ABSTRACT

In this research, a comparative study was done on the product design curriculums from nine sample Japanese national and public universities. Through the findings, some key characteristics were observed. Firstly, ‘Integrative’ subjects were gradually offered in the product design curriculum in the 1980s with an increased in numbers in the 1990s. But the emphasis of ‘integrative’ subjects differed among the sample universities. Secondly, the sample universities differed in the emphasis in offering diversity and flexibility in the study of professional education subjects. Thirdly, industrial experience was not emphasis for students to transit from school to work.

Keywords: Product design curriculum, Curriculum development, Curriculum structure

1. BACKGROUND AND PURPOSE OF RESEARCH

The beginning of the 1950s could be understood as the infant years of Japanese industrial design. This was could be seen by the formation of the design section in Matsushita Electric Industrial Co. Ltd, the first of its kind in the Japanese industry [1]. In the area of education, numerous product design programs were setup at university level since then [2]. The influence of Bauhaus’ pedagogical philosophies continued to leave traces in the present Japanese product design education, especially philosophy of the basic design course. The relationship between university education and Japanese industries was characterized by the fact that the industries offered a continual learning platform for graduates in the area of specialized professional knowledge [3]. University education was generally seen as a general and fundamental learning of a discipline [4].

In the view of product design education in Japanese universities, what role then does it play in the education of undergraduates? The curriculum can be perceived as interrelated plans and experiences that the learner had encounter under the direction of the school [5][6]. The purpose of this research is to clarify the product design education of undergraduates by identifying the characteristics of product design curriculum in Japanese universities at undergraduate level.

2. RESEARCH METHODS

The research was done through a comparative study of product design curriculum in nine selected Japanese national and public universities that offer product design program.

In this research, the comparative study would only focus on the professional education of the program at undergraduate level. The following methods are used to prepare the relevant data and information for comparative study.

(1) Literature review

In literature review, publications, between 1970 and 2008, from the nine sample universities were collected. The publications collected and reviewed were as followed:

a) Student Handbooks
b) School/Faculty and department magazines and brochures
c) Course Syllabuses
d) Study Guides
d) Historical documents that had recorded the
setting up of the university and the industrial design program.

(2) Field visit to selected universities
Interview and consultation with the lecturers and students were done when possible.

The data collected were consolidated based on:

a. Education philosophies, historical background and admission policies in each university
The educational philosophies and historical background provides the background understanding on the directions and aims that the school.

b. Curriculum structure
The curriculum structure formed the plans and experiences that the undergraduates will go through during the learning of product design. The curriculum structure describes the subjects, the form of learning that the undergraduates will go through at different stage during the course of study. The curriculum structures in the respective product design programs in the sample universities were put together in terms of time period - 1970s, 1980s, 1990s, 2000s.

c. Proportion of Study Contents
The study of product design is governed by the credit requirements for graduation. The credit requirements determined the amount of time spent in lecture, practical and seminar in the curriculum. The amount of credits allocated to the study of compulsory professional education subjects and electives were presented in the form of graphs to understand the room for flexibility and diversity in the learning of product design.

3. RESEARCH FINDINGS
In this study, nine national and public Japanese universities offering product design program were used as samples. The demographics for the sample universities are shown in Table 1. The key findings are presented in the following sections.

3.1 TRANSITIONS OF CURRICULUM, 1970s TO 2000s
Based on the literature reviews, the curriculum structures of the nine sample universities were consolidated.

<table>
<thead>
<tr>
<th>Table 1. Sample universities demographics</th>
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<td>Type of University</td>
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<td>Public University</td>
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3.1.1 Product design curriculums in the 1970s
From the available data and information collected, product design curriculums from 5 sample schools could be consolidated and shown in Figure 1.

