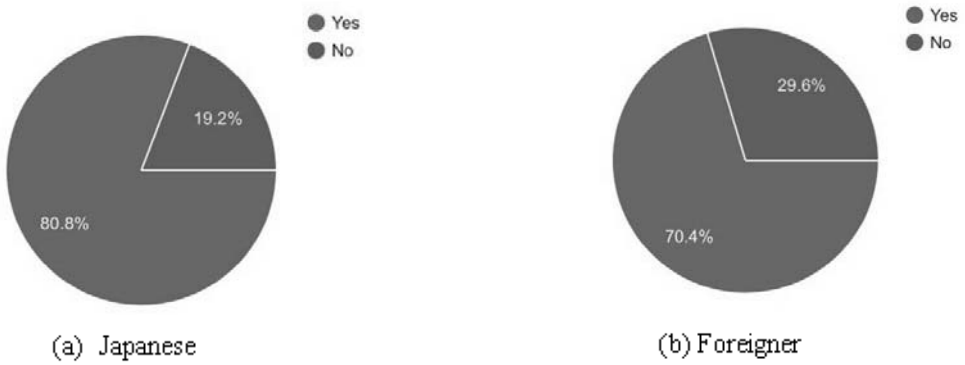


Figure6. Have you ever found it difficult to learn English?

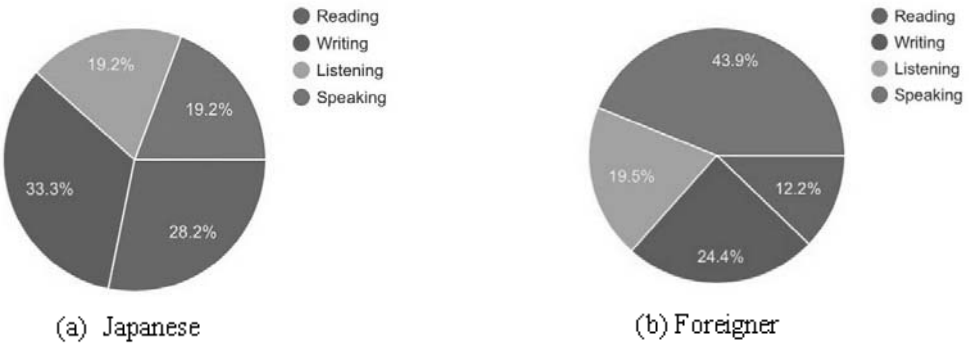
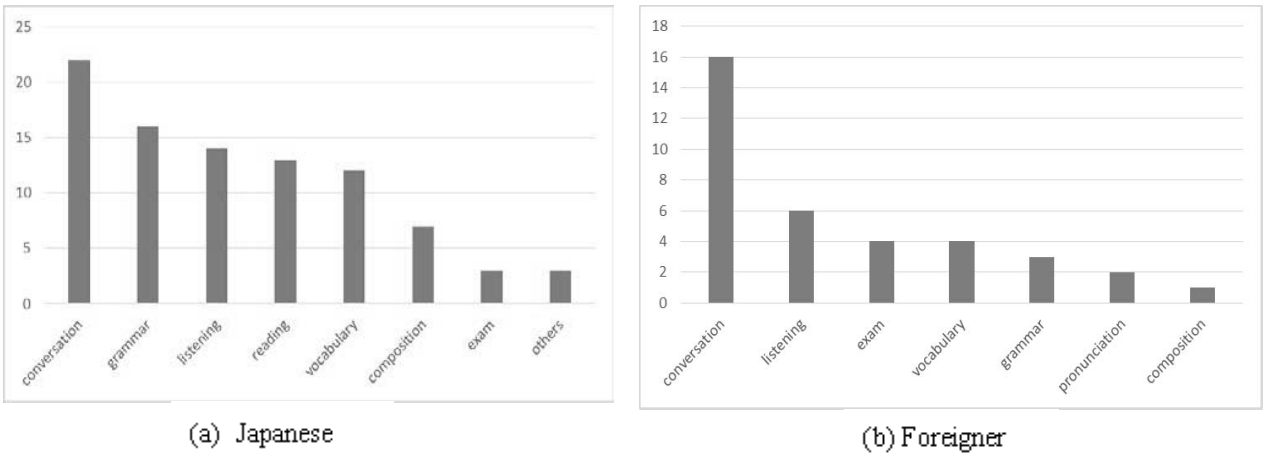


Figure7. The most difficult to learn English



(a) Japanese (b) Foreigner

Figure8. Explanation concretely about Figure7

4. CONSIDERATION

Based on the results and figures in previous chapter, it seems that other countries and Japan have their own characteristics of foreign language education. And also it is clear that each country's weak and strong skills in learning English are compared with Japanese. Many countries started to learn English as a foreign language earlier than Japan. We think that this point may be appealed in the difference between strong and weak points of "speaking" and "listening". It is good about that early acquiring of foreign language will have a positive effect on two skills "speaking" and "listening". Furthermore, foreign language education in Japan has traditionally focused on memorizing grammar and words for examination rather than emphasis on communication. It was also difficult for foreign language to lack of practical skills against "speaking" and "listening" in Japan.

5. CONCLUSION

In this research, we think about the outlook for the future of foreign language education in Japan. From now on, there will be movements to the foreign language activities such as curricularization etc in Japan. Including them, we should make have several viewpoints in order to further enhance foreign language education in Japan.

According to the comparisons with other countries in Chapter4, we noticed differences between Japan and EU countries. EU countries are admired that there are many points to be referred to among other countries in foreign language education. There are solid standards to serve as a base in the evaluation and goal. It is not in Japan.

Unfortunately in Japan, there is no unified examination of foreign language education in elementary school. It is weak point to improve foreign language to suit for Japanese children. Based

on this discussion, it need to make it a chance to curriculing foreign language education at the primary education stage, and it is necessary to develop a movement to make uniform standards in Japan in order to carry out more comprehensive foreign language education.

In chapter 3, most of Japanese answered that activity with ALT is the most impressive thing in foreign language class. Most of Japanese have the impression with ALT that it was enjoyable and fulfilling. We have to think about improving English skill by researching about how to use ALT who is necessary and sufficient condition for foreign language effectively.

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Comparison of True Orthoimage Generated Using Photogrammetry and Computer Vision Techniques

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ABSTRACT: Due to the development of photogrammetry and computer vision technology, it is possible to efficiently generate true orthoimage used in 3D analysis and services. The purpose of this study is to compare the results and the process of creating true orthoimage in terms of photogrammetry and computer vision. In order to generate the results of the experiment, we used commercial software and made an evaluation after generating true orthoimage for the same target area and as a result, it was found that it is possible to efficiently generate true orthoimage in an area where there is relief caused by buildings when applying the computer vision technology compared to photogrammetry.

1. Introduction

Images taken from aerial photographs have inclines and relief due to the central projection. On the other hand, ortho-rectified images are used for various analyses in urban space because they have the same characteristics as maps. With regard to orthoimage production, highly precise DSM (Digital Surface Model) or DBM (Digital Building Model) is needed to generate true orthoimage with inclines and relief removed completely. Recently, true orthoimage can be efficiently generated as the method of acquiring high resolution image information and the processing technology are developed due to the development of aerial photogrammetry technology, computer vision technology, sensor technology, etc. Therefore, it is necessary to compare the results of generating true orthoimage by aerial photogrammetry and those of generating true orthoimage by the computer vision technique.

This study compared the results of true orthoimage images for two cases of images taken by an aerial photographing camera and UAV with a low cost camera that can be purchased easily by the general public.

2. Comparison of procedure between photogrammetry and computer vision techniques

The photogrammetry process is based on absolute trust in the interior and exterior orientation parameters of the aerial photographs taken. The software used in the photogrammetry process is most widely used, and it is possible to generate DSM and orthoimage based on the Hexagon ERDAS

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LPS software of the traditional photogrammetry process. Point cloud can be also extracted by using ATE, eATE, SGM modules of LPS software.

The computer vision process uses SIFT (Scale Invariant Feature Transform) technique and SfM (Structure from motion) technique to automatically match images and generate point cloud, DSM, and true orthoimage regardless of interior and exterior orientation (Aicardi et al, 2016).

The SfM is a technique for generating a three-dimensional point cloud by sequentially bundle adjusting the images matched by the SIFT and simultaneously restoring the positional relationship between an object and a camera.

Unlike the traditional aerial photogrammetry software, the software using the computer vision process is characterized by reconstructing the attitude of the camera at the time of shooting only with reference or without exterior orientation parameters and data processing also focuses on automation. A representative program for photogrammetry is Hexagon ERDAS LPS software, and computer vision software includes ContextCapture, Pix4Dmapper and PhotoScan etc. Table 1 compares the main features of computer vision software.

ContextCapture software not only can process the data of both aerial images and UAV images, but also create 3D model and point cloud. Therefore, the true orthoimage production of the images taken by a camera for digital aerial photogrammetry was performed using ContextCapture software and compared with the results of LPS, the photogrammetry software.

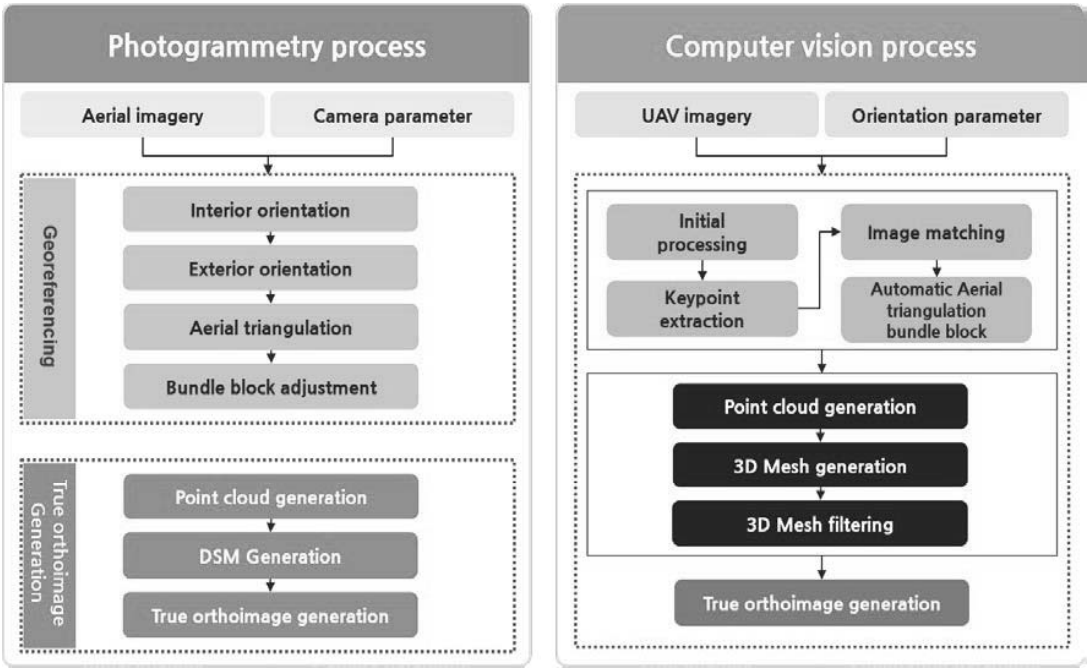
Table 1. Comparison of computer vision software

Item	ContextCapture	Pix4Dmapper	PhotoScan
Company	Bently	Pix4D	Agisoft
Use imagery	Aerial, UAV, Ground, Video etc.	UAV, Ground etc.	UAV, Ground etc.
Version	V4.2	V2.1	V1.2.5
Output	3D model, True ortho, DSM, Point Cloud	3D model, True ortho, DSM, Point Cloud	3D model, True ortho, DSM, Point Cloud
3D model Format	3ds Max, S3C, OSGB, OBJ, DAE, LOD tree, FBX, STL, KML, ESRI i3S, SpacEyes3D	OBJ, FBX, PLY, DXF	OBJ, 3DS, VRML, DAE, PLY, STL, FBX, DXF, KMZ
Pros and cons	Excellent of true orthoimage, 3D model, data compatibility, edit and modified	Normal of true orthoimage, 3D model Can modify Point cloud Can't process aerial imagery over 40MP	Normal of true orthoimage, 3D model Can't Edit/Modified Can't process aerial imagery

3. Comparison of true orthoimage generation process

The biggest difference in the true orthoimage generation process using photogrammetry and computer vision processes can be said to be the continuity of data processing. For ERDAS LPS, as shown in Figure 1 (a), aerial triangulation, point cloud generation using SGM, DSM generation, and true orthoimage generation are performed separately. On the other hand, ContextCapture focuses on automatic processing by minimizing manual work.

In addition, a big difference is that ERDAS LPS generates true orthoimage by removing relief displacement based on DSM whereas ContextCapture removes the relief displacement of images and produces true orthoimage by using 3D mesh data like a kind of DBM (Digital Building Model) as shown in figure 1(b).



(a) ERDAS LPS **(b) ContextCapture**

Figure 1. Photogrammetry and computer vision process(Bhandari et al, 2015)

4. True orthoimage generation

4.1 Research imagery

For the experiment of this study, we used images taken with DMC I which is a camera for digital aerial photogrammetry and UAV images taken with eBee. Table 2 shows spatial resolution, overlap, image size, and camera used for aerial photographs and UAV images.

Table 2. Camera information

Item	Aerial imagery	UAV imagery
Camera	DMC I	Sony WX220
Effective pixel	About 1 hundred million pixels (7,680×13,824)	About 18 million pixels (4,896×3,672)
Altitude	2,500m	130m
Overlap	Forward overlap/80% sidelap/60%	Forward overlap/80% sidelap/80%
Spatial resolution	25cm	4cm

4.2 True orthoimage generation using photogrammetry procedures

In ERDAS LPS using the photogrammetry process, the process of creating true orthoimage for DMC I images is divided into two stages.

The first step is geo-referencing, which performs aerial triangulation to determine the attitude and position of the camera with interior orientation parameters, exterior orientation parameters initial values, ground control points, and tie points of the camera as input data.

The second step is the step of producing true orthoimage. Point cloud is generated using SGM technique, and DSM is generated by interpolating generated point cloud. In this study, true orthoimage of 25cm which is the same as the spatial resolution of the original image was created by using DSM data of the GSD 1m.

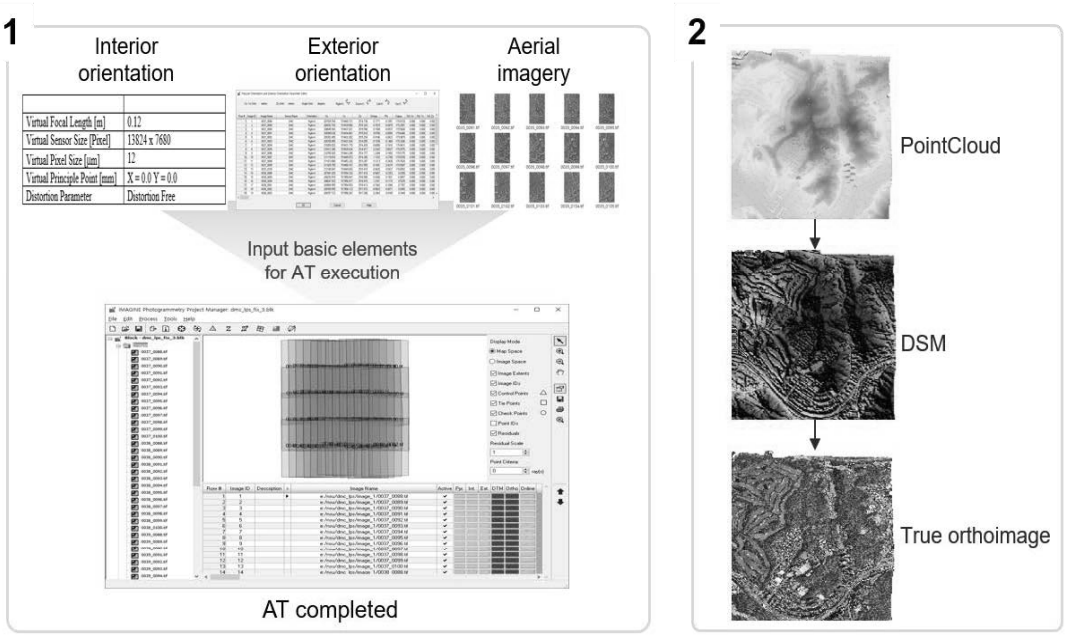


Figure 2. Photogrammetry process

4.3 True orthoimage generation using computer vision procedures

The computer vision process created true orthoimage of DMC I images by using ContextCapture software. The process of producing true orthoimage can be divided into two stages like photogrammetry.

The first step is the step of tracking the camera attitude using the input image and performing aerial triangulation. Since DMC I images know the camera's interior orientation parameters, we can perform aerial triangulation using several ground control points and feature points to determine the exterior orientation parameters of the camera.

The second step is the step of creating true orthoimage. Unlike photogrammetry, ContextCapture generates DSM based on 3D mesh, and spatial resolution of true orthoimage is 25cm, the same as original image.

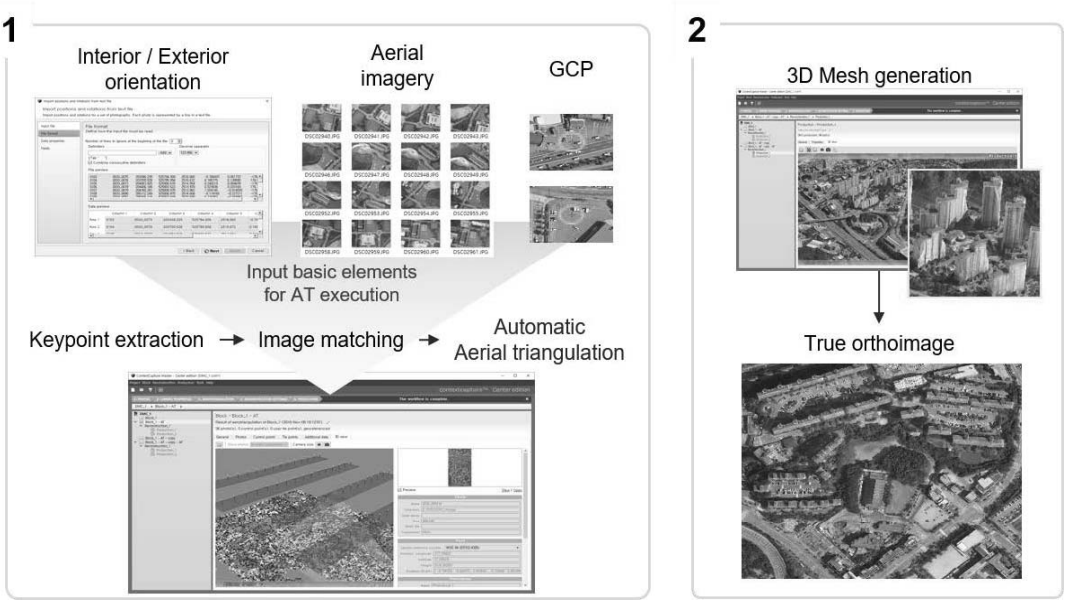


Figure 3. Computer vision process

5. Experimental results

5.1 True orthoimage results using photogrammetry and computer vision methods

For DMC I images, the photogrammetry process and the computer vision process used ERDAS LPS software and ContextCapture software, respectively. After producing true orthoimage by two production methods, we qualitatively compared the result with shape.

The left side of Figure 4 shows the result using the photogrammetry process ERDAS LPS software and the right side shows the result using the computer vision process ContextCapture. As can be seen in Figure 4, the results of using the photogrammetry process show that geometric distortion occurs in the bridges, while the results of using the computer vision process show little distortion.

DMC1(ERDAS + LPS) DMC1(ContextCapture)

Figure 4. Bridge region comparison

Figure 5 compared areas containing high-rise buildings where relief exists. The results of using the photogrammetry process on the left show the phenomenon that the relief displacement of the building is not removed and double mapping occurs, whereas the results of using the computer

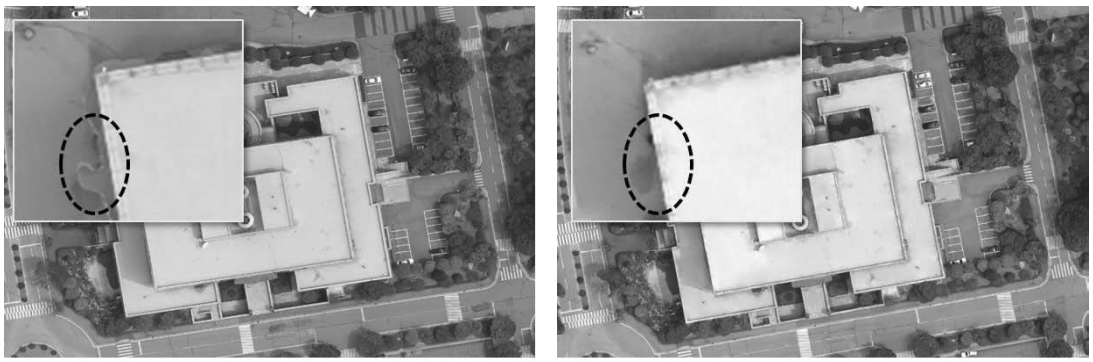
vision process on the right side show that the relief displacement of the building is relatively removed.

DMC1(ERDAS + LPS) DMC1(ContextCapture)

Figure 5. Building region comparison

5.2 True orthoimage results between ContextCapture and Pix4Dmapper

For UAV images, true orthoimage were created by using ContextCapture and Pix4Dmapper software using the computer vision process. The result of true orthoimage was analyzed qualitatively with a focus on the building part. As can be seen in Figure 6, Pix4Dmapper on the left has a small distortion in the edge of the building, while the ContextCapture on the right has the edge of the building treated well.



UAV(Pix4Dmapper) UAV(ContextCapture)

Figure 6. Comparison of building edges

6. Conclusion

This is a study of comparing the process of generating true orthoimage by photogrammetry and computer vision techniques and results. The following results were obtained through the experiment:

First, the photogrammetry method does not completely remove the relief displacement when generating true orthoimage in the region where the relief exists, while the computer vision method removes the relief displacement relatively. It was found that it is effective to perform data processing based on the 3D mesh in order to generate true orthoimage.

