Cultural Influences in Design

Jean-Luc Herbeaux, Richard Bannerot

RohMax Additives GmbH / University of Houston

Abstract

A short design project was given concurrently to sophomore engineering students at the Kanazawa Institute of Technology (Ishikawa, Japan) and at the University of Houston (Texas, USA) as part of the first engineering design course taken in both curricula. Students were asked to design and build at least one low-cost device whose main purpose was to support a set of chopsticks while not in use. The project was introduced in the first week of the Japanese and US design classes with minimal guidance from the instructors to provide the engineers-to-be with a first experience in design. The (intentional) lack of technological challenge did not necessarily mean that the project was easy as each student population had to face its own challenges. The product to be designed, while foreign and mostly unknown to the US students, is very well known and deeply traditional in Japan. In general, the US students attempted to design devices with more than one function. Predictably, some of the US projects resulted in products, which despite their originality and functionality, were unsuitable for the Asian market as they violated some of the traditional cultural values of Asia. In the Japanese projects, the originality did not appear at the function level but in the way esthetics and recycle-ability were treated. Work samples submitted by both student groups are described and evaluated in this paper. Design trends are commented upon and analyzed in light of the cultural and behavioral characteristics of the two groups.

Introduction

The world's economy and industries are becoming increasingly global. But it spite of the globalization efforts in economic, industrial, and financial circles, engineering instructors rarely implement international collaborative efforts in teaching and seldom know how programs operate in foreign countries. Of course, many institutions offer selected students opportunities to study or even work abroad, but these international experiences rarely benefit the entire student body. International collaborative experiences in teaching can be beneficial to both instructors and students. They may acquaint instructors with new teaching tools and methods, provide valuable data regarding differences between student populations and eventually provide answers on discrepancies between engineers' behaviors and competitiveness in the workplace. Students would undoubtedly benefit from such experiences by widening their understanding of foreign countries and associated cultures. The acquisition of such knowledge is particularly important in

the context of international design practice. This paper describes the implementation and results of a design project developed and offered jointly by design instructors at the University of Houston (Texas, USA) and the Kanazawa Institute of Technology (Ishikawa, Japan). While this project is a very small step towards international collaboration and information exchange, it demonsrtrates a cultural "disconnect."

The Participants

The Kanazawa Institute of Technology (KIT)[1] is Japan's largest institution of higher learning specializing in engineering and technology. A new sophomore level, two course sequence in engineering design was introduced as part of a new curriculum launched in 1995 in an effort to promote the integration and application of acquired knowledge and skills. The main objective of this new sequence was to provide students of all engineering majors with a first opportunity to experience and implement the design process. This design experience and their newly developed understanding of some of the methods and tools available to designers are expected to enhance the students' ability to solve open-ended (and often ill-defined) problems in real life settings. Each course requires the students to participate in a quarter-long team project (typically involving the rethinking and redesign of a real life artifact) from the problem discovery stage, to a problem statement, and eventually to the detail design stage. Most teams (composed of five or six students) work on different projects as each problem statement is derived from the teams' findings at the problem discovery stage. Most students entering this two course sequence have had no previous experience in design as the Japanese high school educational system emphasizes knowledge acquisition with little consideration for applications and open-ended problem solving. The typical KIT sophomore student is twenty years old and finished high school two years prior to his/her enrollment in the first course of the sequence. An average of two thousand students enroll each year in each of these two core courses. Ten to twelve equivalent full time faculty members, of both Japanese and foreign origin, coordinate their efforts to develop and teach the courses. The lecture time is principally used to provide guidance to the students relative to the design process and to introduce design tools and methods.

The Department of Mechanical Engineering at the University of Houston (UH) has required a sophomore design course since 1981. The course's content and philosophy changed significantly in 1991 as described previously[2]. Despite regular modifications to the lecture material since 1991, the main objective of the course has remained the same, namely to allow students to experience the design and fabrication processes during a semester-long project. Teams of four students each are required to participate in a class wide design competition involving the design, fabrication and testing of a system which must perform a set of functions under the constraints set by the instructors[3]. Typically a minimum performance level is required to pass the course. Superior performance levels are encouraged by establishing performance goals and a figure of merit evaluation scheme. In the lectures, the teaching team[1] attempts to provide insights on the multiple facets of design, by addressing such topics as engineering ethics, engineering economy, manufacturing, shop practice, esthetics[4], intellectual property, personality and working in teams issues and ergonomics and also by providing students with guidance relative to the design process [5].