In the early years of study, Basic Design Course in year 1 and 2 could be seen to be offered to students for foundation studies in Tokyo University of the Arts and University of Tsukuba. Basic Design Course could be traced back to the Bauhaus educational philosophy for foundation building in junior study years before entering into specialized study. This could be explained by the return of Bauhaus graduates, Mizutani Takehiko and Yamawaki Iwao who both used to teach in Tokyo University of Education (currently University of Tsukuba) and Tokyo University of Fine Arts and Music (currently Tokyo University of the Arts) respective. Mizutani and Yamawaki were one of those who had been involved in the introduction and promotion of Bauhaus education in Japan. In the 1970s, the concept and pedagogy of basic design teaching could still be seen in the design education in Japan.

From the curriculum structures, two types of characteristics could be observed. The first characteristic would see professional subjects being offered under specialization groups in the form of chair groups in the curriculums offered in Chiba University, University of Tsukuba, Kyoto Institute of Technology and Kyushu Institute of Design. Each chair group represented a certain field of specialization. The second characteristic could observe a more practical-
It is generally believed that design is integrative, and interdisciplinary [7][8][9][10]. It is not just the study of a diverse knowledge from different fields of specialization in the design discipline and from other discipline, avenues are required for integrating and applying these knowledge. The amount of subjects that provided opportunities for students to integrate the different knowledge obtained through integrative projects is consolidated in Figure 2. These types of subject will be called ‘integrative’ subjects in this study.

Out of five universities, ‘integrative’ subjects were offered in Tokyo University of the Arts and University of Tsukuba. In Tokyo University of the Arts, ‘integrative’ subjects like Design Seminars were offered in year 1 and 2. In year 3 and 4, Industrial Design Process A and B were offered. These subjects were all compulsory professional education subjects. In the University of Tsukuba, ‘integrative’ subjects like Product Design Seminar I, II and III and Product Design Integrative Seminar were offered as electives from year 3 onwards. The amount of credits allocated for these subjects also differed in both of the programs. Tokyo University of the Arts seemed to allocate higher credits in the ‘integrative’ subjects. In other words, students tend to spend more time in ‘integrative’ subjects in Tokyo University of the Arts.

3.1.2 Product design curriculums in the 1980s

Due to the availability of information, the curriculums and syllabuses in Aichi Prefectural University of Arts and Music were available for inclusion in the analyzed.

Figure 3 shows the product design curriculum structures of six sample universities. From the figure, two distinct trends could be observed. Firstly, it was

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Figure 1. The curriculum structures of product design curriculums in sample universities in the 1970s

Figure 2. The number of ‘integrative’ subjects in the product design curriculums in sample universities, 1970s
observed that ‘integrative’ subjects were gradually offered in more product design curriculums. Figure 4 shows the number of ‘integrative’ subjects that were offered in the product design curriculums in the sample universities. Besides Tokyo University of the Arts and University of Tsukuba, ‘integrative’ subjects were offered in Kyoto Institute of Technology and Aichi University of Fine Arts and Music.

In Kyoto Institute of Technology, ‘integrative’ subjects were offered as followed, Basic Design Practical 1 (year 1), Basic Design Practical II and III (year 2), Design Planning I (year 3) and Design Planning II (year 4). In Aichi Prefectural University of Fine Arts and Music, Design Studio I to IV were offered starting from year 1 to year 4 respectively.

The credits offered for ‘integrative’ subjects had differed among different faculties. Fine art/art oriented faculties like Tokyo University of the Arts and Aichi Prefectural University of Fine Arts and Music seemed to allocate a higher amount of credits for ‘integrative’ subjects.

The second trend was observed in Chiba University and Kyushu Institute of Design as they seemed to have a tendency of emphasizing on a broad-learning of professional education subjects across the different fields of specialization.
3.1.3 Product Design Curriculums in the 1990s

In the 1990s, Hiroshima City University, Okayama Prefectural University and Nagoya City University had started to offer product design program at undergraduate level. The curriculums for product design in the 1990s are presented in Figure 5.

Figure 5. The curriculum structures of product design curriculums in sample universities in the 1990s
From the figure, it could be observed that 'integrative' subjects were offered in the three new product design programs offered in Okayama Prefectural University, Hiroshima City University and Nagoya City University. In Okayama Prefectural University, Product Design Practice I-III were offered between year 2 and year 3. In Hiroshima City University, in year 1: Basic Form Practical I (2D), Basic Form Practical I (3D), Design Practice I, in year 2: Basic Form Practical II (2D), Basic Form Practical II (3D) and Design Practice II, in year 3: Basic Form Practical III and in year 4: Plastic Arts Practice II. In Nagoya City University, Design Projects in Human Environment Design I-IV were offered between year 2 and year 4.