Second, the comparison of computer vision software showed that Pix4Dmapper produces distortions in the corners of buildings whereas ContextCapture does not cause distortion in the

corner of the building relatively, indicating ContextCapture software is effective when data processing is performed in a superposition with a 3D building.

Due to the limitations of the experiment, this study performed the qualitative analysis of true orthoimage and it is necessary to add quantitative evaluation using a digital map in future.

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Comparing Peace Education As Seen From Both Suffering and Aggressing Sides of Wars Involving Japan

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Abstract: In this study, comparing peace education as seen from both suffering and aggressing sides of wars involving Japan by a mind map, targeted for the schoolchild and the college student. I found out the merits and demerits of both suffering and aggressing sides of wars involving Japan and learner's idea changed before and behind the class.
Keyword: Both Suffering and Aggressing Sides of Wars Involving Japan

1. Introduction

1.1 Purpose of this study

A problem nowadays in Japan is that the merits and demerits of lectures on wars involving Japan, focusing on suffering and aggressing sides, are not clear. In particular, many students at school are taught very little about Japan as an 'aggressor' during times of war as peace education in Japan. This research has two objectives. The first is to compare peace education as seen from both the suffering and aggressing sides and to clarify the merits and demerits of it. The second is to find out whether students, who take lectures with a focus on both suffering and aggressing sides of Japan during war, show a change of mind after they have taken the lectures as compared to before they took the lectures.

In order to reach the objectives stated above, two lectures will be given to two different focus groups. One lecture will be focused on the atomic bombing from the suffering point of view, and the other lecture will be on the coal mines of Battleship Island from the aggressing point of view. And both lectures will be given to both a group of elementary school students and a group of university students. We believe that by drawing up a worksheet with the information from the mind maps from both before and after the lectures, the merits and demerits of lectures on wars involving Japan will become clear. Furthermore, I believe it will be possible to find out whether students, who take lectures with a focus on both the suffering as well as the aggressing sides of Japan during war, show changes of mind by comparing the mind maps from before and after the lectures.

2. Syllabus planning

2.1 Japan on The Suffering Side of War

The 'suffering of Japan during war' will be depicted by focusing on the damage inflicted by the atomic bombing of Nagasaki and Hiroshima as setting for the lecture. The reason why we put the focus on the 'atomic bomb,' while there are many other examples of war inflicted suffering of Japan, is that this subject will be grasped easily by the children.

2.2 Japan on The Aggressing Side of War

The 'aggressing of Japan during war' will be depicted by focusing on the foreigners who were forced to work in the coal mines of Battleship Island at the time as setting for the lecture. The reason why we put the focus on the 'foreigners who were forced to work in the coal mines of Battleship Island,' while there are many other examples of Japan as an aggressor during times of war, is because the children being Japanese might feel that they are somehow related to the aggressing of Japan at the time.

3. Research Method

3.1 Main Method

In this research, lectures will be given to elementary school students and university students, focusing both on the 'atomic bomb' with 'Japan on the suffering side of war,' and focusing on the 'foreigners who were forced to work in the coal mines of Battleship Island' with 'Japan on the aggressing side of war.' We will attempt to reach the objectives of this research drawing up a worksheet with the information from the mind maps from both before and after the lectures.

Before the lectures, a worksheet (worksheet 1) is handed out on which they have to draw up a mind map of things that come to mind when thinking of the words "peace," "war" and "that which is important to you." After the lectures have ended, another worksheet (worksheet 2) will be handed out on which they once more have to draw up a mind map for the words "peace" and "war." The mind map for "that which is important to you" is however only used before the lectures as a form of introduction and will therefore not be handed out again after the lectures have ended.

Furthermore, on worksheet 2 at the very end, a picture of the 44th President of the United States of America, Barack Obama is seen hugging a victim of the atomic bomb, when he visited Hiroshima on 27 May, 2016. The students are then presented with a horizontal line on which four options are given and they have to indicate which point on horizontal line is the closest to how they feel about President Obama's visit to Hiroshima, by drawing a circle at that point(see figure1). The four options from left to right read: 1, I think it is only natural that he came; 2, I am simply glad he came; 3, I did not really mind either way: and 4, I did not want him to come. After this, they will have to express the reason for why they feel that way by writing it down on the worksheet.

① I think it is only natural that he came

② I am simply glad he came

③ I did not really mind either way

④ I did not want him to come

Figure1. Worksheet No2. Format

The following is a more detailed description of the days on which the lectures were given, the target groups, total number of participants and which of the two types of lectures were given respectively (either on Japan on the suffering side or on Japan on the aggressing side of war).

- Friday, 24 June → N Elementary School, 4th to 6th graders (146 students): lecture on Japan on the suffering side of war.
- Friday, 24 June → Nagasaki University students who take part in the module "Aiming For A World Without Nuclear Weapons" (50 students): lecture on Japan on the suffering side of war.
- Tuesday, 28 June → T Elementary School, 5th and 6th graders (231 students): lecture on Japan on the aggressing side of war.
- Friday, 1 July →Nagasaki University students who take part in the module "Aiming For A World Without Nuclear Weapons" (50 students): lecture on Japan on the aggressing side of war.

4. Investigation Results

4.1 Comparison Before and After The Lectures

After comparing the worksheets 1 and 2 from both the elementary students and university students before and after the lectures, it became clear that there was a rise in the amount of students who "came to understand the misery of war and that it should never happen again, while at the same time feeling gratitude for the way in which they can live their current daily lives," after having attended the lecture on Japan on the suffering side of war. Also, it became clear that there was a rise in the amount of students who "came to understand that war causes many victims and felt that being able to live together with the people around you in freedom is true peace," after having attended the lecture on Japan on the aggressing side of war.

From this results, the peace education with 'Japan as suffering from war' as subject has merit that the feeling among the students that a war should never happen again becomes stronger. And they become more aware of and thankful for their friends, family and lives in general, and that within them a 'heart that will treasure peace' is born. The demerits of this kind of education, however, is that many felt a sense of fright and started feeling sad.

Furthermore, the peace education with 'Japan as aggressor in war' as subject has merit that the students start to understand that Japan has also caused a lot of victims during times of war, instead of thinking that Japan only was a victim of war.

4.2 Changes Thinking Before and After The Lectures

In order to find out whether there were any differences in the students' way of thinking or changes in the their 'mental state' from before and after the lectures, the mind maps from before and after the lectures were compared. Two ways of comparing were used. The first is to compare the different amount of words in the mind maps when thinking of 'peace' and 'war'. And the second is to compare the changes in the words used in the mind maps.

The following figure 2, show the results of the comparisons mentioned above. "Elementary" refers to elementary school students and "University" refers to university students. "Peace" and "war" indicate the mind maps is being referred to. When there is an increase, it is indicated with "increase," when there is no change it is indicated with "same" and when there is a decline it is indicated with "decrease."

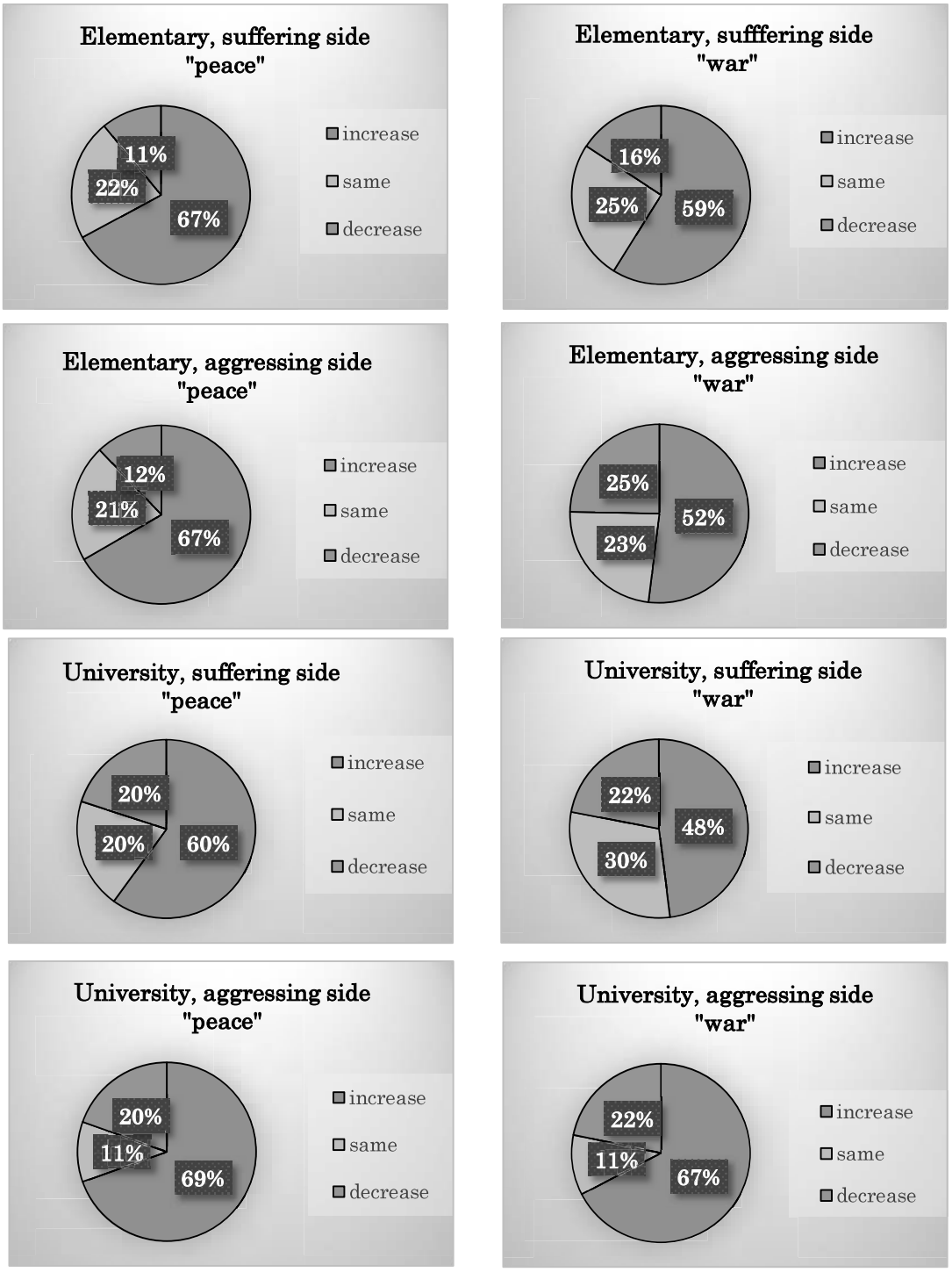

Figure2. Result before and after the lectures

When looking at these results, focused on the word 'war' after the lecture on 'Japan as suffering from war' by University Students, the overall trend is increased the images that came to mind when thinking of 'peace' and 'war,' as expressed on the mind maps.

However, there cannot be seen much change in the amount of different words used by elementary school students after both types of lectures.

There can also not be seen much change in the amount of words that were used by university students in the mind maps that focused on 'peace,' after both the lectures on 'Japan on the suffering side' and 'Japan on the aggressing side' of war. However, when it comes to the images on 'war,' there is a higher percentage of words used after the lecture on 'Japan as aggressor.'

Next, a comparison will follow between the changes in the different words used in the mind maps. Figure3 compares these changes in the different words used in the mind maps focused on 'peace' and 'war' before and after the lectures. For instance, the titled in figure3 "ELEMENTARY, SUFFERING SIDE, PEACE," it indicates that the target group was 'elementary students, who drew a mind map focused on peace, after a lecture on Japan as suffering from war.' Characters "a" to "e" has meaning as to follow.

- Students showing big changes are indicated with "a"
- If the students' words are different, but the meaning of them clearly do not change, it is indicated with "b"
- If students show no changes at all, it is indicated with "c"
- If a new word is added after a lecture, it is indicated with "d"
- If a word is removed after a lecture, it is indicated with "e"

When looking at these results in figure3, overall "a," "d" and "e" make up about 75% of each chart. In the charts depicting "elementary suffering side" and "elementary aggressing side," there are more changes in the students' when they were lectured on 'Japan on the aggressing side.' This result indicates that there are especially a lot of children with changes of mind after these specific lectures as compared to before these lectures. Also in the charts depicting university students can be seen that there are more changes in their way of thinking after lectures on 'Japan on the aggressing side.' Moreover, when comparing the elementary school students and the university students with each other, it becomes clear that there are more university students with a changed mindset after the lectures than elementary school students.

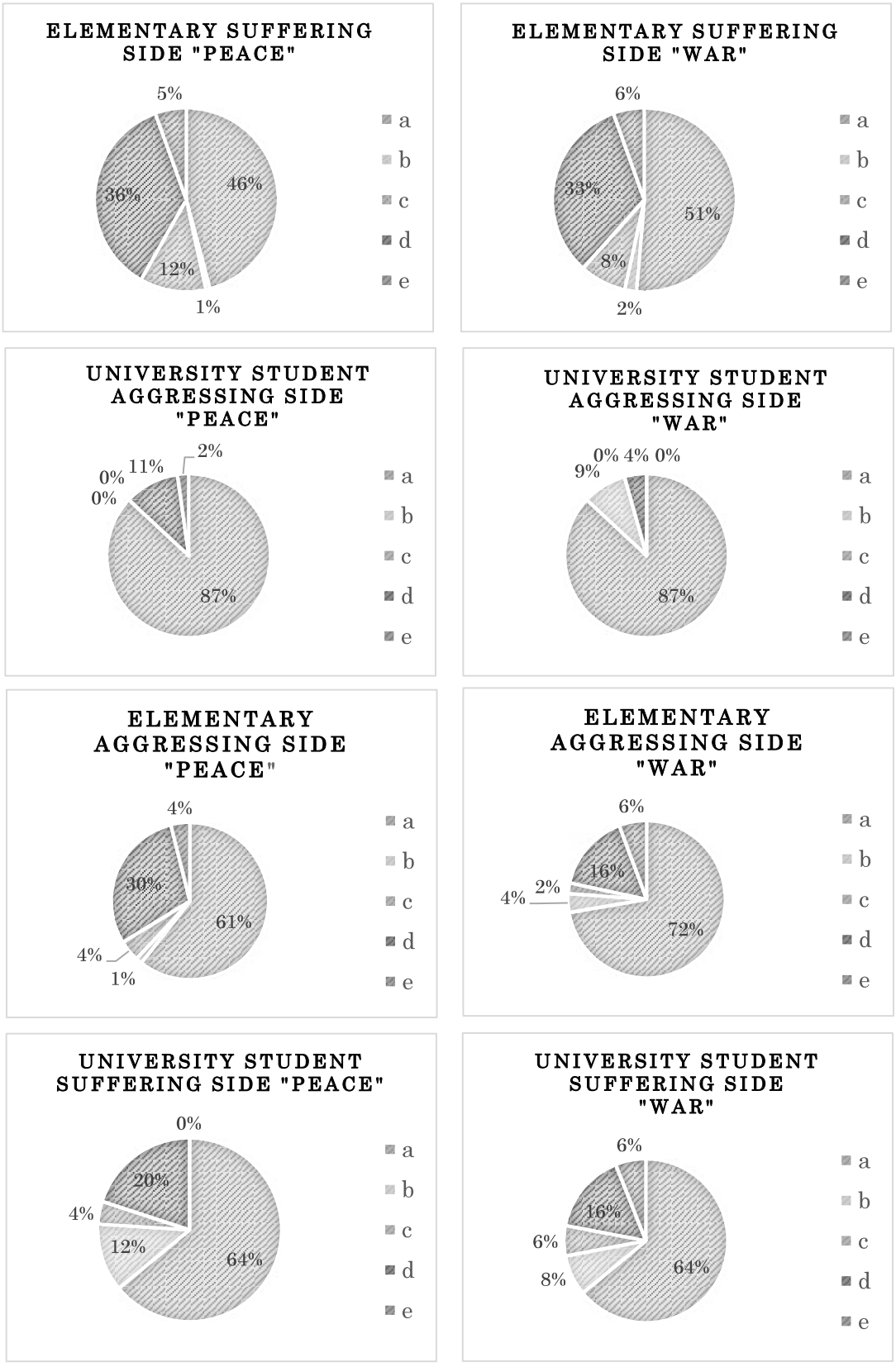

Figure3. Result before and after the lectures

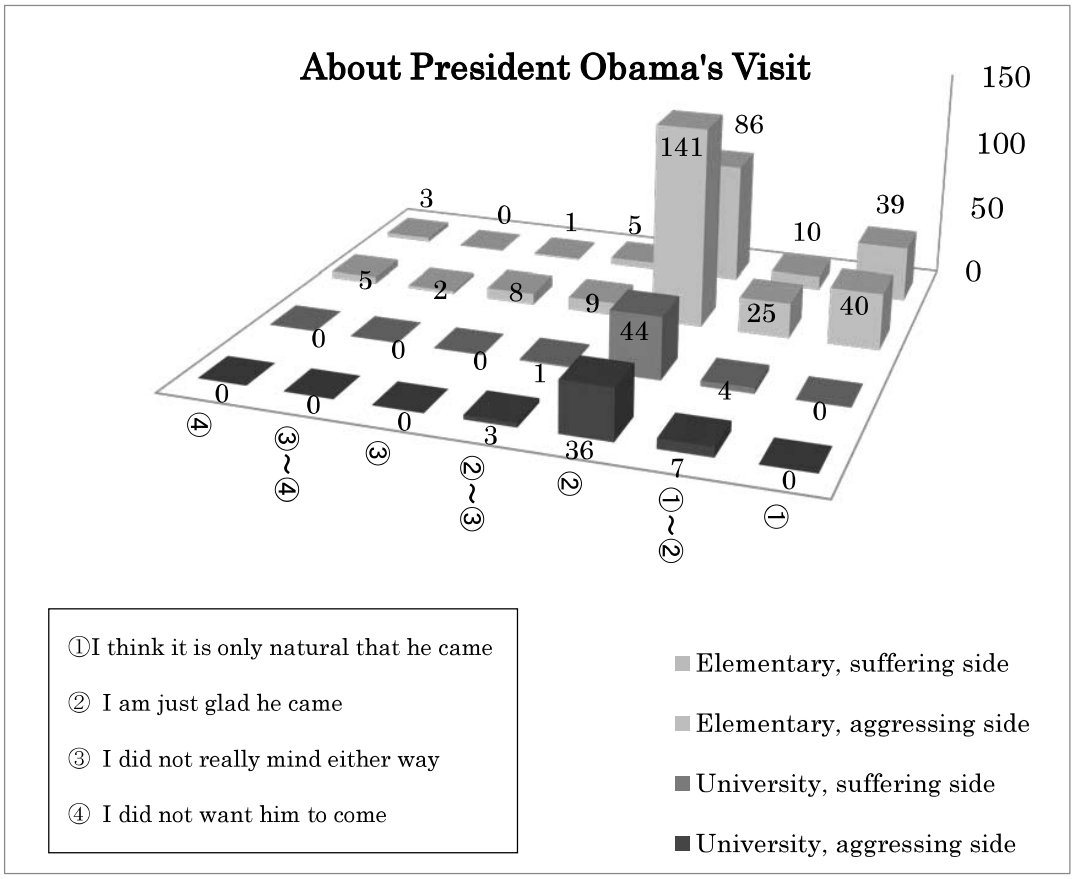

Figure4. Results of the Questionnaire sheets

When looking at this graph, it becomes clear that among all four target groups, the majority of all the students answered "I am just glad he came," which indicates that his visiting Hiroshima has left a favorable impression. The reason why students gave this answer varied greatly, from those who said that "The U.S. has done Japan a lot of wrong and even went as far as to use an atomic bomb, so I cannot exactly say it is only natural, but if President Obama would not have come it might have been even more unpleasant" whilst thinking of the victims of the atomic bomb, to those who said that "The U.S. was the one who dropped the bomb, so if they were to come, they will be able to learn just how much damage they have done."

From these results, we can be found that the elementary school students gave various opinions ranging widely between option 1 and 4, while the university students were more inclined to keep their opinions between the small range of 1 and 2.

5. Conclusion

There are two outcomes to this research. The first is that the merits and demerits of peace education, looked at from both the suffering and the aggressing sides, have been clarified. The second is that it has been established that students, who have been lectured on ‘Japan as suffering from war’ and ‘Japan as aggressor in war,’ respectively had changes of mentality.

Up until today, there has never really been any peace education focusing on ‘Japan as aggressing during times of war.’ Because of that, there has also never really been done any comparing of two types of peace education. Through this research, by targeting elementary school students and university students by lecturing them on those both types of peace education, and by letting them draw up mind maps, it has become clear how the students think and how these thoughts change. It can be said that this will be of great use for the peace education from today onward.

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Electrochemical Determination of Naproxen Using Poly (L-Serine) Modified Glassy Carbon Electrode

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ABSTRACT: In this study, a polymerized film of L-serine-modified glassy carbon electrode was synthesized using the electropolymerization method with cyclic voltammetry for the electrochemical determination of naproxen (NAP). The voltammetric behavior of NAP exhibited excellent electrocatalytic activity toward the oxidation-reduction of NAP on the modified electrode. Using linear sweep voltammetry the calibration curves of NAP was obtained in the range of 4.3×10^{-6}–6.5×10^{-5} mol L^{-1}. The effect of scan rate on the electrode process was investigated. High sensitivity and reproducibility together with ease of preparation and regeneration of the electrode surface make the electrode suitable for the determination of NAP in real samples.