The courses at KIT and UH share some common points. In both courses, students perform significant design work as they are required to not only conceptualize but also finalize their solutions. Both student bodies exhibit a clear lack of design experience as they enter the course although the more heterogeneous UH students tend to have some industrial experience and access to personal or company tools, equipment and work space. KIT students mostly live in student housing and have no industrial experience. In both courses, emphasis is put on the use and application of skills rather than on the acquisition of knowledge. Most of the learning is achieved through doing and a large percentage of the course content is therefore allowed to vary. In both courses, appropriate feedback and support are given to the students during their design journey but no "recipes" are provided. Students are encouraged to explore and make mistakes.

In summary, the differences between courses can be found in the level of homogeneity in the two student bodies, the more restrictive time constraints imposed on the Japanese course (The KIT academic year is composed of three ten-week "quarters" while the UH has two thirteen-week semesters.), the population size, and the access to personal tools and equipment.

Project Description

This project involves the design and fabrication of a low-cost device whose main purpose is to support a set of chopsticks while not in use (i.e., a chopsticks rest or haski oki, in Japanese) during a meal for the Japanese market. This project was introduced in the first week of the Fall 1997 offerings of both the US and Japanese design courses. In both countries the instructors provided only minimal guidance to afford the engineers-to-be with a first brief experience in design before they had to tackle their major project for the semester. The project and the associated results were used during the remainder of the course to explain good versus poor design practice by example. The forty American students were asked to submit their results individually. In Japan, the instructing team opted for team submissions because of time constraints. The project was assigned to teams of five and six members across the twelve sections (a total of four hundred students). The time allotted to the project was one week in Japan and two weeks in the USA.

Existing Solutions and Table Manners [6,7]

Before examining the students' submissions, it is useful to introduce some of the existing solutions and to discuss Japanese table manners. Chopsticks are used in most parts of East Asia to prepare and eat food. They are available in a variety of lengths and materials. Japanese chopsticks are the shortest of all and are typical made of wood. Chopsticks holders are commonly used in Japan and come in many shapes, materials and sizes. Their purpose is to prevent the end of the chopsticks that comes in contact with the food (referred to as the active end or tip) from coming in contact with the tabletop. They should also allow the user to easily pick up his/her chopsticks from their position and serve as ornaments.

The Japanese etiquette for chopsticks' usage is strict. Formal etiquette requires that chopstick be picked up with thumb, forefinger and middle finger of the right hand at their center. The left hand is then used to provide support so that the right hand may be repositioned under the

chopsticks for proper use. Placing the chopsticks back on the table involves the reverse operation. The chopsticks should be replaced on the holder when not being used. The following practices: (a) stabbing food with chopsticks, (b) breaking food items using one chopstick in each hand, (c) passing a food item from one set of chopsticks to another, (d) moving tableware with the chopsticks, (e) hitting the table or tableware with the chopsticks, (f) planting chopsticks vertically in rice or any other food (This is done only when offering food to the dead.), (g) licking the chopsticks. (h) mismatching the chopsticks, (i) inserting the wrong end of a pair of chopsticks into ones mouth, (j) using chopsticks as toothpicks, (k) placing the chopsticks across a bowl or plate when not in use, and (l) using the chopsticks with the left hand (even for left handers), are all considered unacceptable, rude, and /or unrefined. American students were not necessarily aware of some of these unofficial rules and therefore created some ill-fated artifacts. Conversely, the creativity of the Japanese students might have been stifled by their desire to adhere closely to these guidelines.

Selected American Solutions

A selection of models produced by the American students is presented and evaluated below. The reader may find that the comments provided here tend to stress the negative aspects of the proposed solutions. Our intention is to demonstrate the importance of integrating cultural factors in the practice of design. A designer's lack of understanding of (or respect for) cultural and traditional values may predestine his/her creations to commercial failure. The American students were very creative as 90% of the devices were original creations significantly different from the current solutions. Also, craftsmanship was exemplary.

The two systems, shown in Fig. 1 and 2, were designed to hold a napkin and a pair of chopsticks. While the designers should be praised for attempting to design bifunctional systems, they should also be reminded that their products would fail in Japan. Japanese people rarely use napkins made of fabric as their multiple and repeated uses contradict Japanese views of hygiene. They favor disposable paper napkins on all occasions. The system presented in Fig. 1 forces the chopsticks to come in contact with the napkin and the napkin holder therefore leading to the contamination of the latter once the chopsticks have been used. The position of the chopsticks in both designs is unsatisfactory. Chopsticks should be presented parallel to and touching each other. In Fig. 2 the chopsticks should be supported closer to the end that comes in contact with the food. The position of the chopsticks in Fig. 3 is unacceptable on a Japanese table. The active tips should not point in diverging directions.