In 1997, ‘integrative’ subjects started to be offered in the product design curriculum in Chiba University and Kyushu Institute of Design. In Chiba University, ‘integrative’ subject like Collaborative Research and Design Projects was offered as an avenue to allow students to apply and synthesize the acquired knowledge. This subject was offered as an alternative to Graduation Thesis and contained projects that were in collaboration with the industries. As in Kyushu Institute of Design, ‘integrative’ subject like Practice in Industrial Design was offered as an elective.

Figure 6 shows the number of ‘integrative’ subjects offered in the nine sample universities. From the figure, a trend could be observed in the amount of credits allocated for ‘integrative’ subjects. Product design curriculums in engineering and design oriented faculties like; School of Design (University of Tsukuba), Faculty of Engineering (Chiba University), Faculty of Engineering and Design (Kyoto Institute of Technology), Faculty of Design (Kyushu Institute of Design and Okayama Prefectural University) and School of Design and Architecture (Nagoya City University) had offered ‘integrative’ subjects of not more than 6 credits.

From this trend, it could be deduced that students in art oriented faculties, in general, spent more time in ‘integrative’ subjects which at many time, also involved practical workshops. Ishimura [11] had explained that towards the 1990s, with the introduction of Doctorate programs in the graduate schools, design faculties and design departments were slanting towards two style of approaches. The first was the emphasis on strengthening of research and the second was to the emphasis on practical skills and techniques. For faculties that take the former approach would see the time spent on practical workshops being shortened. Computer CG modelling had also gradually increased in place of time and labour intensive activities like model making [12].

3.1.4 Product design curriculums in the 2000s

In the 2000s, the product design curriculums in Chiba University and University of Tsukuba had undergone restructuring. The curriculums for the nine sample universities are presented in Figure 7. The product design curriculum in Chiba University had restructured into a more integrative, system-based and thematic in the study of product design.
**DIVERSITY AND UNITY**

**Figure 7. The curriculum structures of product design curriculums in sample universities in the 2000s**

<table>
<thead>
<tr>
<th>University</th>
<th>Curriculum Structure</th>
<th>Core Subjects</th>
<th>Foundation Subjects</th>
<th>Elective Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiroshima City University</td>
<td>(Curriculum Structure between 2000-2008)</td>
<td>- Professional Education:</td>
<td>- Product Design Theory</td>
<td>- Product Design Practice 1, 2</td>
</tr>
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<td></td>
<td></td>
<td>- Graduation Thesis</td>
<td>- Product Design Seminar</td>
<td>- Product Design Practice 3, 4</td>
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<td></td>
<td></td>
<td></td>
<td>- Product Design Practice 5</td>
<td></td>
</tr>
<tr>
<td>Okayama Prefectural University</td>
<td>(Curriculum Structure between 2000-2008)</td>
<td>- Common Subjects</td>
<td>- Common Subjects</td>
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<td></td>
<td></td>
<td></td>
<td>- Electives Subjects</td>
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<td></td>
<td></td>
<td></td>
<td>- Design Studio IV: Thematic Design Projects</td>
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<td></td>
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<td></td>
<td>- Graduation Thesis or Graduation/Research of Design</td>
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<tr>
<td>Kyushu University (2003 onwards)</td>
<td>(Curriculum Structure between 2000-2008)</td>
<td>- Professional Education:</td>
<td>- Course major Compulsory Subjects, Subjects offered by other departments (same as electives)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- Graduation Thesis and Design</td>
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<tr>
<td>Kyoto Institute of Technology</td>
<td>(Curriculum Structure between 2000-2008)</td>
<td>- Professional Education:</td>
<td>- Course Technical Subjects</td>
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<td></td>
<td></td>
<td>- Graduation Thesis and Design</td>
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<tr>
<td></td>
<td></td>
<td>- Graduation Thesis &amp; Design</td>
<td></td>
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<tr>
<td>University of Tsukuba</td>
<td>(Curriculum Structure between 2000-2008)</td>
<td>- Basic Design Course</td>
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<td></td>
<td></td>
<td>- Basic Design Course Elective Subjects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tokyo University of the Arts</td>
<td>(Curriculum Structure between 2000-2008)</td>
<td>- Specialized Fundamentals</td>
<td>- Specialized Fundamentals</td>
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<td></td>
<td></td>
<td>- Specialized Course Elective Subjects</td>
<td>- Specialized Course Elective Subjects</td>
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<td></td>
<td></td>
<td>- Design Fundamentals</td>
<td>- Specialized Course Elective Subjects</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 7. The curriculum structures of product design curriculums in sample universities in the 2000s*
Professional education had been offered in themes like Technical Design, Transportation, Environment Design and Media Design. More ‘integrative’ subjects were also offered in year 1 and 2. It could be understood that ‘integrative’ subjects had increased in numbers.