Keywords: Naproxen (NAP); Serine; Glassy carbon electrode; Cyclic voltammetry

1. INTRODUCTION

Pharmaceuticals and personal care products (PPCPs) have recently been detected in sewage effluents and surface water, suggesting that their possible environmental impact is an emerging environmental issue [1]. Naproxen (NAP) is a non-steroidal anti-inflammatory drug (NSAID) for pain relief and the treatment of fever, inflammation and different health problems [2]. The current estimated annual consumption of NAP in Taiwan is approximately 3.2 tons [3]. Due to the huge amounts of PPCPs are consumed, the substances and/or their metabolites are found in the environment due to the emissions during manufacturing, improper disposal of unused medicines, excretion from humans and animals [4]. Due to their low and non-biodegradability, the concentrations of NAP in wastewater treatment plant (WWTP) effluents are reported to range from 25 ng L^{-1} to 33.9 μg L^{-1} [5]. Therefore, they are often detected in the aquatic environment in different concentrations. In general, NAP and its intermediates have been detected in natural waters at concentrations form ng L^{-1} to μg L^{-1} [6]. Unfortunately, the observed of the occurrence of congenital mal-formations and cardiovascular diseases in children whose mothers during the first term of their pregnancies [7]. Moreover, many studies have referred to the toxicity of living organisms, showing the effects on the endocrine system of fish and bivalves [8]. Thus, the potential ecotoxic risks from the presence of untreated NAP in the aquatic environment. Therefore, efforts to develop new detection for NAP are very important. So far, different methods have been reported for the determination of NAP, such as high-performance liquid chromatography and liquid chromatography–mass spectrometry. Although these methods are accurate, they rely on multistep sample cleanup procedures and are therefore relatively expensive and time-consuming. Little

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attention has been paid to the determination of NAP using electrochemical techniques that may be simple, rapid and less expensive. It was reported that poly L-serine (PLS) film-modified electrodes may be used to decrease over potential, improve mass transfer, and enrich active substance during the electrochemical reactions of interest [8]. To the best of our knowledge, electrochemical determination of NAP using PLS film-modified electrodes has not yet been addressed, although such techniques are important for the sensitive and rapid analysis of NAP. In this study, a cyclic voltammetric (CV) approach was used to achieve the electropolymerization of L-serine on a glassy carbon electrode (GCE) surface and to prepare PLS film-modified GCE. CV analysis was performed to examine the electrode's characteristic and response. Linear sweep voltammetry (LSV) was used to obtain the linear concentration ranges and detection limits of NAP. The method developed in this study has great potential for practical use in the determination of NAP residues in real environmental media and pharmaceutical samples.

2. MATERIALS AND METHODS

Naproxen chemical was purchased from Sigma (USA) while L-serine was obtained from Alfa Aesar (UK). The stock solutions (2.2×10^{-4} mol L^{-1}) of NAP was prepared by dissolving into 0.1 M pH 5.0 phosphate buffer solutions (PBS), and then stored at 4^0C. The determination of the NAP was performed in a conventional three-electrode system based on CV and LSV analyses. The working electrode used here was a GCE (3 mm in diameter) modified with PLS film. A platinum wire and an Ag/AgCl electrode were used as the counter and the reference electrodes, respectively. A 6081D electrochemical workstation (CH Instruments Inc., USA) was used to record experimental data. The PLS film-modified GCE was prepared as follows. A GCE was polished to a mirror finished on polish pads with 0.05 μm alumina slurry, then rinsed with distilled water, and finally sonicated in distilled water to give a clean mirror surface.

3. RESULTS AND DISCUSSION

Figure 1(a) shows the electropolymerization of L-serine on GCE surface was carried out using CV sweeps between –0.6 and 2.0 V versus Ag/AgCl in a 0.1 mol L^{-1} PBS (pH 5.0) containing 1.0×10^{-2} mol L^{-1} L-serine. An oxidation peak is observed at 1.41 V versus Ag/AgCl in the anodic scan and a reduction peak appears at –0.27 V versus Ag/AgCl in the reverse reduction scan due to the formation of PLS. After 20 segments of CV sweeps, the oxidation and reduction peak current increase with the cyclic number of voltammetry scans increasing, indicating that an electroconductive polymer film has been formed on the electrode surface.

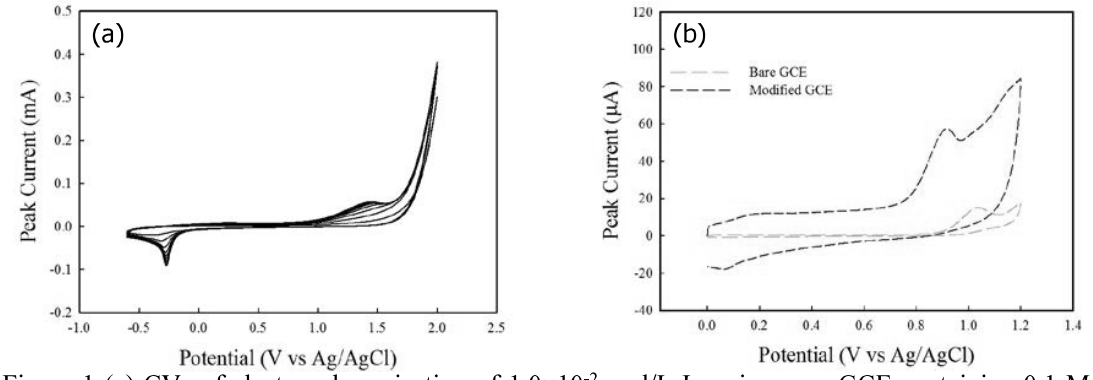

Figure 1 (a) CVs of electropolymerization of 1.0×10^{-2} mol/L L-serine on a GCE containing 0.1 M phosphate buffer solution (pH 5.0) as supporting electrolyte at a scan rate 50 mV/s at the surface of GCE; (b) CVs of 2.2×10^{-4} mol L^{-1} NAP on the PLS film-modified and bare GCEs for comparison.

The electrochemical behaviors of NAP on the bar GCE and PLS film-modified GCE were investigated using CV (Fig. 1(b)). The CVs of 2.2×10^{-4} mol L^{-1} NAP in 0.1 mol L^{-1} PBS (pH 5.0). On the bare, NAP produced an oxidation peak at the 1.03 V versus Ag/AgCl. When using the PLS film-modified GCE, the response was considerably improved in peak current and negative shift of peak potential for NAP oxidation, the shape of the peaks turn sharper and the peak current increased significantly. The peak current of NAP oxidation on the PLS film-modified GCE was much higher than that of the bare GCE, and the oxidation peak potentials also negatively shifted. This phenomenon is similar to that observed by [9] for electrochemical determination of estradiol using a PLS film-modified GCE. The reasons for promoting the oxidation of NAP can be explained as follows. The carbonyl groups of NAP formed hydrogen bonds with the hydroxyl and amino groups of PLS units. Such bonding increased the adsorption capacities of NAP on the surface of PLS film modified GCE and thus effectively improved their detection sensitivity.

To investigate the mechanism of electrochemical reactions of NAP, the effect of scan rate on the peak currents of NAP at the PLS film modified GCE was investigated by CV. Figure 2(a) and (b) shows the CV sweeps of 2.2×10^{-4} mol L^{-1} NAP on the bare GCE and PLS film-modified GCE at different scan rates. Redox peak currents increase linearly with the scan rate in the range 25–200 mV/s. Thus, the electrochemical reaction is rather an adsorption-controlled step than a diffusion-controlled process.

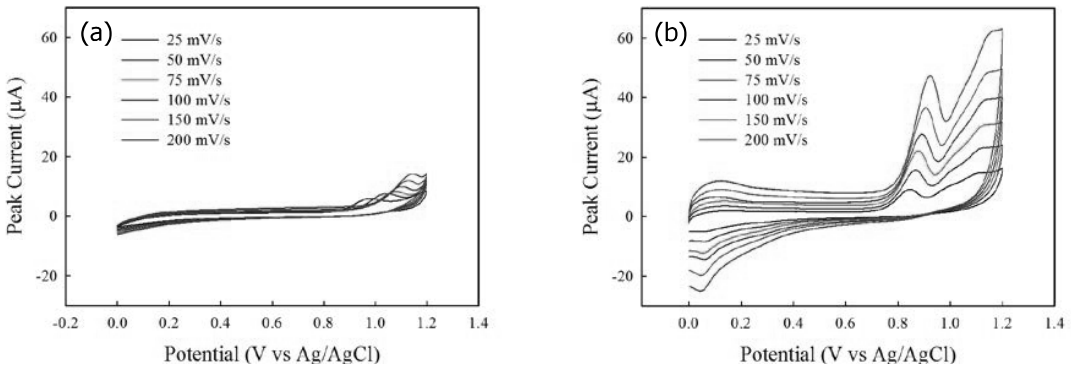

Figure 2 CVs with (A) bare GCE, (B) PLS film-modified GCE of 2.2×10^{-4} mol L^{-1} NAP with different scan rate in 0.1 M phosphate buffer (pH 5.0).

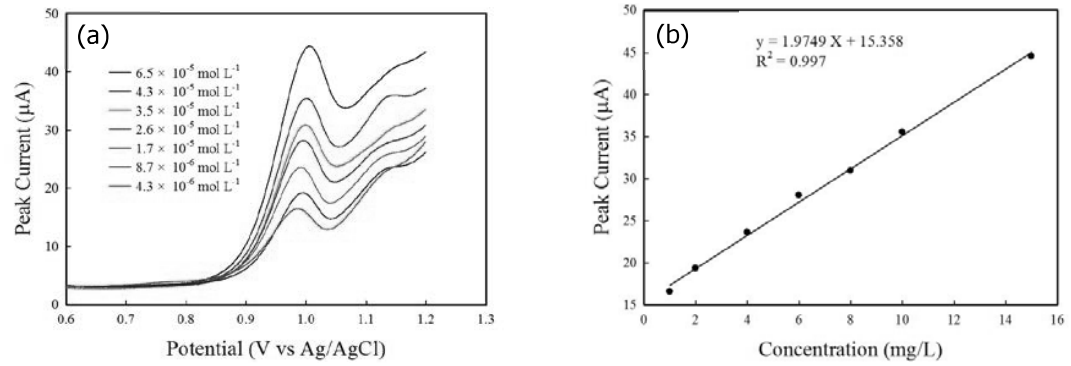

Figure 3 (a) LSVs (scan rate = 200 mV/s) of NAP with different concentrations in 0.1 M PBS (pH 5.0) on the PLS film modified GCE. NAP concentrations: 4.3×10^{-6}, 8.7×10^{-6}, 1.7×10^{-5}, 2.6×10^{-5}, 3.5×10^{-5}, 4.3×10^{-5}, and 6.5×10^{-5} mol L^{-1}; (b) Variation in peak current versus concentration.

The calibration was obtained scan rate 200 mV/s using LSV (Fig. 3(a)) The oxidation peak current of NAP was proportional to its concentration over the range from 4.3×10^{-6} to 6.5×10^{-5} mol L^{-1} (correlation coefficient R>0.998) (Fig. 3(b)). The result indicated that excellent accuracy and reproducibility for NAP detection.

4. CONCLUSION

Our findings indicate that the PLS-modified GCE electrode was fabricated using the electropolymerization by cyclic voltammetry for the electrochemical determination of NAP, and the electrochemical behaviors of NAP are studied on this modified electrode. The modified electrode exhibits high electrocatalytic activity under 200 mV/s of scan rate. This method could be used for determination of the content of NAP in real samples.

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Removal of Heavy Metal from Contaminated Harbor Sediment by Acid washing

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ABSTRACT: Batch sediment washing experiments were conducted to remove six metals (Cu, Zn, Ni, Cd, Cr, and Pb) from contaminated sediments. The effect of different operating parameters such as: type of washing solutions, reaction time, solution concentration, and liquid/solid ratio were investigated. In the proposed work acid washing solution i.e., HCl was applied for the leaching of heavy metals from contaminated sediment and showed significantly high efficiency compared to other acid. The removal efficiency was 81.8%, 90.1%, 45.0%, 100%, 43.0%, and 88.5% for Cu, Zn, Ni, Cd, Cr, and Pb, respectively, at a 0.5 M HCl washing solution, liquid/solid ratio of 15, and 30 minutes washing time. Moreover, the results indicated that the removal efficiency of metals directly proportional to the liquid/solid ratio and concentration of washing solution. The results will be useful as preliminary evaluation of the removal of heavy metals from the contaminated sediments using acid solution in washing operation.

Keywords: Heavy metal; Harbor Sediment; Acid washing

1. INTRODUCTION

There are concerns over the contamination of harbor sediments with metals and organic pollutants due to potential toxicological hazard. For instance, metals can bioaccumulate in food chains, induce high mortality rates, and disturbance of reproductive processes in marine organisms [1]. Conventional marine sediments remediation approaches such as in situ-capping, landfill disposal and dumping at sea are becoming unsustainable, due to problems associated with contaminant transport pathways and environmental compatibility. Hence, we need environmentally friendly approaches should be developed in order to remove pollutants from sediments. In Taiwan, soil/sediment washing is often considered as a promising remedial technique for heavy metals contaminated sites over a relatively short time period compared to other remedial techniques. Numerous studies have been investigated over the use of different types of washing solutions (e.g., inorganic acids, organic acids) for the remediation of soils/sediments contaminated by heavy metals. Hydrochloric acid and other inorganic acids are known to be effective in removal of heavy metals from soils/sediments [2].

The proposed work focused on three different acid washing solutions and their metal removal efficiency from contaminated harbor sediments. The optimization parameters were studied such as washing time, acid washing solution concentration, and liquid/solid (L/S) ratio. The effectiveness of the washing process was evaluated by measuring the residual metal concentrations after the washing process.

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2. MATERIALS AND METHODS

2.1 Contaminated sediment

The harbor sediment contaminated heavy metals was collected from Kaohsiung harbor, Taiwan. The contaminated sediments were air-dried at room temperature and sieved (< 1 mm) to remove stones and large particles, then thoroughly mixed to ensure uniformity and stored in a plastic box for analysis of physico-chemical characteristics and acid washing experiments. The characteristics of contaminated sediment was provided in Table 1.

Table 1 Characteristics of the contaminated harbor sediment.

Item	Clay (%)	Silt (%)	Sand (%)	OM (%)	Heavy metals (mg/kg)					
					Cu	Zn	Ni	Cd	Cr	Pb
Value	26.3	71.8	1.9	3.5	894	1356	62.2	17.0	231	131
Method	Coulter LS230			oxidation (dichromate)	NIEA M319.1C					

2.2 Acid washing of sediments

Solutions of HCl, HNO_3, and H_3PO_4 were used as washing agents. The acid washing process was performed with 2 g of dried sediment mixed with 5, 10, 15, 20, or 25 mL of washing solution in a 40 mL plastic bottle, and the mixture was then shaken in a horizontal shaker at 200 rpm at room temperature (25±2°C). At the end of each contact period, the slurries were centrifuged at 4500 rpm for 30 minutes then taking supernatant filtered through 0.45 μm membrane filters. The filtrate was then analyzed for metal content. The solid material was oven-dried at 45°C and thereafter subjected to the total metal digestion (incorporating HNO_3, HCl, HF, and H_2O_2) extraction procedure to estimate the metal removal efficiency. All the heavy metal analyses were performed using an atomic absorption spectrophotometer (AAS).

3. RESULTS AND DISCUSSION

Results of batch sediment washing experiments were showed in Fig. 1. As can be seen, the heavy metals removal efficiency showed quick increase in the first 30 minutes (Fig. 1a). This result was observed in previous studies [3]. It was noted that extending the reaction time from 30 to 300 minutes did not affect the removal efficiency significantly. The removal efficiency order was Cd > Pb > Zn > Cu > Ni > Cr. After 30 minutes contact time, the removal efficiency for Cd, Pb, Zn, Cu, Ni, and Cr was 100%, 90.3%, 84.0%, 75.1%, 38.7% and 36.9%, respectively. Among the heavy metals studied, Cd, Pb, Zn, and Cu exhibited high removal efficiency (75.0-100%) while Ni, and Cr had low removal efficiency (36.9-38.7%).

Liquid/solid ratio is an important parameter in soil washing: higher L/S indicates greater capacity of solubilization [4]. Fig. 1b shows the effect of liquid/solid ratio on metal removal efficiency. As can be seen, increasing the L/S ratio had a positive effect on the metals removal efficiency. The removal percentage increased steadily with increase in L/S ratio from 5 to 15. Further increase in the L/S ratio from 15 to 25 led to only a slight increase in the metal removal efficiency. Fig. 1c shows the effect of HCl concentration on metal removal efficiency. The removal percentage increased steadily with increase in concentration from 0.01 to 0.2 M. Further increase in the HCl concentration from 0.2 to 1.0 M led to only a slight increase in the metal removal efficiency except Cr. Fig. 1d shows the removal efficiency of different acid washing solution. The HCl showed the highest metal removal, with 81.8%, 90.1%, 45.0%, 100%, 43.0%, and 88.5% for Cu, Zn, Ni, Cd, Cr, and Pb,

respectively, followed by HNO_3, while much lower removal efficiency by Cu and Pb, was observed for H_3PO_4.

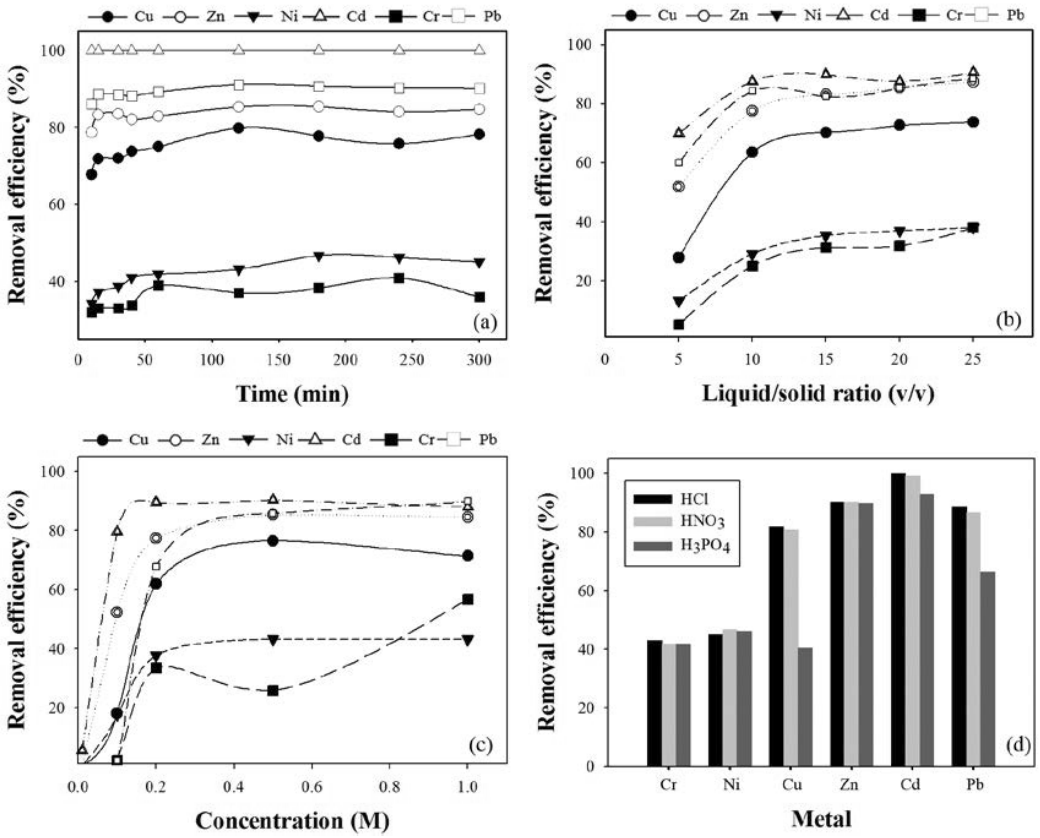

Figure 1 Results of sediment acid washing experiments (a) effect of washing time on metals removal with 0.5 M HCl (liquid/solid ratio: 10); (b) effect of liquid/solid ratio on metals removal with 0.5 M HCl (washing time: 30 minutes); (c) effect of concentration on metals removal with HCl (washing time: 30 minutes; liquid/solid ratio: 15); (d) effect of type solution on metals removal (concentration: 0.5 M; washing time: 30 minutes; liquid/solid ratio:15).

Based on the entire experiment, the optimized conditions was L/S = 15, washing time = 30 min with 0.5 M HCl. These results revealed that the residual concentration were Cu (163 mg/kg), Zn (134 mg/kg), Ni (34 mg/kg), Cd (<0.01 mg/kg), Cr (132 mg/kg), and Pb (15 mg/kg), respectively (Table 2). The observed results from the experiment were complied with the standard parameters of soil monitoring/control standard of Taiwan. Hence, the acid washing method shows good potential to be used for the removal of heavy metals from contaminated harbor sediments.

4. CONCLUSION

The optimization parameters were at 0.5 M HCl washing solution, liquid/solid ratio of 15, with washing time of 30 minutes. The optimal removal efficiencies of Cu, Zn, Ni, Cd, Cr and Pb were 81.8%, 90.1%, 45%, 100%, 43%, and 88.5%. The observed results from the experiment were complied with the standard parameters of soil monitoring/control standard of Taiwan.

Table 2 Heavy metals removal under the optimum operating conditions

Metal	Residual concentrations	Soil standard	
		Monitoring	Control
Cu (mg/kg)	163	220	400
Zn (mg/kg)	134	1000	2000
Ni (mg/kg)	34	130	200
Cd (mg/kg)	<0.01	10	20
Cr (mg/kg)	132	175	250
Pb (mg/kg)	15	1000	2000

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A Western Perspective on Racial Classification and Cultural Identity in Japan and Korea

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ABSTRACT: The author raises the question of race as a valid concept for biological or social classification and expands this point to inquire how Japanese and Korean societies determine who belongs as societal members. Marginality and ambiguity create separate criteria for determining who is Japanese or Korean.
Keywords: race; society; classification; Japanese; Korean

1. About the Author.

The author having lived extensively in Japan and Korea for over two decades as an expatriated American often questions his cultural identity as the attachment to his homeland has dissolved over the years. While striving for cultural acceptance in Japan and Korea the author has found that acceptance is exclusive to ethnic orientation and appearance over cultural knowledge or language skill. Caucasian colleagues of Western lineage who have taken on Japanese or Korean citizenship have also shared experiences on the lack of cultural acceptance and overall disbelief of citizenship based entirely on physical appearance. Western expatriates must carefully consider the political and social ramifications of naturalizing as a Korean or as a Japanese. Taking on citizenship is a serious matter especially since neither Japan nor Korea recognizes dual or multiple citizenship unless one is a minor. Renunciation of all former citizenship means that one must re-evaluate their personal identity and connection to their homeland. Likewise, one's "new" identity as a Japanese or Korean citizen is potentially a challenge for social acceptance since nationality in the social definition is determined predominantly by race. Although politically accepted as a citizen, a naturalized Westerner may never become fully accepted by society and be condemned to reside as a perpetual foreigner.