The systems presented in Figs. 4 and 5 represent attempts to combine carrier and holder. Again, this honorable effort to attain multi-functionality produced mixed results. While both systems are esthetically pleasing, they do not correspond to the preferences of the Japanese population who typically do not put their carrying box (hashi bako) on the table and do not spoil it by placing "dirty" chopsticks in or on it. The system shown in Fig. 5 would also prove to be difficult to clean if the tips of the chopsticks that come in contact with the food were to be placed in the housing during the meal. While the esthetics appeal of the two systems presented in Fig. 6 and 7 is debatable, they present the advantage of positioning the two chopsticks together. Unfortunately, the tips that come in contact with the food are lodged into a closed housing where

the food and fluids may accumulate during the meal. The orientation of the chopsticks (active tip down) is also unnatural for the Japanese population. However, these two receptacles could be used to hold chopsticks prior to the beginning of the meal. The dispose-ability of the housing shown in Fig. 6 makes the associated model more appealing to the Japanese population. The models presented in Figs. 8 and 9 keep the two chopsticks apart making them difficult to pick up. They both contact the active ends of the chopsticks. The chopsticks are required to pass through small holes in the holder in Fig. 9. As a consequence food may collect around the edges of the holes during the process. The chopsticks' orientation is also unnatural as described earlier. The pyramidal holder shown in Fig. 10 is a very distinctive solution despite separating the chopsticks. The L-shaped holder shown in Fig. 11 could be commercialized in Japan. It respects the guidelines set earlier. The toothpick placed in the groove at the edge of the L is a nice addition. The model shown in Fig. 12 offers interesting esthetics without failing the cultural test.

The Japanese Solutions

A total of seventy-two designs were submitted by the Japanese students. Figure 13 illustrates one of the ten or so designs based on origami (paper folding). The art of origami is extensively documented in the literature and numerous designs are available already. Japanese students rarely attempted to achieve multi-functionality and concentrated principally on recycled materials and/or recycle-ability. Many designs were remarkably simple and inexpensive, e.g., a peanut or a piece of bamboo. About twenty design made use of recycled items, such as the bottom from a soda bottle or a wine bottle cork; many were very similar to the "common" Japanese designs, illustrated in Fig. 14. These concepts lead to the creation of ill-fated products due to questionable esthetics. A number of holders were constructed from recycled chopsticks as well as from many other "found" materials such as wire and pieces of plastic. Two of the Japanese designs were in the form of a "pen holder" which held the chopsticks upright and would lead to food residues being left in the holder, thus violating two of the "best practice" tenets. Maybe these two represented the only "out of the box" Japanese thinkers.

Conclusions

American and Japanese sophomore engineering students were asked to work of the same short design project, namely to design and build a chopsticks' rest (a system to support two chopsticks while not in use during a meal) for the Japanese market. The product to be designed, while foreign and mostly unknown to the US students, is very well known and deeply traditional in Japan. Most American students attempted to design original multi-functional devices, but most failed to integrate cultural factors into their design thinking thereby creating holders unsuitable for the Japanese market as they violated some of the guidelines of proper table etiquette. Many Japanese students encountered difficulties in escaping the traditional representation of a chopsticks holder and in being creative within the boundaries of the cultural constraints. Students successful in this quest for novelty provided an original treatment of the product esthetics and/or addressed recycle-ability issues. This short collaborative project was a positive experience for both students and instructors. It provided an opportunity for the American students to expand their horizons beyond their national borders and emphasized the important of studying and acquiring an in-depth understanding of the target market. It forced the Japanese

students to question an established and unquestioned solution to an old problem. Furthermore, both groups benefited from a study of the solutions generated by their foreign counterparts.

This design experiment has demonstrated that even the simplest of consumer products can fail due to cultural differences and barriers. The project can be repeated (serving as a case study for design classes) to demonstrate how the lack of knowledge and understanding of the cultural differences between societies can lead to unsuccessful products even if the project is a technical success.