In the University of Tsukuba, professional educational subjects in different fields of specialization were mainly studied as electives offered in respective study year. Parallel to the study of specialized subjects were a set of ‘integrative’ subjects offered in each study year. This seemed to provide students with opportunities to synthesize and apply specialized knowledge learned in each year.

In fact, product design curriculums in the sample universities seemed to be adopting a similar trend of curriculum structure since the 1980s. Professional education subjects in different fields of specialization had been offered as either compulsory, compulsory elective or electives and studied in parallel with a set of ‘integrative’ subjects offered throughout the four year duration.

Figure 8 shows the number of ‘integrative’ subjects offered in the sample universities. In the 2000s, it could be observed that all universities had offered ‘integrative’ subjects. It could be observed that fine art/art oriented faculties continued to have a higher emphasis in ‘integrative’ subjects.

3.2 DIVERSITY AND FLEXIBILITY

As mentioned previously, professional education subjects were offered as either compulsory, compulsory electives or electives. In this study, compulsory electives were considered as electives. Compulsory subjects provided a structure for core knowledge. Electives provided students with the room for diverse and flexible learning based on individual interest. But how much diversity and flexibility was provided to students in the sample universities? Figure 9 and 10 present the percentage of credits that were allocated for compulsory subjects and electives subjects with respect to the total credit requirement for graduation.

Figure 9. Percentage of credits allocated for compulsory professional education subjects

Figure 10. Percentage of credits allocated for elective professional education subjects
From Figure 9, it could be observed that product design programs in Tokyo University of the Arts, Aichi Prefectural University of Fine Arts and Music and Hiroshima City University had emphasized on a higher percentage credits (at least 60% and above towards 2008) for compulsory professional education subjects. It could also be understood from previous sections that majority of these compulsory professional education subjects consisted of ‘integrative’ subjects with high credit allocation.

On the other hand, product design programs in the rest of the sample universities had generally less emphasis (generally 40% or below towards 2008) in offering compulsory professional education subjects.

In the area of elective professional education subjects, product design curriculums in Tokyo University of the Arts, Aichi Prefectural University of Fine Arts and Music and Hiroshima City University had relatively less emphasis (generally 20% and below towards 2008) on offering elective professional education subjects.

On the other hand, product design programs in the other sample universities tend to have a higher emphasis (generally 27% and above towards the 2008) on the offering elective professional education subjects.

From these findings, it could be understood that fine art/art oriented faculties, tend to have a higher emphasis on having a more structured learning of common design knowledge, skills and techniques and a less emphasis on a diverse and flexible study on specialized knowledge. On the other hand, design oriented faculties tend to emphasized more on a diverse and flexible learning of knowledge in different fields of specialization or disciplines and a less emphasis on having a structured learning of common design knowledge, skills and techniques.

### 3.3 INDUSTRIAL EXPERIENCES

In undergraduate study, internship programs are often offered help students to transit from school to work. But the employment pattern in Japan was characterized by the fact that the knowledge and skills acquired by students during university education was considered as secondary by the industries. Industries have a tendency of viewing graduates as ‘raw’ materials and in-firm training during the initial years of work would equip graduates with the necessary professional and specialized skills and knowledge required for work.