The author studied East Asian Cultural Anthropology at universities in Korea and Japan and majored in Asian Studies and Japanese at his alma mater in the United States. The author has also worked facilitating courses at universities and public schools in Japan and Korea further providing cultural perspective based on research, experience and observation.

2. Introduction: Questioning Race as a Valid Concept for Biological Classification.

Human beings, in all societies, try to impose order and classify the universe around them. In all languages, objects of the natural world are named. Everything, from the smallest plants and animals to every river and mountain all have names. However, the imposed order and classification of the natural universe is more than merely assigning names. Human beings also find it necessary to determine what things belong together based upon observed similarities of qualities between plants and animals. Having an object named and categorized in a certain group serves to establish the identity of that object. However, even those who are doing the classifying are part of the natural world being classified. Therefore, humans are also subject to classification (Klass, 1971). Humans use race as a classification method to establish identity. There are many variables to consider in the classification of humans and whether it is a valid concept. With the consideration of all the complexities and contradictions within classification systems such as cultural implications and historical and modern problems, one comes to the conclusion that human classification based upon race is, in fact, not a valid biological classification concept.

Races are defined by sociologists as being "groups of people characterized by shared inherited physical traits that distinguish them from other groups." (Rose, 1986). *Race*, in many ways is synonymous with the term *ethnicity*. Both terms are used to describe the awareness of differences among people. Ethnic groups are those within a larger society that retain distinctive cultural and social traits. Although every person is physically unique, gross similarities of skin color, hair texture and other traits often lead us to categorize people according to certain shared physical characteristics (Horton, 1976).

Modern classification of human beings is most often credited to the work of Carolus Linnaeus, who divided humans according to skin color, and reported that there were four divisions, or races: African, European, Asian, and American-Indian (Klass, 1971). However, Linnaeus classification for races was challenged by Johann Friedrich Blumenbach, who in 1775 proposed that humans should be divided into five races: Caucasian, Mongolian, Ethiopian, Malayan, and American. Nevertheless, even Blumenbach's theory for classification has proven unsatisfactory due to certain groups that don't "fit" into his divisions. To compensate for these problems, terms such as "Mongolian-like" are used to describe East Asian, Siberian, American-Indian or Polynesian people who are not classifiable according to Blumenbach's theory (Klass, 1971). In addition to these problems of racial classification, people who are of a "mixed race" also encounter social as well as scientific difficulties identifying themselves unambiguously. Therefore, race is an invalid biological concept because of the many *sub-race* variations.

In modern scientific studies, Blumenbach's theory of five race groups has been replaced by the theories of Lewontin. According to Lewontin, the actual levels of genetic variations between and within seven designated "races" are greater *within* these races than *between* them. His studies

indicate that race explains only about ten percent of human genetic diversity. This low number indicates that race is not an accurate description of human variation. Therefore, race is a product of human minds and not of nature, and "...race fails to describe variation accurately [because] much variation is continuous, whereas race is a discrete unit" (Relethford, 1996).

Other reasons that race is not valid as a biological classification concept is that race has cultural and social implications. Therefore, its classification presents many problems for interpretation. Human classification of race throughout history has often had undertones of nationalistic adventures. Race is often used for biological as well as social distinctions. Aristotle, a Greek philosopher, indicated with his essentialistic concept that all beings, including humans, must have their "perfect type" and he placed favoritism toward the Greeks as being the "perfect type." Linneous in the 1700's also classified human behavioral attributes with a heavy bias against groups other than Europeans. During the 1900's, Morton used the study of cranial size variations for the basis of his classification theory. However, he was selective about having larger skull sizes to support Europeans in his experiments, which dramatically and artificially altered the results of his studies. His studies as well as Broca's studies of cranial shape used to determine race have been proven to be inconclusive. With undertones of racism, Boas conducted "intelligence tests" on immigrants in an attempt to prove his ideas that round-headed people are superior in intellect (Lambert, 1988).

Modern classification techniques, although more detailed and varied in nature, are still inconclusive as established criteria for determining race identity. Modern classification techniques include comparative studies of blood type, hair type, DNA, and Rh factor (Marks, 1995). Mendel's law of segregation published in 1865 is still a source for chromosome study and modern classification ever since its rediscovery in the 1900s (Relethford, 2012). There have also been various linguistic studies used in the attempt to classify of race (Cavalli-Sforza, 1991). Other studies consist of a more scientific approach to traditional race classification based upon skin color. Differences in skin color reflect differences in the rates of melanin synthesis (Richards, 1998). By theory, the skin pigmentation and its reaction to ultraviolet radiation from the sun has an influence on the distribution of race populations. Melanin pigment of the skin protects against ultraviolet radiation and is more evident in populations that are in geographic locations which heavily expose such populations to radiation from the sun (Maged, 1997).

Historical and social studies of human classification have often continued to breed segregation. It is easier to identify an individual on the basis of "race" as a title or a name without consideration to the individual. Therefore, a racial name may also be used to strip away identity and reduce a person to an object or to an inanimate entity—completely disposable and convenient to discriminate (Franti, 1994). Much like a camera cannot take a picture of itself, perhaps it is impossible for an individual to know who they are until they have an understanding of who they are not (Freilich, 1972). We find

out about ourselves through others. Race is not a valid biological concept because of cultural implications as well as historical and modern problems associated with the classification of race.

Race as a classification method promotes discrimination and "othering" of marginal society members. This is also very much evident in modern societies across the globe. As Donna Nakazawa wrote in the July 6, 2003 edition of Parade Magazine, many governments do not readily acknowledge cultural diversity as those of mixed-race are not given the liberty to identify themselves as belonging to more than one race. The "you can't be both" mentality is manifested when filling out forms requesting information on race or nationality. Boxes might be labeled "black" "white" "Asian" when one of mixed-race is forced to mark only one choice and "other" or multiple selections are not an option, one's identity becomes institutionally challenged (Nakazawa, 2003).

Scientists have acknowledged that there is more variation within race than between race further suggesting that racial classification is not valid. In social terms as well, variations in what is considered "dark-skinned" or "black" is a source for bullying and discrimination even among dark-skinned social groups. Sharon G. Flake (1998) in her novel "The Skin I'm In" writes about how African-American youth interpret different hues of dark skin color as labels and criteria for discrimination suggesting that there are different degrees of "blackness" in reference to both skin color and character.

Lee Thomas (2007) in his book "Turning White" challenges skin color as racial identification when considering skin color being altered through skin pigmentation disorders such as vitiligo. Vitiligo is a condition where melanocytes, the cells that promote skin pigmentation, shut down leaving sections of skin void of color. Universal vitiligo encompasses most of the body and such depigmentation renders an individual completely white due to the absence of skin color. Albinos are also void of skin pigmentation due to a lack of melanocytes and the enzyme tyrosinase from birth. Albinos and individuals with vitiligo have suffered social ostracization and discrimination throughout history. In the 18th century, social scientists such as Abbe Demanet, Comte de Buffon, and Claude-Nicolas Le Cat attempted to categorize albinos as a separate race further complicating the validity of race as a quantifier of humans (Blakemore & Jennett, 2001).

3. Who is *Korean* in Today's Korea? Who is *Japanese* in Today's Japan?

In order to determine who is Japanese or Korean and who is not Japanese or Korean from the native resident viewpoint, it is best to have an understanding of their respective cultures. It is difficult for Westerners to see Japanese or Koreans entirely as the Japanese and Koreans see themselves. It's difficult for any individual to see themselves and acknowledge their beliefs and culture until in a situation where they are in a culture or environment that is other than what they are accustomed to. In other words, "you don't know who you are until you know who you aren't." This concept can be viewed to breed separation, but it is by labeling that a society and an individual are

created. Labeling is a necessary initial step in understanding anything at all. When questioning what X is, it is necessary to formulate an answer by first giving a name to X (Lebra, 1996)

Labeling by relations and patterns of social interaction provide references for belongingness. Cultural anthropologist Takie Lebra Sugiyama explains in detail about how the individual is who he/she is by formal and informal references to blood ties, geographical ties, and occupational ties. These references are distinct and necessary for creating identity for the individual and are relative to how the Japanese and Koreans perceive who they are. Society determines and prescribes the value to the categories. Free society is self-governing and determines the mind-set, law—with its informal and formal restraining devices, customs, and behavior of the individual society members. How the individual fits into the category, which is described by Dr. Lebra as being the "frame," determines if he/she is Japanese or Korean. Moeran and Valentine (1992) also describe those who do not fit the description of what a society has prescribed as being Japanese or Korean are described as being *marginals* or *outsiders*. There are different degrees of marginality and outsiders. For example, an individual who is of mixed Korean or Japanese and foreign parentage is marginal rather than being an outsider, or a "pure" foreigner. This analysis leaves an impression that the Koreans and Japanese determine who is Korean or Japanese entirely by appearance, however, distrust of ambiguity in belonging is manifested by the Japanese opinion of Koreans and other Asians.

Who exactly is marginal is determined by society. Dr. Lebra stated that Japanese who don't act like Japanese are not readily accepted as being Japanese. Examples, as given in the anthropological studies are the cases of "returnees." After living abroad, those Japanese found that their perception and behavior slightly altered and differed from other Japanese upon returning to Japan. Dr. Lebra explained this concept by the description of how foreigners are expected to act like foreigners. "Japanese expect foreigners in Japan to retain their foreign identity... *Japanized* foreigners, who may be liked by their Japanese friends, to be sure, nevertheless often disturb the sense of belongingness held by most Japanese" (Lebra, 1996). This can also be argued about returnees in Korea. The author associated with Korean returnee students at Keimyung University and was told of their experiences of being bullied by classmates due to their Korean-ness being challenged by native residents. Most of the Korean returnees were from the Soviet Union; however, Korean returnees were also composed of long-term residents of Canada, Japan, and the United States.

International marriages and other foreign contact label the individual separated as a marginal, marrying a foreigner from a low-status country may render one as an outsider than a marginal. How the children of international marriages are received by society also is manifested by the titles that such children have been given by society. In Korea 혼혈 *hon hyeol* or *hon hyara* meaning, "mixed blood" is common but can also be interpreted to mean "half blood" as one can see in the Korean title of J.K. Rowling's Harry Potter series: Harry Potter and the Half-Blood Prince 해리포터와**혼혈**왕자. However 혼혈 has in recent years been replaced by the title of 반 or 절반 meaning "half".

The author assumes that there is nothing intrinsically wrong with the 혼혈 expression when compared to the expression *tuigi* 틔기 which is inherently derogatory and refers directly to children of mixed blood. *Half* and 혼혈 *hon hyeol* are debatably descriptive; however, both expressions represent the fact the Koreans create a reference only to the "half" that is Korean without acknowledgment that the child is representative of two cultures.

Likewise, in Japan, children of international marriage were once given the label of 合の子 *ai no k*o. Derogatory expressions such as 何□の馬の骨か分からない *doko no uma no hone ka wakaranai* are found in Japanese literature. In modern times 合の子 has been updated to 混血 *kon ketsu* meaning "mixed blood" which has been further updated to ハ□フ or "half." Neither Japanese nor Koreans tend to be aware of the negative nuance associated with this term. *Half* which is derived from *half-breed* or *half-blood* carries the nuance of being unfinished, incomplete or not entire—perhaps the equivalent of 中途半端 or 何か足らない in Japanese. Although no ill intention may be given by Koreans and Japanese as they use this term liberally as a label, both Koreans and Japanese are subconsciously only acknowledging the Japanese or Korean "half" of the individual. The politically correct term for a child of an international marriage is "double" or "multi-national" since these terms acknowledge the entirety of the individual. Nevertheless, having no label at all would represent true cultural acceptance and end discrimination as the individual would not be seen as nor judged by the color of his or her skin or ethnic orientation.

The concept of "half" also represents how international marriage causes a cultural pollution resulting in marginality (Kondo, 1990). The author, having interviewed individuals of mixed parentage in Japan and Korea has found that there is divided opinion as to the offensiveness of the expression "half" as a title. Most do not find the term offensive; nevertheless, those that do find the term offensive are very much vocal about correcting the use of the title and are engaged in a never-ending battle against society as the term has become so widely accepted.

By experience, ethnic origin and skin color are determining factors for treatment as a true resident of Japan or Korea. The terms *gaijin* 外□人 or 외국인 *weigukin* refers exclusively to foreigners who are Caucasian further suggesting a covert sense of belongingness based on ethnic ties. In the late 80s, Caucasian foreigners who were able to converse fluently in Japanese were labeled *henna gaijin* □な外人. Once a popular term, this remained in use until the mid 90s which is now replaced by the perennial *Nihongo wa o-jozu desu* 日本語はお上手です which appears on the surface to be a compliment is nevertheless potentially highly offensive to one who has taken on Japanese citizenship or has been born, raised and educated in Japan and otherwise maintains a self-identity of being Japanese. As Yoshikazu Matsui writes, further offense can be taken if this compliment is given to those who have endeavored through years of study to master the Japanese language and are told *Nihongo wa o-jozu desu* 日本語はお上手です in response for both delivering a speech in Japanese as well as for uttering a simple greeting. Based on ethnic appearance, one is treated as perpetual

foreigner regardless of language ability (Matsui, 1992).

Acceptance of an individual as being Japanese or Korean is often based primarily upon appearance and superficially upon language skills. Somewhat debatable perhaps, but this provides an interesting background for another group who are of mixed Japanese or Korean and foreign parentage. Appearance already creates a level of marginality in most cases which can only be solidified by language skill. Those who are not of mixed lineage and rely entirely on language have to continually "prove" their identity (Keene, 1999). According to naturalized Japanese citizen Debito Arudo, having Japanese language ability may serve as a *qualifier to entitlement* for "Japaneseness." Language ability and "Japaneseness" are not a racially-based social construct, as more non-native speakers and multiethnic natives continue to appear (Arudo, 2007). Demographic changes in Japan are occurring. An increasing number of foreigners are naturalizing and becoming Japanese citizens as reported in the article *The New Faces of Japan* in the September 2006 edition Newsweek Magazine. Society accepting the citizenship of naturalized Japanese citizens is the true challenge for achieving global awareness (Newsweek, 2006).

Besides language and appearance another form of establishing identity which is culturally important in any society is the individual's name. If the individual's name is a Japanese or Korean name, it creates a notable level of acceptance within the marginality. Even by the author's experience of having the name of "Lee," while residing in Korea, the author was often asked to repeat the name out of the disbelief of the listener. When the name "Lee" is finally accepted, it is usually followed by the statement describing how Lee is a common family name in Korea—even ludicrous remarks and inquiries of whether or not the author was of Korean ancestry. If the individual's name is a Korean name or a Japanese name, it creates a notable level of acceptance within the marginality.

Historically, the Japanese government required foreigner nationals of countries occupied by the Japanese military to renounce their former citizenship as well as renounce their name for a Japanese name. Later, with the end of World War II, names written in Chinese ideograph characters or *kanji* following the pronunciation of a foreigner's original name were acceptable. In the wake of World War II, taking on Japanese citizenship was more of a choice than a matter of being forcibly assimilated; however, the practice of using such □て字 *ateji* characters has recently gone retro by requiring all those whom take on Japanese citizenship to use only standard Japanese names. In the past only foreigners that were forcefully assimilated as Japanese had their names changed according to this standard. During the Japanese military occupation of Korea and Taiwan, the Japanese government forced Koreans and Taiwanese to have Japanese names in an attempt to eclipse their nationality and remove ambiguity and forcing a merge in culture. Japanese history and treatment of the Ainu and Ryukyu people also reflects the politically supported campaign to remove ambiguity and force assimilation.

There are various levels of marginality which are controlled by society and by the disposition of

the individual Japanese and Korean society member. The later is evident in examples of Caucasian Westerners who were raised in Korea or Japan, growing up as Japanese or Korean and are Japanese or Korean by all description accept for appearance. Being of Caucasian ancestry instead of Asian decent has set the level of marginality to its own category which is closer to an outsider than even a "pure" marginal. Apparently, as also in the case of other Asians in Japan or Korea, neither language nor cultural understanding is a strong enough category to allow foreigners in Japan or Korea to be accepted as being Japanese or Korean.

4. Survey Results: Student Opinion.

On November 11th and 13th of 2013 and January 6th of 2014, the author took separate surveys on student opinion on the nationality and cultural identity of twenty-one widely known individuals in Japanese society. Survey was conducted with students in the Environmental Department and students in the Economics Department at Nagasaki University. Students polled were junior university students. Of the 220 students that responded, 77 were female and 143 were male. Not all participants responded and many responded in partial answers as can be seen in the data.

Students polled were asked to explain "what is a *Japanese*?" No remarks were made or direction given nor were answers or responses solicited. Students were given freedom to determine their own criteria and discuss among themselves what characteristics and requirements constitute a Japanese citizen. Answers and explanations given on "what is a Japanese?" were diverse. In no order of preference or importance, the most common answers include the following:

A person who has lived in Japan 日本に住んだことがある人
A person who considers him/herself "Japanese" 自分が「日本人だ」と思う人
A person who has Japanese citizenship 日本□籍を有する人
A person who has assimilated into Japan 日本に溶け□んでいる人
A person born in Japan 日本で生まれた人
A person who has spent the majority of his/her life in Japan 人生の大半を日本で過ごした人
A person who likes Japan 日本が好きな人
A person who has Japanese blood 日本の血が入っている人
A person who knows a lot about Japan 日本について詳しい人
A person using Japanese in everyday conversation 日常□話で日本語を使う人
A person with Japanese parents/grandparents □親□祖父母に日本人がいる人
A person who is proud of Japan 日本について誇りを持つ人

Opinions were diverse, but most responses favored blood ties such race and ethnicity as the determining criteria for determining "what is a Japanese?" Students also had ludicrous responses such as "the ability to use chopsticks" or "can eat *sushi* and *natto*" as determining criteria.

Samples of Japanese societal members and people that have appeared in the Japanese media were

used for survey material. Students were given a choice to choose “Japanese” “Foreigner” or “Don’t Know” for their response. The researcher instructed the students to not give too much thought in their response, but to follow their first impression. The correct response for who is “Japanese” is based on criteria of citizenship determined by legally accepted governmental interpretation. Maintaining a Japanese passport and having a residency registration or *juminhyo* 住民票 and being included in a citizen’s registry *koseki* 口籍 are the legal requirements determining citizenship. Although vague, debatable, and potentially unknown by the students, for research purpose serves as the criteria used for determining the *correctness* of the student’s response.

The following society members are of Japanese citizenship: Rie Miyazawa, Anna Umemiya, Sachio Kinugasa, Fujimori Alberto, Konishiki, Akebono, Ramos Rui, Antonio Inoki, Eri “Rola” Sato, Marutei Tsurunen, Shintaro Ishihara, and “Tama-chan”. Some of the individuals mentioned have either taken on citizenship *kika* 口化 in their lifetime or are Japanese but of mixed lineage; however all are Japanese based on the criteria of having citizenship and maintaining a *juminyo* or *koseki*:

The following society members are not Japanese due to possessing neither citizenship nor a *juminhyo*. The following individuals are of “permanent resident” *zainichi eijusha* 在日永住者 status, but maintain foreign citizenship: Akiko Wada, Lee Flake (the author), and Sadaharu Oh.

Of the society members mentioned, Kent Derricott is the only individual not of Japanese citizenship nor of permanent residency status. Other individuals mentioned fall into a dubious grey legal status at the time of writing this paper. Such society members were mentioned were for the sake of promoting conversation. These individuals include: Takezaki Kuniyaki “Neko Hiroshi,” Shimomura Osamu, Donald Keene, David Aldwinkle (有道出人), and Shigenobu Fusako.

Takezaki Kuniyaki, a.k.a. “Neko Hiroshi” had to denounce his Japanese citizenship in order to petition for Cambodian citizenship. However, after not meeting the residency requirement for Cambodian citizenship, he has become temporarily stateless. Granted, his Japanese citizenship was reinstated. Dual citizenship, if offered, would prevent individuals from becoming stateless. Dual citizenship would be an asset to governments for tax purposes and for claiming notoriety based on the accomplishments of their citizens. Shimomura Osamu is a case example.

Shimomura Osamu after having lived and studied extensively in the United States at the University of Washington, Princeton University, Boston University School of Medicine and Marine Biological Laboratory, took on American citizenship through long-term residence. The Japanese government does not recognize dual or multiple citizenship. Taking on foreign citizenship is criteria to loosing Japanese citizenship. Shimomura Osamu after his studies with Professor Frank Johnson at Princeton University beginning in 1960 went on to naturalize when honored as professor emeritus at Boston University. Naturalization meant that his Japanese citizenship was annulled. Based on Japanese citizenship law Shimomura Osamu could not be an American citizen while claiming to also be Japanese. However, when Shimomura Osamu was awarded the Nobel Prize in Chemistry in 2008,

his Japanese citizenship was never questioned by the Japanese government. As the news of the "Japanese" Shimomura Osamu being awarded the Nobel Prize worked its way around the international media, the foreign media and Internet news sites such as "Asia Cable" only briefly mentioned his U.S. citizenship. Recently, selective amnesia has taken over the media, as his Japanese citizenship has been reestablished.

Fusako Shigenobu, the founder and former leader of the Japanese Red Army terrorist group, after spending 30 years in the Middle East and possessing and forging passports, somehow maintained her Japanese citizenship. She was tried as a Japanese citizen upon her arrest in Osaka in November 2000 and throughout her prison sentence in 2006 and 2010, her Japanese citizenship was assumed. May Shigenobu, the daughter of Red Army terrorist Fusako Shigenobu, entered Japan on a counterfeit passport, but instead of being arrested for illegal entry and deported, she was granted citizenship and the Japanese government provided her with a new passport.

David Aldwinkle (有道出人), a writer and associate professor at Otaru University and a columnist for Japan Times was granted Japanese citizenship, but at the time of this writing, David Aldwinkle is a resident of Canada. Although the media maintains his claim to Japanese citizenship, his current legal status and citizenship are otherwise unknown by the author. The Japanese literary scholar Donald Keene, after his many years of Japanese literary research and writing announced his interest in taking on Japanese citizenship in the wake of the March 2011 earthquake and tsunami in Tohoku. However, taking on a Japanese name as currently required for Japanese citizenship has forced Donald Keene to have reservations about sacrificing the name he worked his entire life and career to build. Petition to use his *ateji* nickname 鬼怒鳴門 was the last the author heard of Donald Keene's citizenship mentioned in the media. However, online news sources confirm that Donald Keene has acquired Japanese citizenship. Moreover, Donald Keene has gone on to write the book *watashi ga nihonjin ni natta riyuu - nihongo ni miserarete* 私が日本人になった理由―日本語に魅せられて detailing his reasons for taking on Japanese citizenship.