Figure 1: US Solution with Napkin

Figure 2: US Solution with Napkin

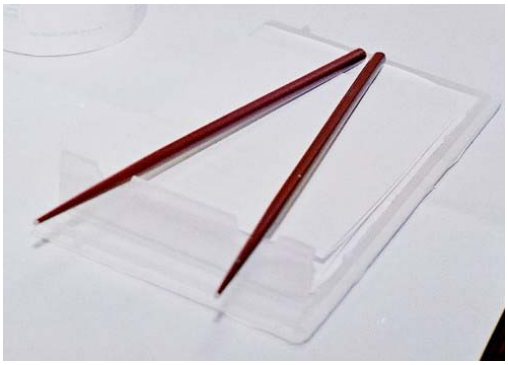

Figure 3: US Solution with Divergent Chopsticks

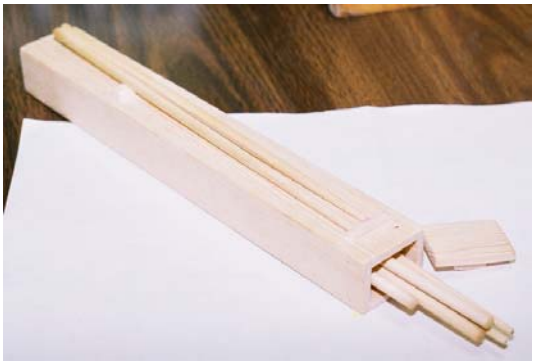

Figure 4: US Solution with Carrying Case

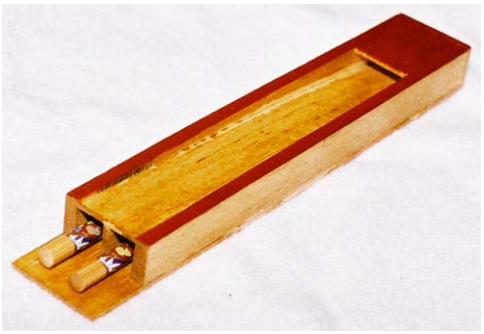

Figure 5: US Solution with Carrying Case

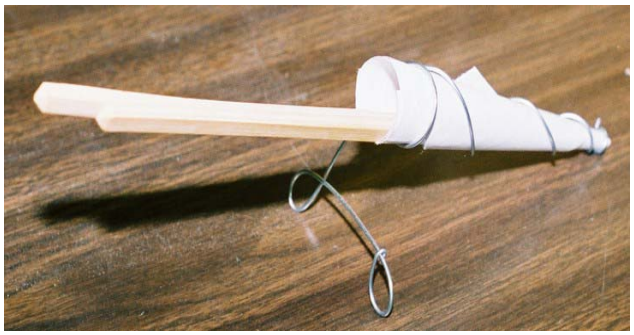

Figure 6: US Solution with a Dispose-Ability and an Orientation Problem

Figure 7: US Solution with a Hygiene and an Orientation Problem

Figure 8: US Solution with a Pick-up Problem

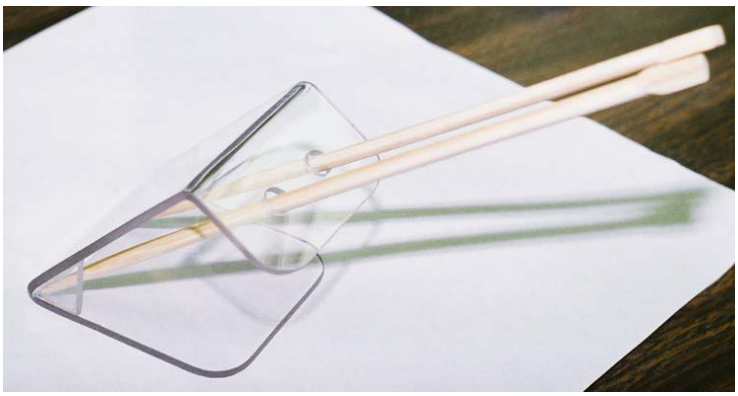

Figure 9: US Solution with a Pick-up and Hygiene Problem

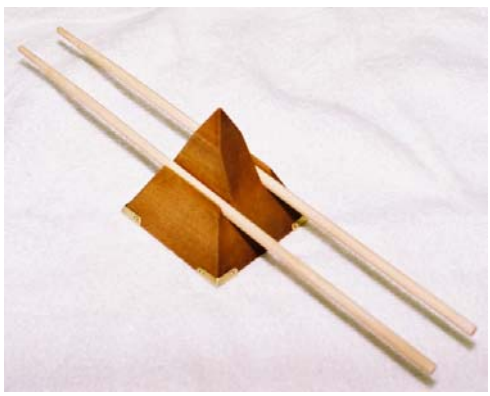

Figure 10: US Pyramid Solution

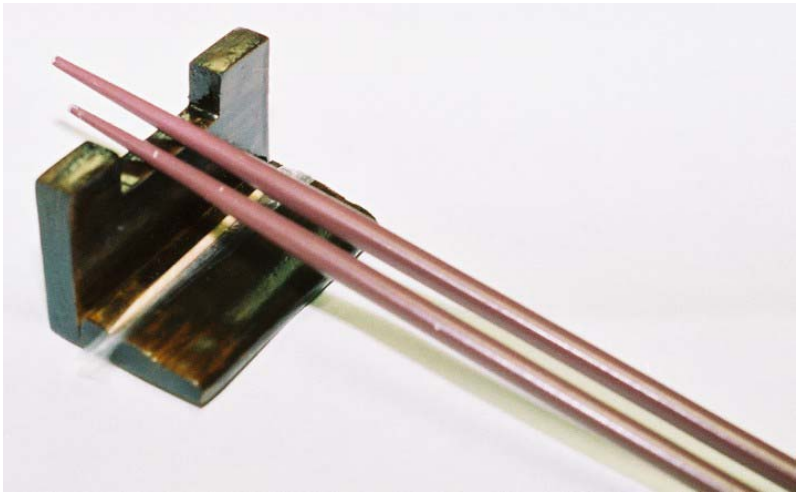

Figure 11: US Solution with Commercial Possibilities

Figure 12: US Solution with Commercial Possibilities

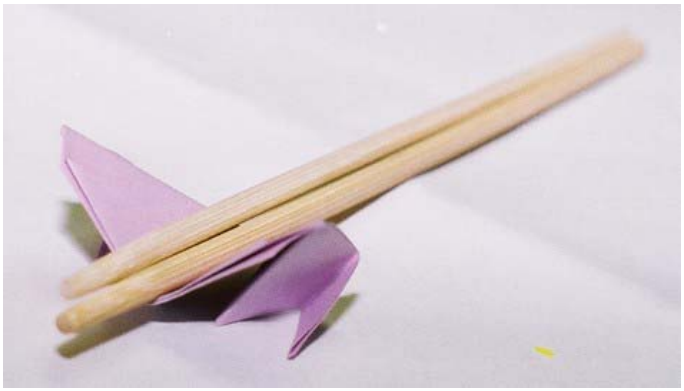

Figure 13: Japanese Origami Solution

Figure 14: Japanese Common Solution

Bibliography

1. http://www.kanazawa-it.ac.jp/ekit/
2. Jean-Luc Herbeaux and Richard Bannerot, "Experiences in Team Teaching Design," Proceedings of 1996 Annual Conference of ASEE Gulf Southwest Section, March 27-29, 1996, San Antonio, Texas, pp 150-153.
3. Jean-Luc Herbeaux and Richard Bannerot, "Developing Major Projects for Introductory Design Courses," Proceedings of 1996 Annual Conference of ASEE Gulf Southwest Section, March 27-29, 1996, San Antonio, Texas, pp 183-187.