With the above considerations in mind, a review was done through the curriculums collected to clarify the emphasis on internship programs in the nine sample universities. From the review, it was found that internship programs were not offered in some of the sample universities.

In the product design curriculums reviewed, Internship programs were found to be offered in Kyoto Institute of Technology (1999 onwards), Chiba University (2006 onwards), Kyushu University (formerly Kyushu Institute of Design) (2006 onwards) and Hiroshima City University (2008 onwards). Internship programs were offered as electives with between 1 to 2 credits.

For universities that did not offer internship programs, alternative programs were offered as electives for students to understand the working environment in the industries, the manufacturing processes, working and design processes in design departments or design offices. These programs were usually called Industrial Practical or Field Practices. In fact such programs were offered as early as in the 1970s in Tokyo University of the Arts and University of Tsukuba. In Okayama Prefectural University, Field Practice and Industrial Practice electives were offered since 1997. In fact, it was noticed that some ‘integrative’ subjects had also provided students with opportunities in industrial collaboration projects to allow students to stay relevant to the industries and society.

It seemed that universities tend to have less emphasis on internship programs that prepare students for work. It might be that universities and industries in Japan both play a role in the education of students. Universities education would tend to provide fundamental knowledge and skills while the industries would provide further education in professional and specialized knowledge and skills.

### 4. CHARACTERISTICS OF PRODUCT DESIGN CURRICULUM

Based on the findings, the characteristics of the product design curriculum in Japanese national and public universities could be stated as followed:

1) ‘Integrative’ subjects were gradually offered in product design curriculum in the 1990s. The
allocation of credits differed in most universities but generally showed two distinct trends. Fine art/art oriented faculties tend to allocated more credits (mostly 5 credits and above) in the ‘integrative’ subjects whereas engineering and design oriented faculties tend to allocated lesser credits (mostly 4 credits and below).

2) The emphasis on ‘integrative’ subjects could also be viewed as two distinct trends. Based on the allocation of credits for the ‘integrative’ subjects, it could be understood that the product design curriculums in fine art/art oriented faculties in Tokyo University of the Arts, Aichi Prefectural University of Fine Arts and Music and Hiroshima City University had emphasized more study time in the ‘integrative’ subjects. While product design curriculums in Chiba University (with the exception in the 2000s), University of Tsukuba, Kyoto Institute of Technology, Kyushu University, Okayama City University and Nagoya City University had in general had a less emphasis on the amount of study time in ‘integrative’ subjects.

3) The percentage of compulsory and elective professional education subjects differed among two groups of universities. The Fine art/art oriented faculties emphasized more on a structured and common study of knowledge and skills while offering less emphasis in diverse and flexible learning. On the other hand, the design oriented faculties had emphasized on a diverse broad-based and flexible learning across different fields of specialization.

4) In general, Japanese universities do not emphasis on a compulsory internship programs as universities tend to aim at providing fundamental knowledge and skills that may or may not gear towards training for the industries.

5. CONCLUSION

Through the findings, it could be observed that ‘integrative’ subjects had gradually increased in product design curriculums to provide an avenue for students to integrate diverse skills and knowledge. As the boundaries between the different specializations become blurred, it is necessary for product designers to synthesize knowledge from different design specializations and also to understand the problems view from the perspectives of different disciplines so as to make appropriate decisions with respect to humanity and environment. In the area of educating prospective design professionals, the findings in this research showed the dilemma in product design curriculums where a balance is required to provide a diverse and flexible learning of design specializations and at the same time, providing the sufficient time and avenues for synthesizing and application of knowledge. While undergraduate program should not be overly devoted to strengthen research, it should be kept in mind that a large number of undergraduates move on to graduate schools in Japan, a lack of fundamental knowledge on design specializations would weaken the foundation for graduate study. In the area of keeping students relevant to the industries and society, ‘integrative’ subjects should continue to provide opportunities for students to be involved in industrial collaboration projects.

REFERENCES