Tama-chan, although not a human being, is a Japanese citizen by legal definition. It is baffling to believe that a male bearded seal—an entirely different species of organism would be granted political acceptance and citizenship; however, Tama-chan has a *juminhyo* registered to Yokohama City, Nishi-Ward. Moreover, fictional entities including animated cartoon characters such as "Chibi Maruko-Chan" and "Crayon Shin-Chan" are also Japanese by legal definition. Saitama Prefecture Niiza and Kasukabe Cities have granted fictional animation characters such as Crayon Shin-Chan a *juminhyo*. If one is adored by society, has Japanese blood through established lineage or is deemed by the government to be an asset to society, such an individual is readily absorbed into society and accepted both socially and politically as a Japanese citizen. Examples of foreign athletes or award winners being quickly granted citizenship or permanent residency over foreign residents that have spent their whole lives petitioning for acceptance makes one realize the capriciousness of both the

Japanese government's standard for granting citizenship as well as public's biased criteria for social acceptance. The author's own experience of petitioning for permanent residency and the struggles associated with the government's selection process has convinced him that the true criteria for citizenship is less than transparent. The lawyer that helped the author gain permanent residency reconfirmed this viewpoint as the author was informed that the profit one provides for the country is debatably the true and only judging criteria for obtaining permanent residency.

Statelessness is also a social issue that concerns social and political acceptance of the citizenship of society members. Although statelessness or *mukokuseki* 無口籍 exists in Japan and Korea, it is rarely covered by the media nor readily acknowledged by the government. Stateless society members are potential candidates for discrimination beyond measure as they are not given protection from any government (Chen, 2012). Although considered an uncommon social issue, statelessness has been researched by social anthropologists. Neither the Korean government nor the Japanese government have offered a permanent solution to statelessness nor are willing to grant citizenship based on mere residence as blood ties also stain political criteria for who belongs in society. Likewise, the governments of Japan and Korea not accepting multiple citizenship is perhaps the root of the problem determining belongingness and marginality in Japan and Korea. The author believes firmly that a governmental acceptance of multiple citizenship would end the problem of statelessness in Japan and Korea as well as creating an avenue for social acceptance of marginalized citizens. Moreover, as the population in Japan declines through the low birth rate or 少子化 *shoshika,* the acceptance of dual citizenship would potentially end the population crisis as many reentry Japanese who have family abroad and permanent residents who do not desire to relinquish their homeland citizenship in order to naturalize or are politically unable to renounce their former citizenship would be able to join Japan's official population as citizens. A more comprehensive study of statelessness and dual citizenship and its legal implications would provide perspective and further add to criteria on proving and establishing personal identity. Statelessness and non-acceptance of dual citizenship is perhaps another manifestation of how multiracial residents of Japan and Korea are marginalized.

Relinquishing citizenship for United States citizens has become increasingly expensive. As Robert W. Wood (2015) wrote for Forbes, the United States has the world's highest fee to renounce citizenship. The U.S. State Department raised the fee 422% from $450 to $2,350. This rate is more than twenty times the average level in other high-income countries (Wood, 2015). According to researcher Harriet Cann (2016), this is extremely high when considering that there is no fee for taking on citizenship nor renouncing citizenship in Japan and that it only costs $20 to renounce citizenship in South Korea (Cann, 2016). In addition to the fee for renouncing citizenship, there is now a heavy "exit tax" imposed on U.S. Citizens renouncing citizenship.

The United States is the only country in the world besides Eritrea that levies taxes based on citizenship rather than on residence or the source of revenue. The author, as an American citizen by

birth, having spent most of his life abroad—which amounts to almost 25 years abroad as an expatriate in Asia, pays taxes to the country that he resides in, but still has to go through the complex process of filing IRS returns. The author doesn't make enough money to owe tax in the U.S.—in fact, he continually pays more to CPA tax preparers than he owes in tax. Long-term expatriated American colleagues have given up their citizenship only to avoid the stress of filing such paperwork on taxes. This is not tax evasion, since it is not about the tax expatriates owe, but rather the burden of filing and fear of penalties that often make United States expatriates question the merit of maintaining U.S. citizenship. U.S. Foreign Account Tax Compliance Act (FATCA) is now reaching across the ocean and digging into U.S. citizen's pockets to pay taxes on savings that such citizens have already paid taxes on. Taxed to relinquish citizenship and taxation based on citizenship instead of income or residence is a concept that neither Japanese nor Koreans can relate to, but is an essential factor when considering the requirements for relinquishing citizenship to legally naturalize in Japan or Korea.

5. Survey Data.

Quantitative data on the student response is as follows:

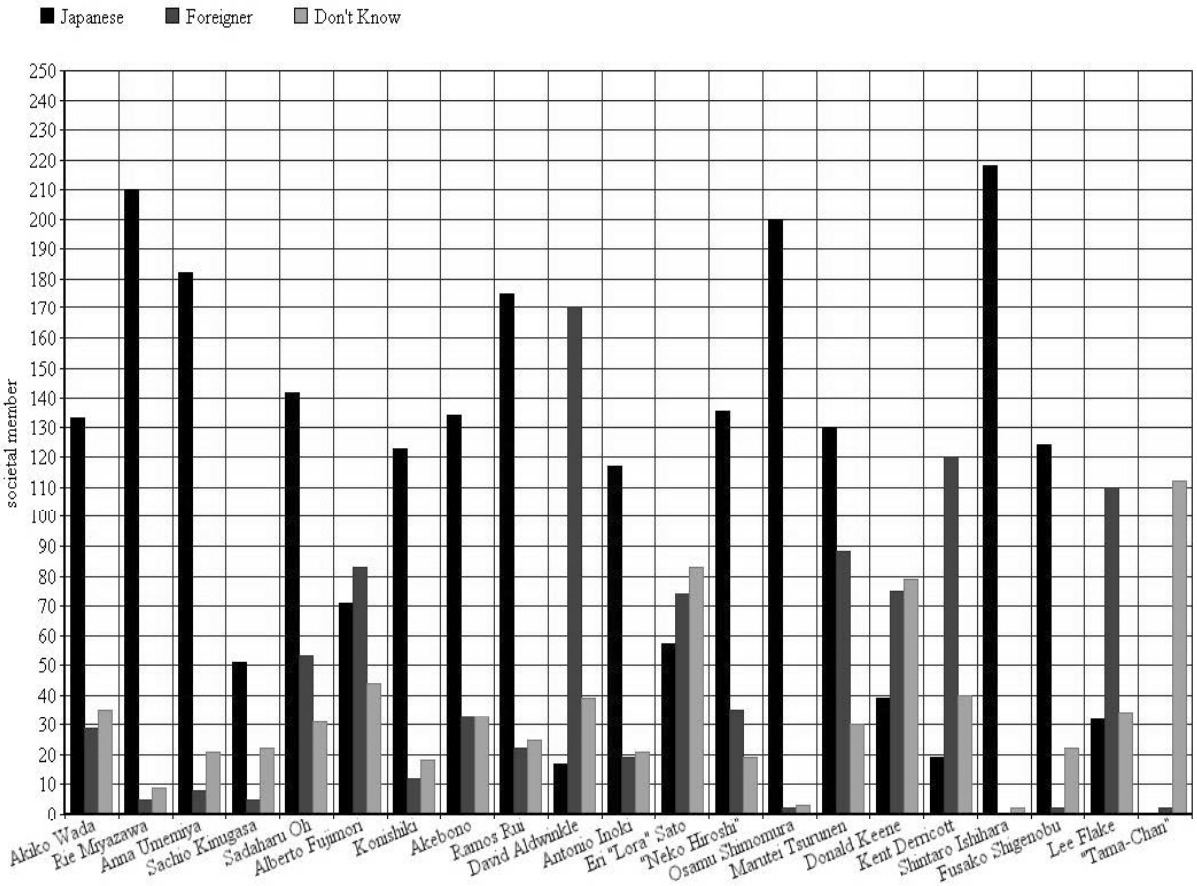

Figure 1. Histogram of student response.

6. Interpretation of the Data.

Students opinion suggest a strong correlation between race and the acceptance of being Japanese. Individuals of mixed lineage (Rie Miyazawa, etc.) were readily accepted as Japanese. Moreover, *zainichi eijusha* (在日永住者) permanent residents or those who are not citizens but are Japanese in appearance (Sadaharu Oh, Akiko Wada, etc.) were almost unanimously voted as being Japanese even without Japanese citizenship.

However, Japanese language ability is also regarded as a social criteria for establishing "citizenship." Alberto Fujimori, even with Japanese lineage and Japanese in appearance was not granted full acceptance as Japanese due to his lack of Japanese language ability. Nevertheless, the author was granted Japanese citizenship by a portion of the students. Upon inquiring about the reason, the students polled indicated that the decision was due to his language abilities. Students also interpreted the author asserting an assumed Japanese citizenry as the intent of the poll. Opinion would no doubt be skewed if the students had met the author for the first time or judge the author based on his Western appearance. The Hawthorne effect might also be observed if the poll was conducted by a native Japanese instead of an individual Western in appearance.

7. Conclusion: To Be or Not to Be.

Having Japanese language ability is the qualifier to "entitlement" of social acceptability; however, it is physical appearance that is immediately endorsed. Language ability alone is not enough to convince all of society into social acceptance. Moreover, having to prove one's language competency with every society member one encounters is a never-ended task.

Citizenship is not merely a matter of legal status nor is it something earnable as Japanese citizens of non-Asian lineage are condemned to unchangeable conditions such as blood or birth. Western lineage Japanese citizens are condemned to live out their lives in Japan as perpetual foreigners. Ascribing something as important as personal identity, nationality and citizenship only to lineage and blood ties can only serve to hurt Japanese society to ostracize and alienate Japanese citizens of international lineage.

Although socially an invisible minority, multiracial Japanese and Koreans are increasing in society. Viewed as a social curiosity, the few known "visable" multicultural Japanese and Koreans dot the modern social landscape as TV "talents" and athletes. Although not commonly mentioned, the media shows occasional interest in the social and political acceptance of multiracial citizens. As an example of multiracial Japanese in the media, articles on multiracial Japanese minorities have made the cover of both Newsweek magazine and Diamond magazine:

Figure 2. Multinationalism of Japan acknowledged in the media.

An individual's race or ethnic orientation tends to be the sole concept that is a determining factor for social acceptance and societal acknowledgment of citizenship. This is also true for Western nations as well. The author's casual observation of social media forums on the subject of racism and race-based hate crimes suggest that racism and "othering" of minority groups exists everywhere there are human beings. Groups and individuals struggling for social acceptance and citizenship exist in every society. Racism exists as a result of labeling and stereotyping. Race and racism, are both constructed concepts—neither are scientific nor biologically valid. It is morally wrong for an individual to be defined or limited by the ignorance and prejudices of other people (Flake, 1999).

Ethnocentricity, in other words, the "it's easier to deal with my own kind" way of thinking is a value held in some degree by all societies. However, both Japanese and Koreans appear to have a great ethnocentric sense because the society value is placed on conformism and collectivism which foster a taste of togetherness (Lebra, 1996) Moreover, the hypothesis of the influences of living in a relative homogenous society has extremely strong social implications.

The author feels that Japanese and Koreans are the ones who decide who are Japanese and Korean while cultural anthropologists, sociologists, researchers, and educators are left to hypothesize and ponder about the reasons and criteria for judgment. The author is in agreement with the mindset of many modern social anthropologists that Asians in general enforce belonging on a societal level and that unambiguous belonging is a key factor of determining who is Korean or Japanese and who is not. Paradigm shifts are common throughout history and perhaps as the Japanese and Koreans become more tolerant and educated concerning the multi-cultural demographic changes within their nations, a newfound acceptance for marginal societal members and citizenship based on criteria other than ethnicity will take root. Diversity within the concept of race and culture is a strength. If

we were all the same, it would be a boring world to live in. Being different and diverse provides uniqueness and dimension to all humans. Likewise, the differences are what affords all members of this global society an opportunity to learn from each other. When considering racial classification, perhaps it is best to be *colourblind* and classify humans on a basis of who we are as individuals and not by the vague concepts of race.

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How to Improve Usability in GIS
- Human Centered Design Process -

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ABSTRACT: This paper introduces the process to reduce human error and improve usability and user satisfaction of GIS (Geographic Information System). The process is called Human Centered Design Process that has 4 steps of "to understand and specify the context of use", "to specify the user and organizational requirements", "to produce design solutions", "to evaluate designs against requirements"
Keywords: Usability; Human Error; Human Centered Design;

1. Introduction

At present, GIS is being used for various purposes. For example, urban planning, railway line management, natural disaster countermeasures, measures against infectious diseases, customer trend analysis, education, etc. Along with that, the types of users are increasing, such as civil servants, doctors, teachers, and general citizens. Problems with usability of widely used systems are not only time-consuming and inefficient in operation, but in the worst case there is a possibility of putting many people's lives at risk.

Therefore, improving usability in GIS is an important issue. However, the current GIS is never high usability. In such a case, it is necessary to improve usability by an appropriate process. In this paper, we introduce the process to improve usability in GIS.

2. Usability

What is usability? ISO9241-11 has the following definition. 1)

Usability:
Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.
Effectiveness:
Accuracy and completeness with which users achieve specified goals
Efficiency:
Resources expended in relation to the accuracy and completeness with which users achieve goals
Satisfaction:
Freedom from discomfort, and positive attitudes towards the use of the product
Context of use:
Users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used

3. Human Centered Design Process

How can we improve usability? The answer is Human Centered Design Process. ISO9241-210 has the following definition. 2)

> *Human-centered design is a creative approach to interactive systems development that aims to make systems usable and useful by focusing on the users, designing around their needs and requirements at all stages, and by applying human factors/ergonomics, usability knowledge, and techniques. This approach enhances effectiveness and efficiency, improves human well-being, user satisfaction, accessibility and sustainability; and counteracts possible adverse effects of use on human health, safety and performance.*

Knowing users well, understanding their problems and requirements, creating a prototype to solve these problems, and evaluating whether the prototype can really satisfy users. If we use that process, we can design system that has high usability.

4. Conclusion

If we can introduce the process shown in Figure 1. in the development process of GIS, we can obtain the effect as shown in Figure 2. Especially if GIS for natural disaster countermeasures becomes easy to use, we can help more people. We hope the world be filled with GIS that has high usability. When that is achieved, research in the field of geospatial information science will be increasingly developed.

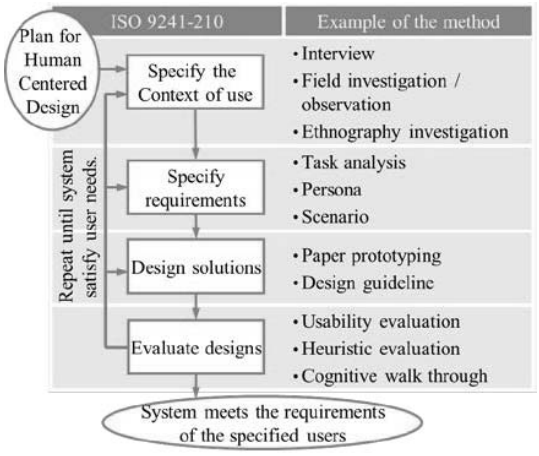

Figure 1. Human Centered Design Process and Methods

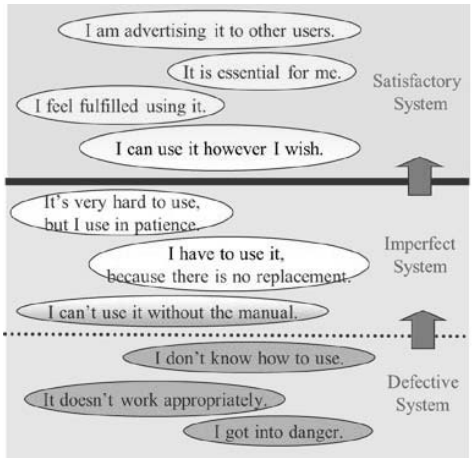

Figure 2. Effects of Human Centered Design Process

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$Fe^{2+}/S_2O_8^{2-}$ Oxidation Process for Degradation of Phthalate Esters in Harbor Sediments

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ABSTRACT: In this study, we focused on the degradation of marine sediments contaminated with 10 phthalate esters (PAEs) contaminants by ferrous ion (Fe^{2+}), which effectively activates persulfate anions ($S_2O_8^{2-}$, PS) to sulfate free radicals ($SO_4^{-\bullet}$) in a slurry system. The effect of initial pH value on degradation of PAEs was investigated. The results showed that the efficiency of PAEs removal was 8%–36% for unactivated persulfate (PS) from an initial dose of 1.7×10^{-2} mM. The removal of PAEs was evaluated found to be 75% at 30 min, at a temperature of 303 K, PS concentration of 1.7×10^{-2} mM and pH of 6.0 by using the Fe^{2+}/PS system. The optimal PS : Fe^{2+} molar ratio for PAEs reduction was 1 : 10^2. Therefore, Fe^{2+} enhanced degradation of PAEs. The mechanism is mainly attributed to $S_2O_8^{2-}$, which can be chemically activated by Fe^{2+} used to generate $SO_4^{-\bullet}$ for PAEs degradation. Our study findings showed that Fe^{2+} was highly effective in environmental treatment applications for PAEs degradation.

Keywords: Sediment; Phthalate esters; Persulfate; Ferrous ion

1. INTRODUCTION

Phthalate esters (PAEs), a class of refractory and toxic organic compounds, are widespread in natural media such as soils, sediments, and water [1-3]. Because of their hydrophobicity and low water solubility, they are strongly associated with sediments among entire natural media during their life cycles. Much attention has been paid to PAEs as prevalent contaminates because their exposure to aquatic organisms may cause an ecotoxic hazard resulting in the potential danger of bioaccumulation [4,5]. The highly reactive sulfate radical ($SO_4^{-\bullet}$)-based advanced oxidation processes (AOP) of persulfate ($S_2O_8^{2-}$) generation to produce a powerful oxidizing species such as $SO_4^{-\bullet}$, has been developed as a potential technology for the treatment of hazardous waste [6-9]. In situ chemical oxidation uses $S_2O_8^{2-}$ as an oxidant and generates various reactive oxygen species for contaminated sediments remediation, but direct reaction of $S_2O_8^{2-}$ with most reductants is slow. Generally, $S_2O_8^{2-}$ can be chemically activated by transition metal ions that are commonly used to generate $SO_4^{-\bullet}$. This major heterogeneous catalytic process has attracted attention in materials chemistry, and the effectiveness of chemically active $S_2O_8^{2-}$ processes has been improved using high-performance Fe(II), which potentially reduces the reaction time under mild reaction conditions. Ferrous ion (Fe^{2+}) is a promising heterogeneous catalyst in various environmental applications because of it is naturally abundant, inexpensive, and nontoxic to the environment and can be used as activator of $S_2O_8^{2-}$. With the increasing applications of $S_2O_8^{2-}$ oxidation technology, Fe^{2+} has been considered to accelerate the degradation rate through the formation of $SO_4^{-\bullet}$. Moreover, according to literature search, there are few studies on the use of Fe^{2+} in the catalytic aqueous phase oxidation of

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PAEs. Therefore, in this study, we investigated the activity of the Fe^{2+} on the decomposition of PAEs in $SO_4^{-\bullet}$-based AOP process.

2. MATERIALS AND METHODS

2.1 Sediment samples

The contaminated sediment was obtained from an industrial port area of southern Kaohsiung with an Ekman Dredge Grab aboard a fishing boat. The collected sediment was kept frozen during transportation. In the laboratory, the samples were freeze-dried for 72 h before being homogenized with a mortar and then sieved (at 0.5 mm).

2.2 Experimental methods

For each test, a 1 g sample of sediment was transferred to a 40 mL borosilicate glass vial reactor, and 25 mL of oxidizer solution with the oxidizer and $FeSO_4$ powders was added. All sample vials were shaken for approximately 30 s and placed in a water bath shaker (SB-9D, Taiwan Hipoint Corporation) with a speed of 200 rpm for 24 h. To detect the contaminant in the sediment as well as to assess the PAEs removal efficiency of the chemical oxidation, the solid and liquid phases were extracted together through sonication and solvent addition (acetone:*n*-hexane). PAEs concentrations were detected through gas chromatography–mass spectrometry, to account for all the PAEs in the sample.

2.3 Instrumental analyses

The PAEs from the sediment and slurry extracts were analyzed using a gas chromatograph (HP Agilent Technologies 6890, USA) equipped with an Agilent 5975 mass selective detector and an Agilent 7683B split/splitless injector (splitless time: 1 min; flow: 60 mL/min) and the injector temperature was maintained at 573 K. The carrier gas was helium injected at a constant flow rate of 1 mL/min. The column temperature was initially kept at 313 K for 1 min, gradually raised to 393 K at the rate of 298 K/min, then increased to 433 K at the rate of 283 K/min, and finally elevated to 573 K (this final temperature was held for 15 min) at the rate of 278 K/min. The concentration of individual PAEs in the solvent was quantified using the internal standard method with five-point standard curves (all $r^2 > 0.98$).