4. Jean-Luc Herbeaux, "The Teaching of Esthetics in Engineering Design," Proceedings of the 1996 ASEE Gulf Southwest Conference of ASEE Gulf Southwest Section, March 27-29, 1996, San Antonio, Texas, pp. 146-149.

5. Jean-Luc Herbeaux and Richard Bannerot, "Sophomore Level Design Projects and Exercises at the University of Houston," Proceedings of 1997 Annual Conference of ASEE Gulf Southwest Section, March 23-25, 1997, Houston, pp. 602-607.
6. http://www.japan-guide.com/e/e2039.html
7. http://www.japan-guide.com/e/e622.html

Biography

JEAN-LUC HERBEAUX
Jean-Luc Herbeaux is Regional Sales Manager Asia Pacific for Rohmax Additives GmbH and is currently based in Singapore. He received his PhD in Mechanical Engineering from the University of Houston where he was employed as a Teaching Fellow. For three years he helped develop and taught the core sophomore design courses at the Kanazawa Institute of Technology. He joined Rohmax in 1999 and after two years in Darmstadt was promoted to his present position.

RICHARD BANNEROT
Richard Bannerot is a Professor of Mechanical Engineering at the University of Houston. His research interests are in the thermal sciences and in engineering design education. For the past eleven years he has taught the required "Introduction to Design" course at the sophomore level. For the first five of those years he team-taught the course with Jean-Luc Herbeaux.