3. RESULTS AND DISCUSSION

Figure 1(a) presents results of the following experiments conducted with Fe^{2+} alone, $Na_2S_2O_8$ (PS) alone, and Fe^{2+}/PS process. The PAEs could not effectively be degraded when only Fe^{2+} was applied, indicating the in effect adsorption of PAEs under the condition investigated. The PAEs removal was 8%–36% for unactivated persulfate (PS) from an initial dose of 1.7×10^{-2} mM. Results showed that the PAEs conversion rate increased to 75% at a PS concentration of 1.7×10^{-2} mM, Fe^{2+} concentration of 1.7 mM, and initial pH value of 6.0 at 303 K in the $SO_4^{-\bullet}$-based AOP by using Fe^{2+} as the activator. In the Fe^{2+}/PS process, Fe^{2+} could promote aqueous $S_2O_8^{2-}$ decomposition to generate $SO_4^{-\bullet}$ and increase the mass transfer coefficient of reacting species that enhances PAEs degradation with the optimal PS : Fe^{2+} molar ratio was 1 : 10^2. Consequently, $S_2O_8^{2-}$ can be activated by Fe^{2+} through electron transfer to produce $SO_4^{-\bullet}$, correspond to a higher conversion yield. In addition, the combination of $S_2O_8^{2-}$ and Fe^{2+} had a synergistic effect on PAEs degradation. Figure 1(b) shows the effect of Fe^{2+}/PS on the PAEs removal achieved the highest degradation for low-molecular-weight PAE (LPAE) is significantly more prone to oxidation than high-molecular-weight PAE (HPAE) because of its higher solubility in water. Moreover, this reaction can be attributed to

the presence of a sufficient quantity of Fe(II), which served as an electron donor for the catalytic decomposing of PS anions. Thus, the combination of $S_2O_8^{2-}$ and Fe^{2+} exerts a synergistic effect on the degradation of PAEs through oxidation.

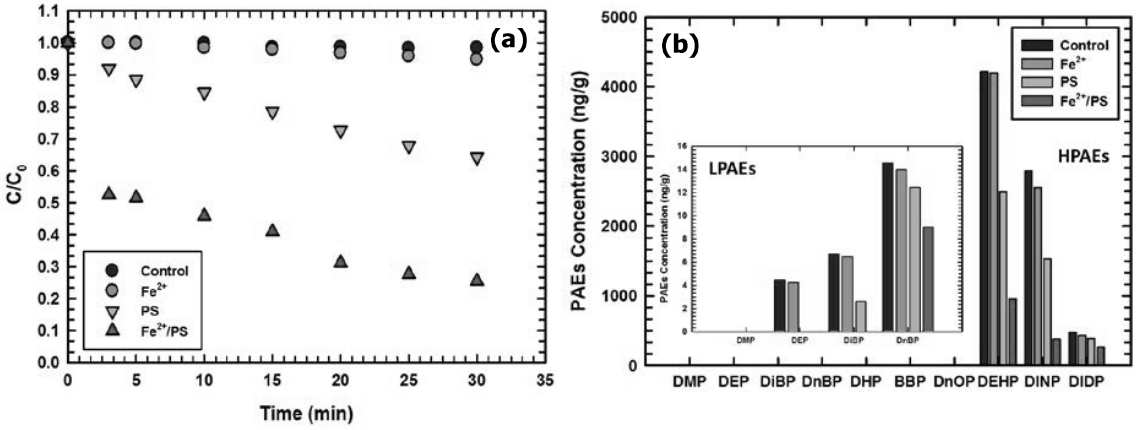

Figure 1 (a) Plots of the decrease in the PAEs concentration (C/C_0) versus time for various processes in slurry system; (b) Contents of individual PAEs in slurry system at various processes are based on the measurements by GC–MS. Experimental conditions: $[PAEs]_o$ = 7512 ± 459 ng/g; reaction time = 30 min; reactor volume = 40 mL; sediment = 1.00 g; temperature = 303 K; pH_0 = 6.0; $[Na_2S_2O_8]$ = 1.7×10^{-2} mM; $[Fe^{2+}]$ = 1.7 mM; molar ratios of PS: ∑PAEs = 10^2:1.

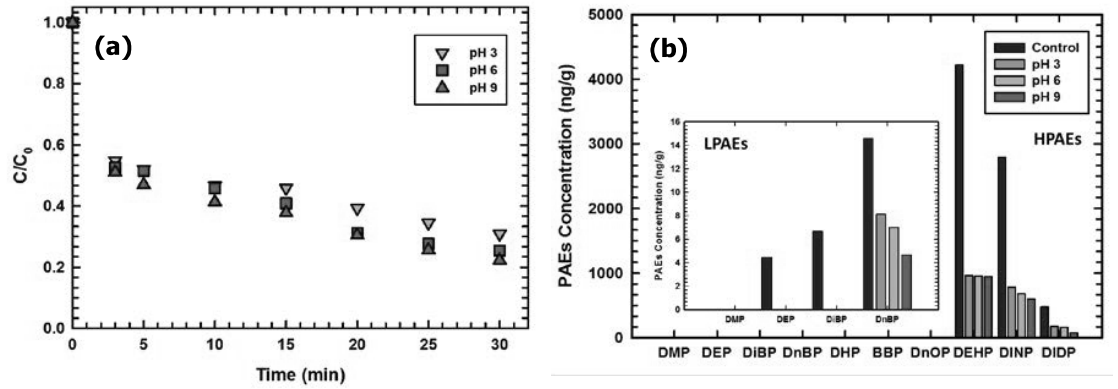

Figure 2 (a) Effect of the initial pH on the PAEs degradation in slurry system; (b) Contents of individual PAEs in slurry system at various initial pH are based on the measurements by GC–MS. Experimental conditions: $[PAEs]_o$ = 7512 ± 459 ng/g; reaction time = 30 min; reactor volume = 40 mL; sediment = 1.00 g; temperature = 303 K; pH_0 = 6.0; $[Na_2S_2O_8]$ = 1.7×10^{-2} mM; $[Fe^{2+}]$ = 1.7 mM; molar ratios of PS: ∑PAEs = 10^2:1.

Figure 2 (a) shows plots of the effect of the initial pH value on PAEs degradation. These plots were obtained during Fe^{2+}/PS runs over the Fe^{2+} catalyst. The effect of pH value on PAEs degradation was significant at pH_0 near 6.0 and 9.0 after a 15 min reaction of the fast stage, whereas PAEs removal was suppressed at pH_0 3.0. Moreover, the aforementioned results thus indicate that the Fe^{2+}/PS process can be successfully applied at a wide initial pH range of 3.0–9.0. We selected pH_0 6.0 in all the experiments because it is the natural pH value of the PAEs. Figure 2(b) shows the effect of Fe^{2+}/PS on the PAEs removal achieved the highest degradation for LPAE is significantly more prone to oxidation than HPAE at pH_0 9.0. The extent of PAE degradation decreased as the pH of the contaminants decreased. Overall, the favorable degradation performance characteristics observed in this study confirm Fe^{2+} as a suitable catalyst and an activator of $S_2O_8^{2-}$ for the catalytic degradation of PAE.

4. CONCLUSION

The present study demonstrates that PAEs can be degradation over a reaction time of 30 min at a PS concentration of 1.7×10^{-2} mM, Fe^{2+} dosage of 1.7 mM, and an optimal initial pH value of 6.0. The degradation rate could be enhanced by the combination of Fe^{2+} and $SO_4^{\bullet-}$. Overall, the Fe^{2+} catalyst had a considerable role in the PAEs catalytic process. The Fe^{2+} catalyst was essential because it was involved in the $S_2O_8^{2-}$ oxidation of PAEs, whereas the Fe^{2+} was suggested to provide the active sites for the reaction during the catalytic run. Our results may be used for applications of PAEs-enriched sediments discharges and to address environmental sustainability.

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ICT Teaching Material for old battle fields in Okinawa, Japan

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ABSTRACT: We made ICT teaching materials utilizing Google Map's API for old battle fields in Okinawa, Japan, because of it is hard to visit there for the reason of access trouble geographically. Our developed teaching material handles 166 places. From this investigation research, we can be found that there are many places which is difficult to visit because of weather. Developed ICT teaching material which has information of exact position in this research are very meaningful to memorize facts of the World War II.

1. INTRODUCTION

There are many old battle fields and monument in Okinawa. The fields and monument are lying scattered all over the Okinawa Island, so it is difficult to visit all places at once. As a result, almost visitor to learn about peace are visit famous place in Itoman City only.

In this research, investigated many old battle fields and ICT teaching materials were finished. Through this materials, old battle fields in Okinawa can attract considerable attention to learn the fields and monument more easily. This material is used Google Map's API and explains fields about during the World War Ⅱ.

2. DATE BASE BOARD

Table 1.Investigation Place

Part	Cities	Name of Survey Place	Counts
Southern	Naha and 5 others	32nd Army Headquarters Shelter, etc.	124
Center	Nishihara and 8 others	The Tower of Nishihara, etc.	38
Northern	Kin and Motobu	Monument of Compulsion Evacuation Kudaka Island People, etc.	4

3. RESULTS

In this results, we want to introduce the typical example of our material. One of the typical example is the Monument of Landed Point by the U.S. Troops

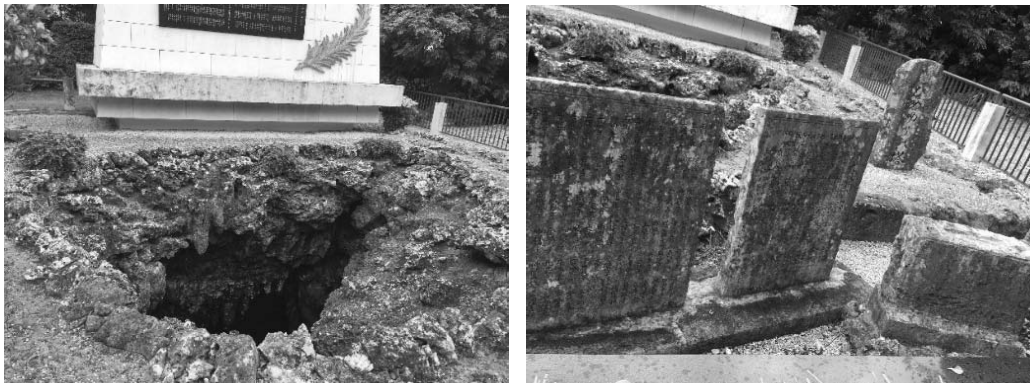
Photo 1. Monument of U.S. Army Landed Point

The U.S. troops landed Kadena town, April the 1st 1945, ending stage of World War Ⅱ, from west coast of island to take central and northern airfields. The tragedy land battle as result, invited ashy site of whole area of Kadena town, the largest prospered business street, and loss of many lives of common villagers and student soldiers of the Okinawa prefectural agricultural high school who served in the Japanese forces, namely the Iron-blood Royal troops. The Japanese central air field which was taken by the U.S. troops was, thereafter, expanded in its scale and turned to present U.S. Air base, so called the largest base in the far-east, and the base is still occupying 83% of Kadena Town area including its munition maintenance storage area.

We believe it is our responsibility to relay the real estate of illogicality and cruelty of war to our successive generations from real estate and experiences. This monument was erected to deny any actions which lead to war and not to erase memories of war and hope for the ever lasting peace.

Second one of the typical example is the Ihara Third Surgical Cave.

(a)The Name of War Dead (b)A Collection Box



(c)Ihara Third Surgical Cave (d)The Staff Name of War Dead

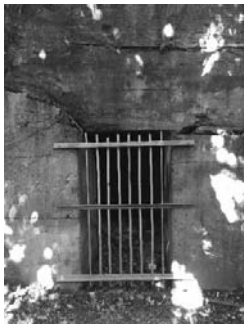
Photo 2. Ihara Third Surgical Cave

The Third Surgery Department medical staff and Himeyuri students at the Okinawa Army Field Hospital in Haebaru escaped into this natural cave after they retreated to the south. Here, on the morning of June 19, 1945, out of about 100 who hid in the cave, 80-odd personal, including 42 Himeyuri students and teachers, lost their lives in an attack by the U.S. military. This cave is one of the sites where Himeyuri students' lives ended.

Third one is the 32nd Army Headquarters Shelter

(a)About the Iron-blood Royal troops

(b)About 32nd Army Headquarters Shelter



(c)The Entrance of Shelter 1

(d)The Entrance of Shelter 2

(e)The Inside of Shelter 1

(f)The Inside of Shelter 2

Photo 3. 32nd Army Headquarters Shelter.

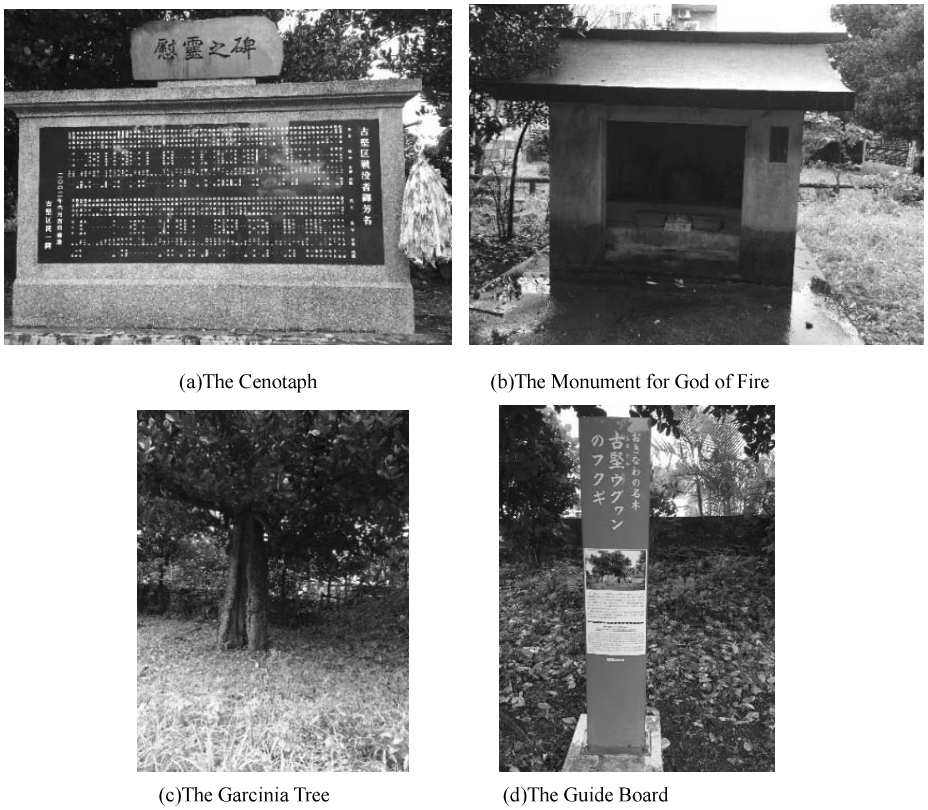
The 32nd Army was founded in March 1944, with the objective of defending the southwest islands known as Nansei Islands. In December of the same year, construction of the Headquarters Shelter began, which mobilized numerous students and local residents. In March 1945, the 32nd

Headquarters moves to the underground shelter and prepared for the climactic battle against the US forces. The Shelter had five connecting tunnels, but these tunnels are now blocked and we are not able to go further into the Shelter.

Over 1000 officers, soldiers, and local civilians and students who served them, lived together in the Headquarters Shelter. The Shelter was equipped with facilities and equipments necessary for the battle command and along both sides of the passageways were double and/or triple bunk beds for the soldiers.

On May22, 1945, the Japanese military command decide to withdraw to Mabuni in the southern region of Okinawa Island. This was a hold-out strategy to delay a decisive battle in Japan proper. A full-scale withdrawal began in the evening of May 27, and the main areas and passageways of the Headquarters Shelter were destroyed. Many precious lives were lost during the evacuation activities of both troops and civilians in association with the withdrawal of the Headquarters. On May 31, Shuri was seized by the US forces, and in the Battle of Okinawa , much of the valuable cultural heritage that spoke of the history of the Ryukyu Kingdom were lost.

Forth one is the Historical Tree of Okinawa, The Garcinia Tree of Fukugi Ugwan.



(a)The Cenotaph (b)The Monument for God of Fire

(c)The Garcinia Tree (d)The Guide Board

Photo 4. Historical Tree of Okinawa, the Garcinia Tree of Furugen Ugwan

Here at Fukugi Ugwan were numerous garcinia trees up until before the war, but today, only a few remain after the devastation of the Battle of Okinawa. With the thickest trunk, the garcinia tree to the south is particularly impressive, and is estimated to be 300 years old. It was recognized as one of Okinawa's one hundred old trees of historical interest. The garcinia tree by the monument has a hollow trunk from the fires of war, speaking of the devastation brought on by the Battle of Okinawa.

Located around the center of the area is the shrine of Furugen Ugwan, dedicated to the local, Furugen deity. On the west side is the Hinukan (the fire god) of Furugen where people pray for the prosperity and good harvests in Furugen

Figure 1. Developed Teaching Material with ICT

As we can see in figure1, about old battle fields and monuments have introduced in our homepage. (http://peace.edu.nagasaki-u.ac.jp/mapping/contents/map.php?TNo=312) There are 166 places and its explanation with photos.

4.CONCLUSION

Through this research, we realited that there are many old battle fields and unknown monument

which is difficult to visit. Using this teaching material, we can easily visit there. There are few resemble research. We can hardly find about same examples. Our teaching material handles 166 places so that this investigation is meaningful for peace education. Over more, this teaching material by using ICT is now recommended by the Ministry of Education of Japan. It means that this teaching material is expected to learn peace education and its practice.

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The Possibilities of Career Education
－Based on Document Search and Interviews－

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ABSTRACT: This research was examined about current career education. In this paper, document searching and interviews to career counselors were conducted. The purpose of these researches is to find out weak points of current career education.

According to this research, it was clear that there were many issues about students themselves and career education in school. In order to improve more than these issues, we realized that there were some important points about what we should do about practice of career education.

1. INTRODUCTION

The first author realized the importance of self-analysis mind through job hunting. She should have done activities about self-analysis and thinking about our future when she was in junior high school or high school. This experience led her interest about career education in Japanese school at present.

The purpose of this research is to consider career education in Japanese school in the future. At first, first author referred to the literature and regulation which current career education based on. Secondly, the interviews about situation of students in job hunting and career education was taken in career counselor. Finally, authors want to consider that what is needed in career education in school from now on.

2. CAREER EDUCATION

First of all, we need to understand the meaning of word “career” before we understand career education. According to Ministry of Education, Culture, Sports, Science and technology (MEXT), the meaning of “career” is defined as in the square like bellow.

> The accumulation which people find out the values of their roles and the relations between them and their roles, while they fill the various roles in their lives.

Therefore, it is important that we grasp widely “career” as the activities which they carry out various positions or roles in family life, school life, working life and civic life.

Based on the definition, “career education” is defined by the reports of Central Council for Education in 2011 like bellow.

> The education prompting career development through developing abilities and attitudes of necessary basis, aiming at the each independence socially and vocationally.

In addition, we need to refer to career developments on each education level when we set goals in career education. The career developments are shown in Table 1.

Table 1 Career developments on each education levels

◆ In Elementary School

The time of forming base about searching course and course selection.

- Formation and Development of actively interest to oneself and others.
- Progress of interest and motivation for jobs or surroundings.
- Acquisition images of dream, hope and yearning for oneself.
- Developing attitude making efforts to one’s goal with to value working.

◆ In Junior High School

The time of searching realistically and selection temporarily.

- Understanding oneself affirmative and acquisition of valuing oneself.
- Forming career view and work view based on interest and concern.
- Making course plan and selection temporarily.
- Searching realistically about a way of life and course.

◆ In High School

The time of realistic search and attempt and preparation for transition to society.

- To deepen understanding oneself and accept oneself.
- Establishment career view and work view as select standards.
- Making plan of future and preparation for transition to society.
- Inquiring into course closely and temporary participation.

2. RESEARCH METHOD

2.1 Survey method

The interviews were carried out from the end of October to the end of November, 2017. First author conducted this survey of 5 career counselors who support university students about job hunting. The Questions are shown in Table 2.

Table 2 5 questions of interviews

A. What do you think are the issue about university students?
B. What is your opinions about current career education?
C. What skills or experiences are needed for job hunting or working?
D. What do you think about career education?
E. What is needed for career education in elementary school?

2.2 Analysis method

At first, we converted voiced data into text data and gave each label name by slicing a paragraph. And also the data were classified into small categories, large categories. Finally, we examined the relations among data and made a figure following each question.(Question D. and E. put in same figure because someone combined D. and E. answers.)

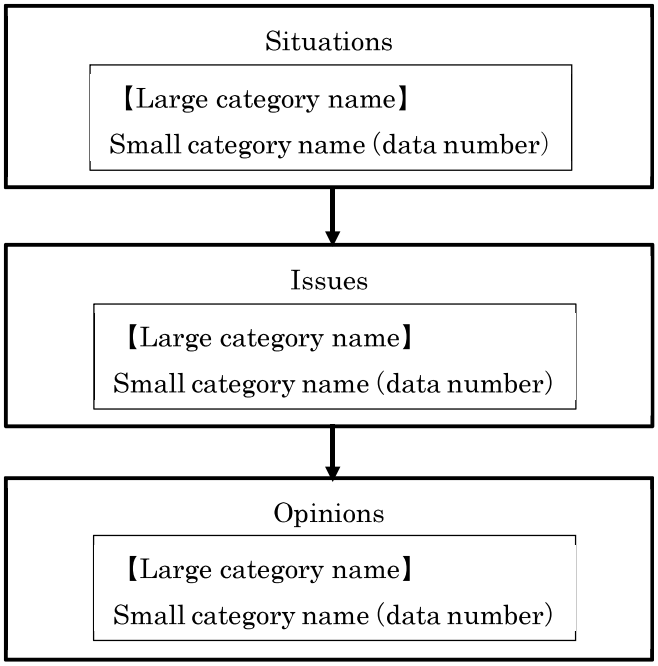


Figure 1 Methods of following classified figures

3. SURVEY RESULTS

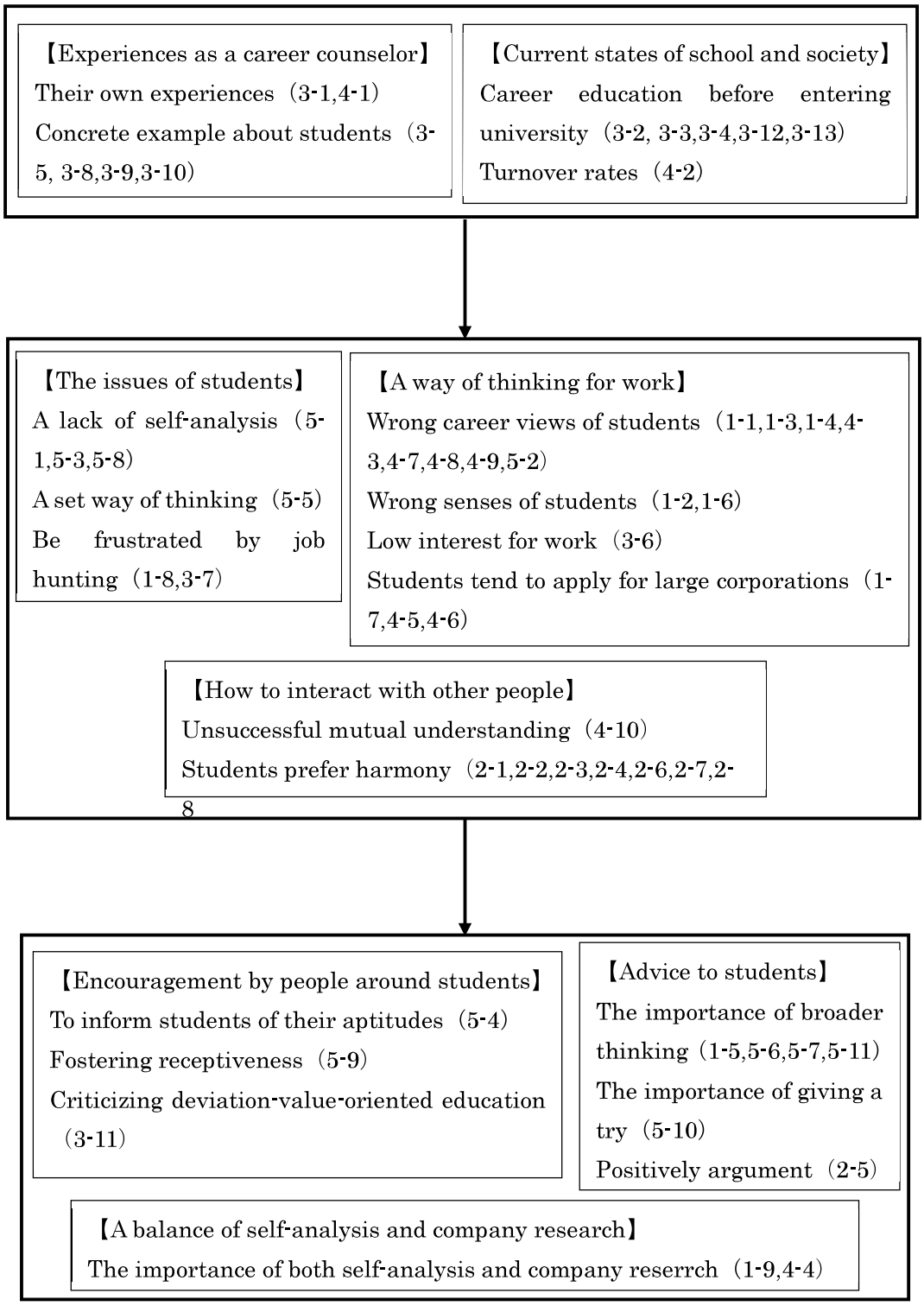


Figure 2 A. What do you think are the issue about university students?

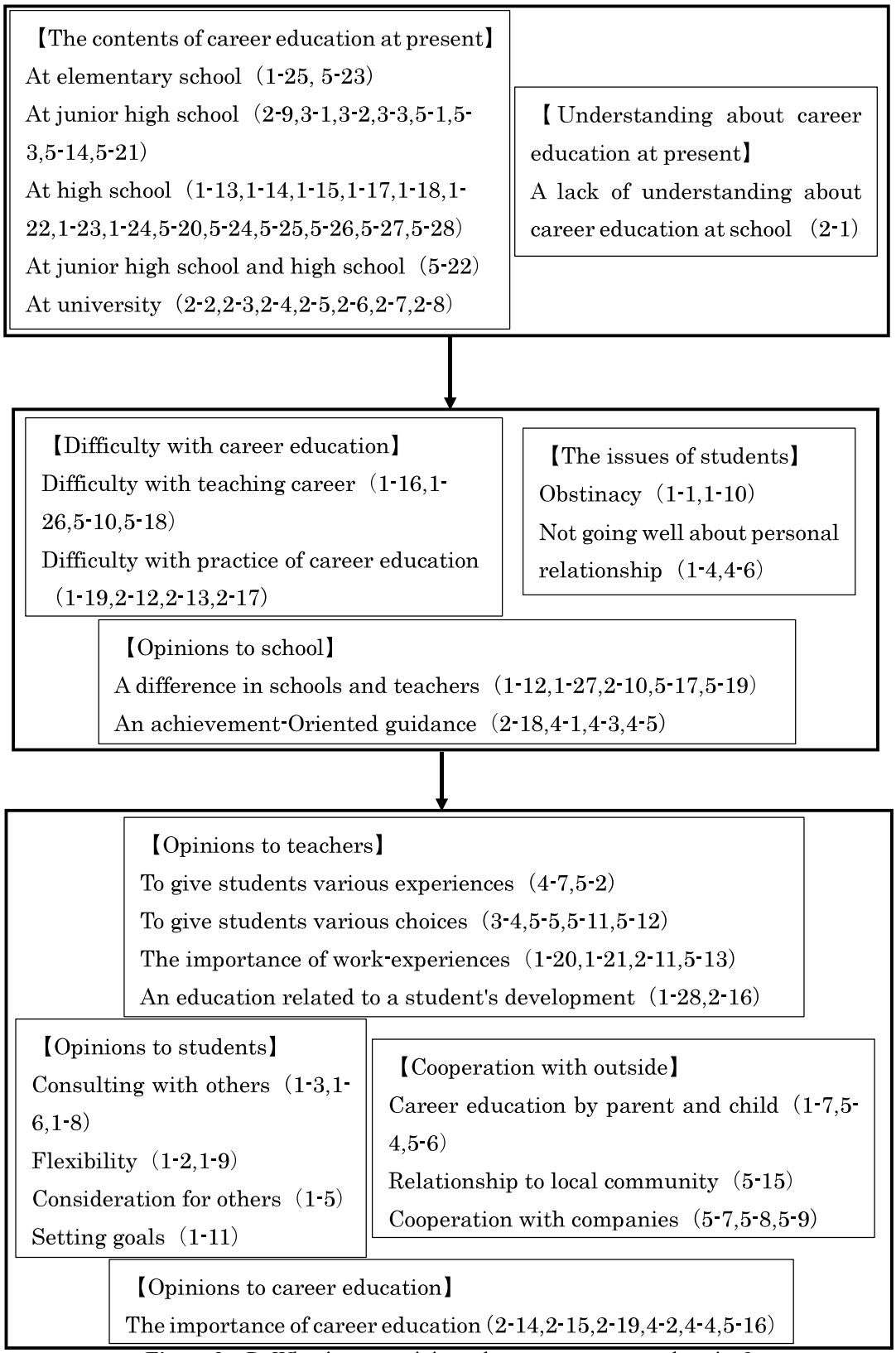


Figure 3 B. What is your opinions about current career education?

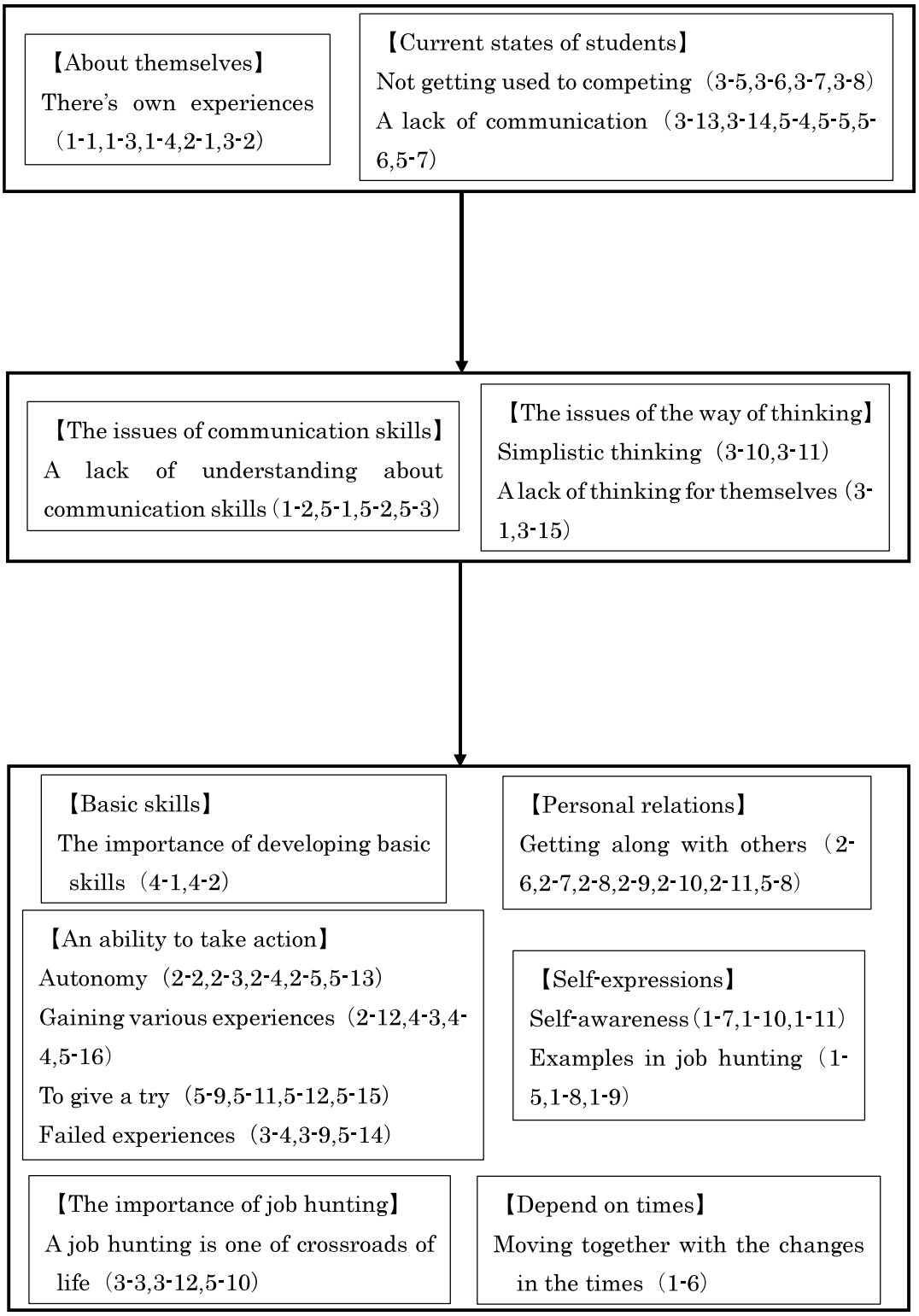


Figure 4 C. What skills or experiences are needed for job hunting or working?

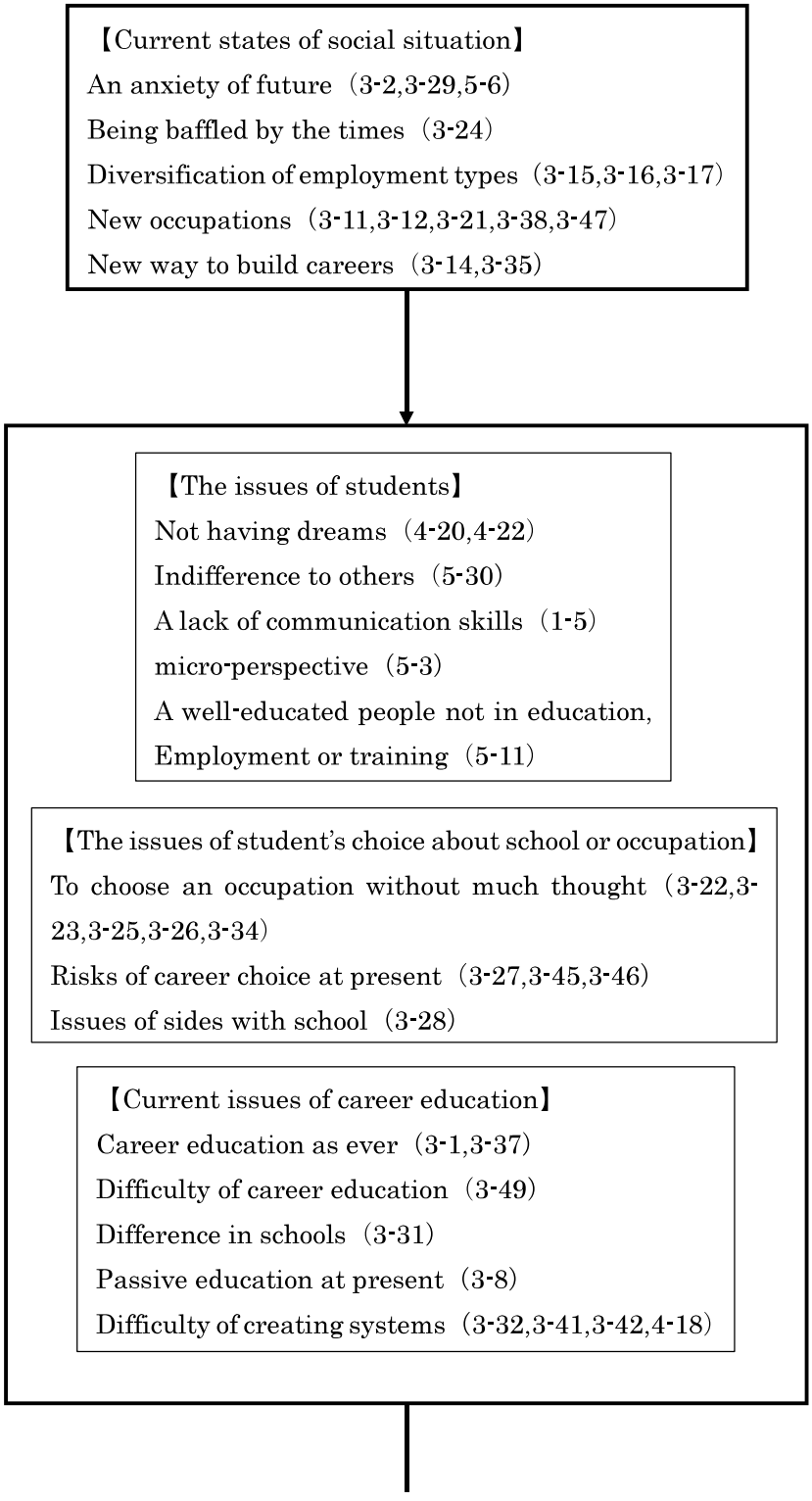
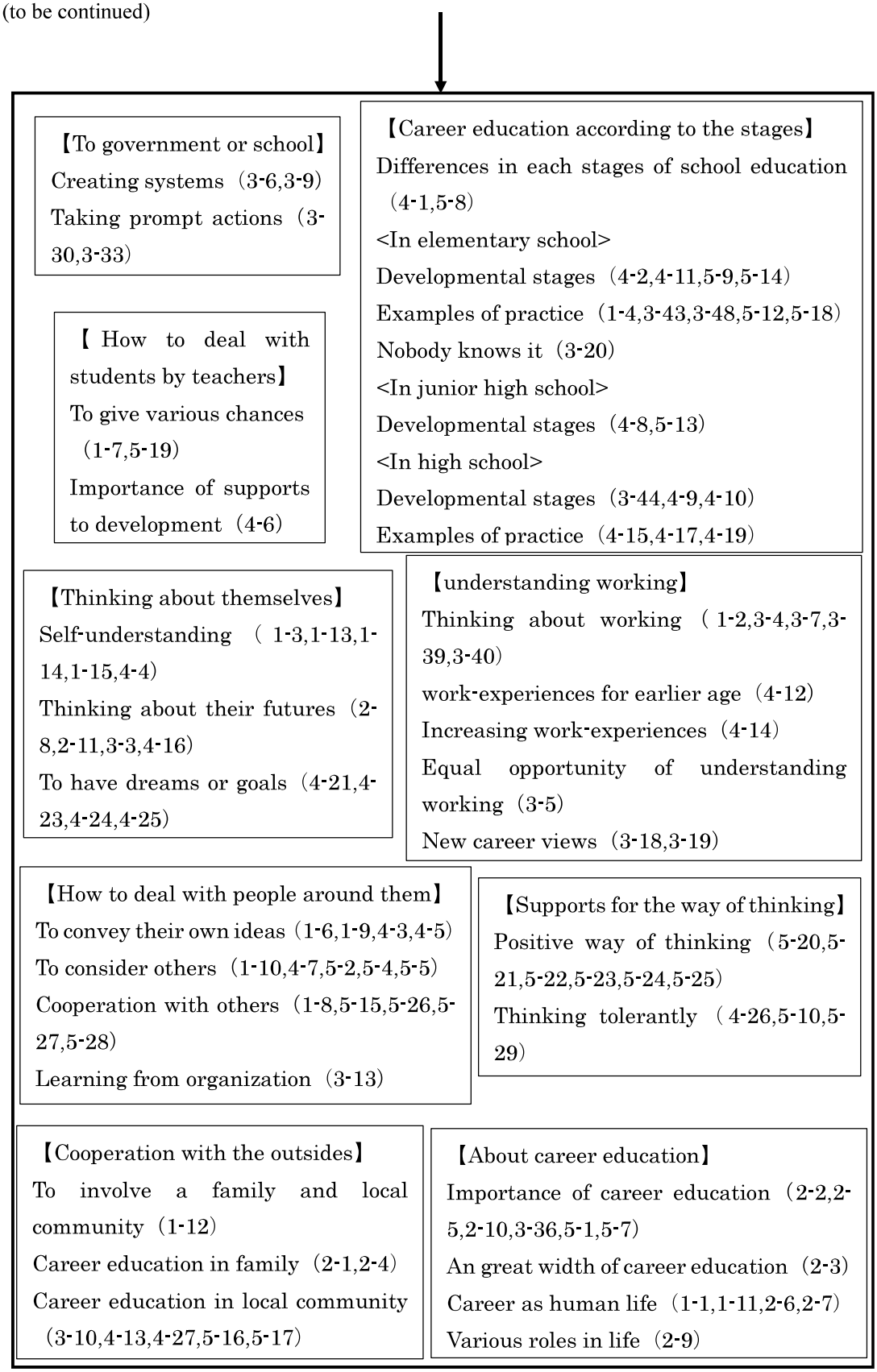


Figure 5 D. What do you think about career education?

E. What is needed for career education in elementary school?

(to be continued)



4. CONSIDERATION

4.1 Issues about students

・Mis-understanding themselves and having negative images about having dream.
・The way of thinking is fixed, simplistic, and thoughtless.
・Students mistake career views and work views and someone don't have interests for working.
・Mis-understanding communication skills.

4.2 Issues about career education

・An impression which Achievement-Oriented guidance is carried out.
・The difficulties about grasping career education itself.
・The difference of consciousness among schools and teachers.

4.3 Possibilities of career education in school

・ It is important to help and support children's development.
・ To shape programs of career education to the times.
・ To shape programs of career education to developmental stages.
・ Cooperation with the outsides: companies, students' families and local community.

5.CONCLUSION

As a result from interviews, it was clear that there were some issues about students. Consequently, career view and work view, the way of thinking, communication skills are parts of problems. Career education is a new educational field comparatively on the ground that it is proposed publicly in 2009. According to interviews, schools also have many issues about practice of career education. However, it was clear that career education have big effects on children at the same time. The first one we should do is to enhance interests for career education itself: "What kind of education is career education?" and "What skills and abilities are needed in career education?" And also, it is important that cooperation with school outsides, such as private enterprises, students' families and local community. In addition, shaping the programs of career education to developmental stages is necessary. Finally, we hope that career education become related closely with job hunting.

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Analysis of DEM Accuracy Using Inverse Distance Weighted Interpolation

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ABSTRACT: This study builds DEM and analyzes the accuracy of the DEM by using IDW (Inverse Distance Weighted) interpolation among spatial interpolation methods. The IDW interpolation used in DEM generation requires the setting of three input variables. The three variables are the number of points to use for interpolation, the resolution, and the maximum distance. This study built DEM depending on the changes in resolution value, number of points. The number of points is from 1 to 15. Resolution is 1m, 5m, 10m and 30m and DEM was made by the each resolution. A total of 60 DEMs were constructed and the accuracy analysis was carried out. The control points used in the accuracy analysis are 136 points. RMSE (root mean square error) was used for the analysis. As a result average of RMSE value by resolution and number of points is the fewest using 10m of resolution and 3 points. The RMSE value is 3.256m. Therefore, under the condition of spatial information of digital topography map 2.0 and IDW interpolation, using DEM analyzed at 3 point and 10×10 m as conditions of IDW is the most accurate.

1. Introduction

This study analyzes the accuracy of DEM constructed by IDW among spatial interpolation methods. IDW used in the construction of DEM needs to set three environment variables. The three environment variable are the number of points, the resolution, and the maximum distance. In this study, DEM was built depending on changes in the number of points and resolution. The number of points is from 1 to 15. Resolution is 1m, 5m, 10m and 30m and DEM was made by the each resolution. A total of 60 DEMs were analyzed for accuracy.

The control points used in the accuracy analysis are 134 out of 140 points except 6 error information points. RMSE (root mean square error) was used for the analysis. As a result average of RMSE value by resolution and number of points is the fewest using 10m of resolution and 3 points.

2. Spatial Data

This study area is Yongin city, Korea. Three counties of Cheoin-gu, Giheung-gu, Suji-gu and 24 administrative districts are administratively installed in this area. Geographically, it is composed of several narrow basins surrounded by mountains. Geographical statistics show average 171.17m, standard deviation 81.92m, minimum 18.65m and maximum 580m. It is also a multi-core city with many urban centers dispersed.

* Corresponding Author

Table 1 Result of RMSE

Region	Yong-In						
	Avg(m)	STD(m)	Min(m)	Max(m)	Count* (Points)	Area(m^2)	Area/Count (Points)
Value	171.17	81.92	18.65	580	6,535,505	591,277,822.53	90.47

(* Count is the sum of the points converted from points and contour to points.)

Spatial information is the digital topographic map 2.0 provided by the National Geographic Information Institute. The scale is 1: 5,000, the projection coordinate system is ITRF_2000_UTM_K, and it was made based on a longitude of 127.5 ° and a latitude of 38 °. We used spatial information of polygons, the height points, contour lines and the control points in the digital topographic map 2.0. The Administrative District is Yongin City, the point is 36,766, the line is 11,907, and the point is 140 points.

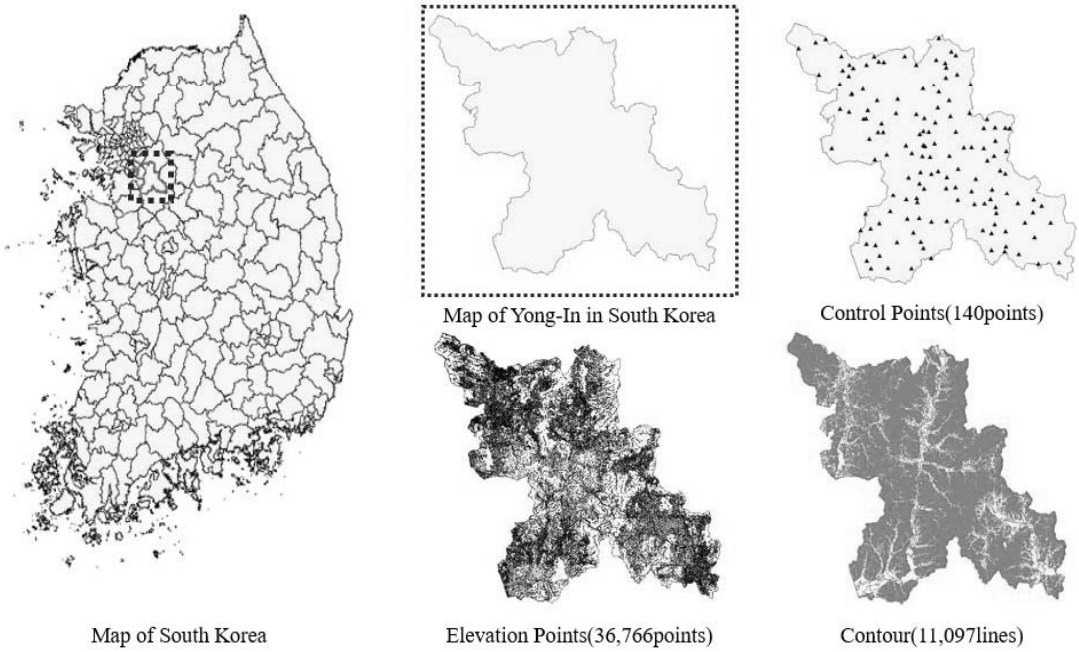

Figure 1 Digital Topographic Map 2.0

The height point is indicated where necessary to represent the state of the area by drawing. The contour lines are based on Incheon average sea level 26.6871m. The interval between the intermediate contour lines is 5.0m and the interval between index contour lines is 25m. The lines of Yongin City are 8570 intermediate contour lines (Convex terrain), 2079 index contour lines(Convex terrain), 349 intermediate contour lines(Concave terrain), and 99 2079 index contour lines (Concave terrain). When looking at the information, it can be seen that the distribution of convex terrain is higher than that of concave terrain.

The control point is four 2nd triangulation points, 17 3rd triangulation points, 58 4th triangulation points,

nine 1st benchmarks, 40 2nd benchmarks and 13 united control points. However, only 6 united control points can be used due to errors in the data. A triangulation point is the national control point based on the fundamental surveying and becomes the reference point of position and height. Like a contour line, an original benchmark is based on Incheon average sea level and is a criterion for determining the height. A unified control point is a multifunctional national surveying control point measuring horizontal position, height value and gravity value. These points, lines and control points are specified to be correctly entered legally.

Table 2 Data of Contour and Control Point

Contour	Intermediate Contour (Convex terrain)	Index Contour (Convex terrain)	Intermediate Contour (Concave terrain)	Index Contour (Concave terrain)
Number of Lines	8570	2079	349	99
Interval(m)	5	25	5	25

Control Point	2nd triangulation	3rd triangulation	4th triangulation	1st Bench Mark	2nd Bench Mark	Unified Control Point
Number of Points	4	17	58	9	40	6

3. Comparison of RMSE Value

RMSE values were compared by number of points and resolution. The RMSE values are as follows:

For resolution, the average of 1×1m DEM is 3.662m, 5×5m DEM is 3.726m, 10×10m DEM is 3.341m and 30×30m DEM is 7.519m. Accuracy of resolution is 10×10m DEM, 1×1m DEM, 5×5m DEM and 30×30m DEM as follows.

For Number of Points, At 15 points used, the RMSE value is maximum. 1×1m DEM is 3.721m, 5×5m DEM is 3.806m, 10×10m DEM is 3.449m and 30×30m DEM is 7.545. The minimum value is that 1×1m DEM is 3.602m at 2 and 3 points, 5×5m DEM is 3.631m at 2 points, 10×10m DEM is 3.256m used to three and 30×30m DEM is 7.485m at 4 points.

Table 3 Result of RMSE

RMSE(m)	Resolution			
Number of Points	1×1m DEM	5×5m DEM	10×10m DEM	30×30m DEM
1	3.643	3.656	3.268	7.488
2	3.602	3.631	3.261	7.522
3	3.602	3.634	3.256	7.502
4	3.618	3.668	3.266	7.485
5	3.631	3.689	3.281	7.492

(To be continued)

6	3.642	3.714	3.297	7.503
7	3.653	3.730	3.318	7.507
8	3.661	3.734	3.331	7.518
9	3.665	3.738	3.356	7.525
10	3.678	3.765	3.370	7.535
11	3.685	3.765	3.393	7.542
12	3.701	3.779	3.409	7.540
13	3.712	3.785	3.423	7.535
14	3.718	3.791	3.433	7.538
15	3.721	3.806	3.449	7.545
Average	3.662	3.726	3.341	7.519

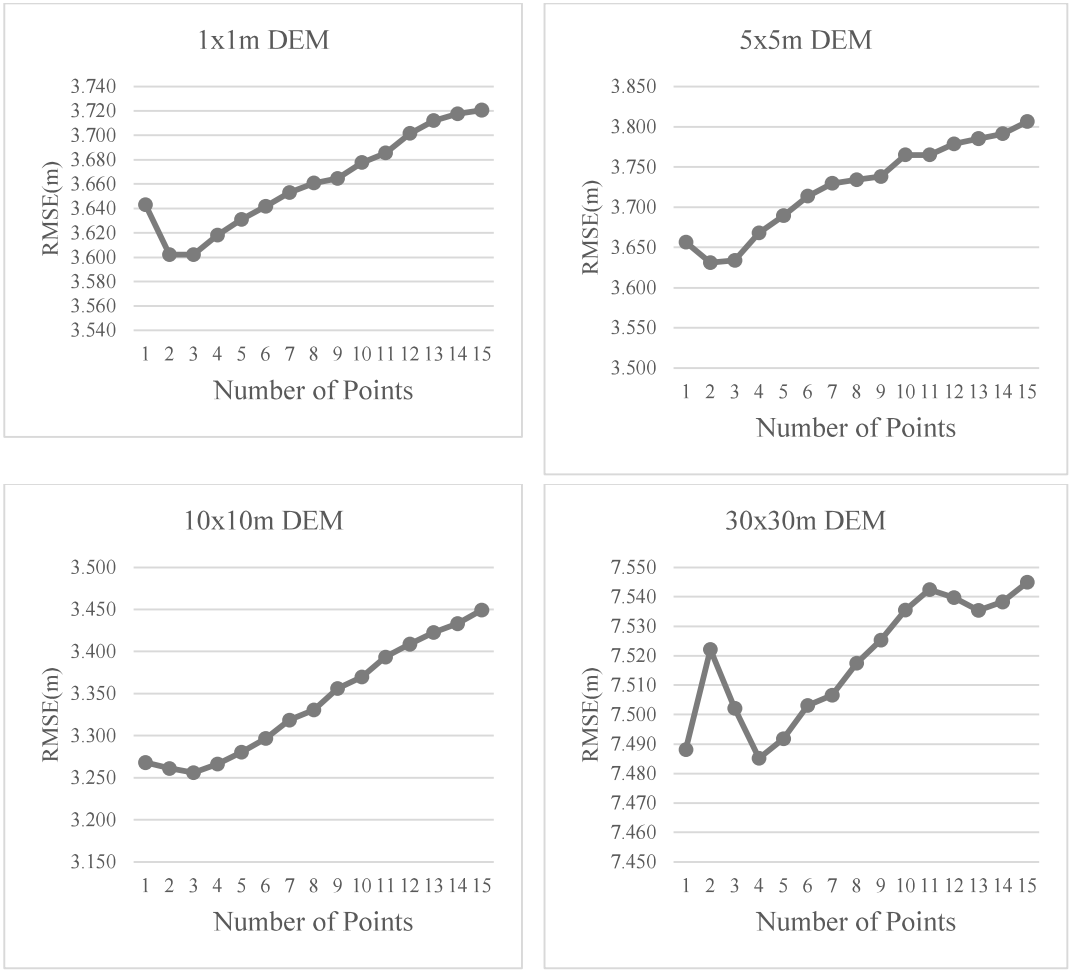

Figure 2 Comparison of RMSE considering the number of points per resolution

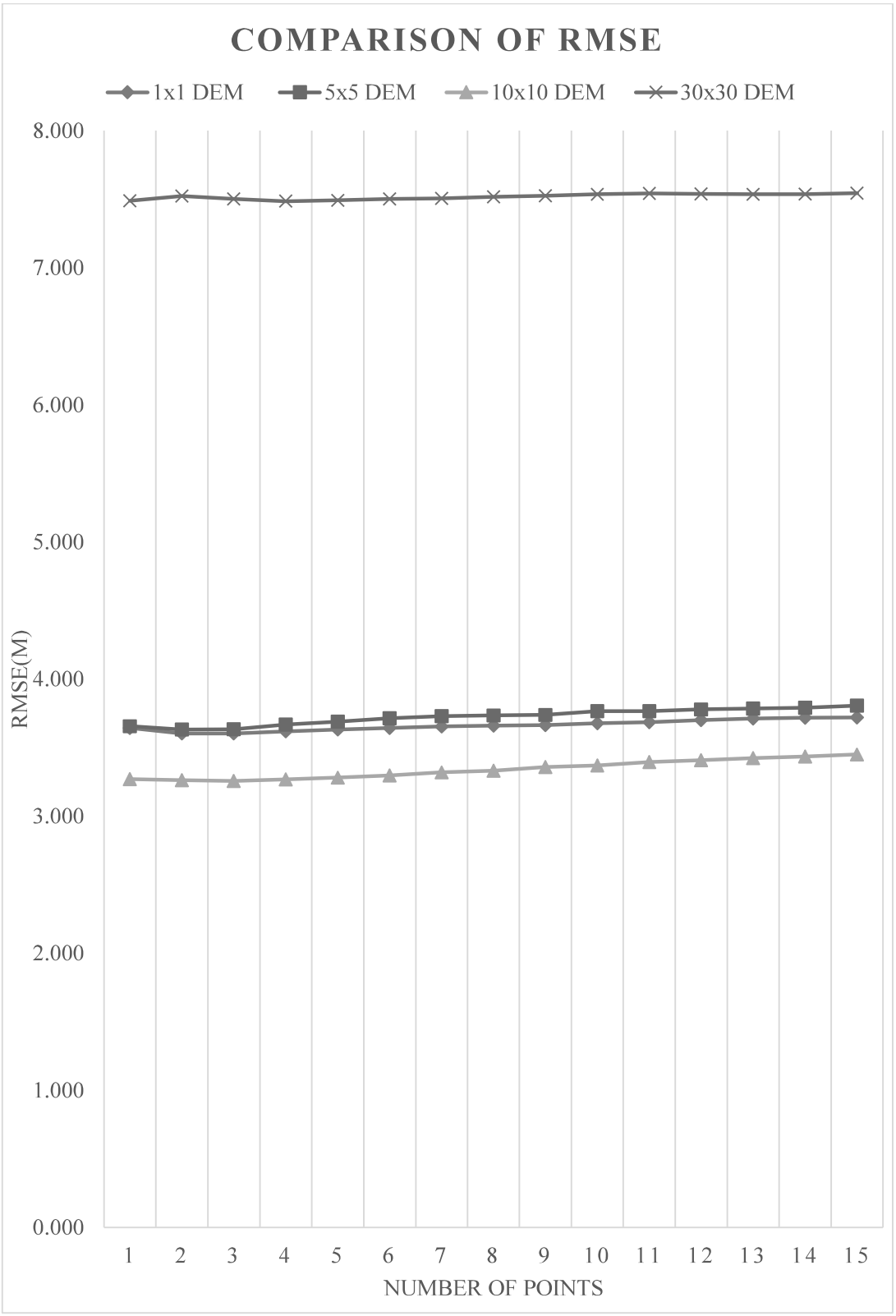

Figure 3 Comparison of RMSE considering number of points and resolution

4. Conclusion

This study analyzes the accuracy of DEM generated by IDW using the height point, contour line and the control point in the spatial information of digital topography map 2.0. A total of 60 DEMs are generated by number of points and resolution in the setting of two variables

First, When the average of RMSE values by resolution is compared, Accuracy was the highest at 10×10m DEM. Compared with the 10×10m DEM, there was a difference of 4.178m for the 30×30m DEM, 0.385m for the 5×5m DEM and 0.321m for the 1×1m DEM. The lower the resolution is, the smaller the difference is, but lower resolution does not mean to higher accuracy.

Second, When comparing the average of RMSE considering the number of points and resolution, using 3 points brought about the most accurate result. RMSE value was the lowest at the point where 3 points were used, and gradually increased as either more or fewer points was used. The difference between the maximum and minimum values in the number of points is that 1×1m DEM is 0.119m, 5×5m DEM is 0.175m, 10×10m DEM is 0.193m and 30×30m DEM is 0.060m. The average of difference between them is 0.137m and small value. But if needing high accuracy of analysis, it is consider for using number of points.

The conditions of this study include the height points, contour lines, and control points, which are the spatial information of the digital topography map 2.0 of the National Geographic Information Institute in Korea. DEM constructed with IDW is the most accuracy using 3 points and 10x10m DEM and RMES value is 3.256m. So DEM need to be decided to resolution considering the spatial information and the method of spatial interpolation.

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Comparison with a Free Association Test for Elementary and Junior High School Students of Japan and Korea

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ABSTRACT: This study is a comparison research of a free association test conducted by elementary school and junior high school students of Japan and Korea. The free association test on junior high school students was performed about 13 years ago. In this paper, we want to compare today's Japanese and Korean, through the association test survey for elementary school students. Through this research, it was found that the awareness of their families, their own and each other's countries values is different between Japanese and Korean of schoolchildren.

1. INTRODUCTION

Korea is a neighbor of Japan and has a close relationship with Japan historically. "Winter Sonata" was a big hit in 2003, and K-POP also became very popular. The number of Korean annual tourists to Japan has been increasing every year. About 4 million Korean in 2015 and around 4.2 million ones as of October 2016 visited Japan. We were interested in how we felt each other and own countries.

2. METHOD OF RESEARCH

We conducted the free association test in both Japan's elementary school and Korea's. After that, we carried out a cluster analysis and compiled the results of it.

Target: Affiliated Elementary School of Nagasaki University
Six grader 89
Hanyang Elementary School of Krea
Six grader 117

2.1 A FREE ASSOSIATION TEST

The free association method is a way that a researcher presents an arbitrary word as a stimulus word and respondents write words associated the stimulus word with freely. The characteristic of this survey is that the respondent can answer with a free idea without being caught by the investigator's thinking. This survey enable respondents to express unconsciousness and subconsciousness.

Example: the stimulus word “NAGASAKI”

NAGASAKI → Champon

NAGASAKI → Castella

NAGASAKI → Peace Park and so on

In this research, we selected the words “FAMILY”, “TEACHER”, “JAPAN”, “KOREA”, “FOREIGHNER”, “JAPANESE” and ”KOREAN” as the stimulus word. After this test, we classified associated words into three categories following grouping standard we decided. The results are shown in Table 1 as below.

Table 1. grouped categories

	Category 1	Category 2	Category 3
FAMILY	The words of “love” and “emotion”	A positive image on human relations	The others
TEACHER	The words of “respect” and “master day”	A positive image on human relations	
JAPAN / KOREA	History events, person’s name ,the then country name, era name before the world war Ⅱ	Current social situation (After the world war Ⅱ)	
FOREIGHNER / JAPANESE / KOREAN	A positive image on human relations	A negative image on human relations	

2.2 A CLUSTER ANALYSIS

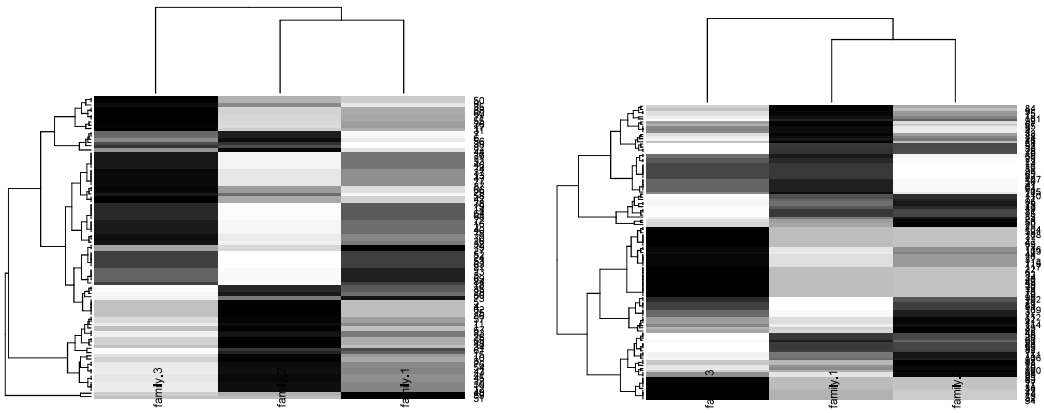
Cluster means "bunches" and "group" in English, and shows how many similar things are gathered. Cluster analysis is a method of collecting objects similar to each other among groups (subjects) in which different properties are mixed and making groups (clusters) and classifying the objects.

In this research, numerical data of free association survey is used and clusters analysis are carried out with using R language based on it. By using the R language, the results of association survey can be shown in Figure 1. Through this results, we can clarify the difference in consciousness between Japanese and Koreans.

3. RESULTS

Figure 1 is the result of associated words with the stimulus word ”FAMILY”. In Figure 1, the blacker color it is, the higher similar cluster is.

The results in Figure 1, the Japanese respondent have a wide black part. It means their thoughts are biased on their opinion, on the other hand, Koreans respondent have various gray color in their consciousness because there are many kinds of gray parts more than Japanese. Finally, our result can be classified into three clusters (A,B,C), and the characteristics of each cluster were analyzed.



(a) Japanese respondent (b) Korean respondent

Figure 1. visualized chart of cluster data

The characteristics of Japanese three clusters are

A: High similarity level of Category1

(There are many words classified as Category 1) 2%

B: High similarity level of Category2

(There are many words classified as Category 2) 25%

C: High similarity level of Category3

(There are many words classified as Category 3) 73%

The characteristics of Korean cluster are

A: High similarity level of Category1

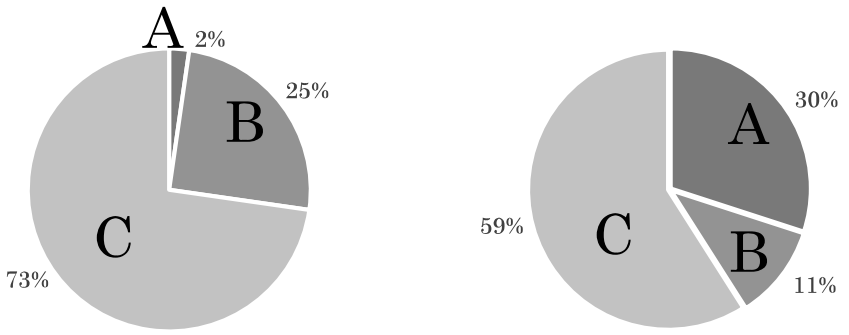
(There are many words classified as Category 1) 30%

B: High similarity level of Category2

(There are many words classified as Category 2) 11%

C: Various consciousness 59%

The proportions of the three clusters can be shown in the following graphs, respectively.



(a) Japanese respondent (b) Korean respondent

Figure 2. Results of cluster characteristics

According to our results, it concluded that there were 27% of the Japanese people who wrote "love" or "emotion" classified as Category 1 (clusterA:2%) and positive words classified as Category 2 (clusterB:25%), on the other hand 41% of Koreans wrote Category 1 words (clusterA:30%) and Category 2 words (clusterB:11%).

4. DISCUSSION

In the results of cluster analysis showed in Figure 2, Koreans have a strong consciousness of "love" for their "family" compared with Japanese. And they often wrote "uncle" and "aunt" in many times. This is because there are nicknames of each family members determined by the relationship of them with age / affiliation (maternal, paternal) of them in Korean. On the other hand, Japanese do not distinguish between "uncle" and "aunt". Japanese people often wrote family members, as only parents, siblings and pets. In our opinions, it means that Korean's family connections are strong and their relatives are like good brothers more than Japanese family type. It can be said that Korean people have strong family loving mind.

In addition, the difference between Japanese and Korean's associated words with the stimulus word "FAMILY" is that many Japanese wrote the words of action like "support me" and "get on counseling" ,while Koreans wrote the words of atmosphere like "making peace", "warm atmosphere"

On the other hand, Japan and Korea's consciousness to their own country, Japanese captured Japan and Japanese people better than 13 years ago. Koreans, however, wrote a lot of "President Park Geun-hye" and while there are many children who are concerned about their country in the future. However they are still proud of their country with "patriotism".

On the consciousness to each other country, Japanese also wrote "President Park Geun-hye ", it seemed that they were interested in Korea. However some children wrote "I do not know well". Meanwhile, Korean people have a strong image of history to Japan, so some people might have negative image for Japanese people.

5. CONCLUSION

From this survey, it is clear that there are many kinds of the difference between Japanese and Korean people's consciousness. Currently, we live in "information society" and "internationalization society", we can easily obtain foreign information and so on, but sometimes it gets wrong one. We need to grasp differences of ideas and cultural differences in the world so that we could exactly tell them to children as a teacher. Moreover, it is important to make it possible for children to deepen their international understanding based on the way foreign family members and foreign cultures.

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