This is to certify that the

thesis entitled

ENERGY ATTITUDES AND BEHAVIORS: A CULTURAL COMPARISON OF JAPANESE AND AMERICAN FAMILIES IN THE UNITED STATES

presented by

Rie Kohno

has been accepted towards fulfillment
of the requirements for

Master degree in Arts

Bonnie Mass Magpin

Major professor

Date 5/20/83

ENERGY ATTITUDES AND BEHAVIORS: A CULTURAL COMPARISON OF JAPANESE AND AMERICAN FAMILIES IN THE UNITED STATES

By

Rie Kohno

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Human Environment and Design

1983

ABSTRACT

ENERGY ATTITUDES AND BEHAVIORS: A CULTURAL COMPARISON OF JAPANESE AND AMERICAN FAMILIES IN THE UNITED STATES

By

Rie Kohno

The objectives of this study were to find the cultural and individual characteristics of written attitudes and observed behaviors relative to energy consumption which change or remain the same in both American and Japanese families, and to develop and generate the theories.

Four case families (two Americans and two Japanese) who were new at Michigan State University in 1982 were selected. Survey method, ethnographic method, and grounded theory were used.

The Japanese families showed their confusions and experiments about the new system and new appliances of the American homes, and they kept most of their cultural behaviors. For the American families, an indirect relationship was established between energy attitudes and energy behaviors.

Two generated theories, a theory of cultural adaptation and a theory of energy attitudes and behaviors were proposed.

To my father and mother who taught me the importance of endeavor.

ACKNOWLEDGEMENTS

I want to express my appreciation to the committee members who have challenged and supported me throughout this work. Dr. Bonnie M. Morrison, my major professor, spent innumerable hours sharing ideas and suggesting improvements. Dr. Linda J. Nelson's precise, organized, and abundant knowledge led to the development of this project. Dr. Peter M. Gladhart's knowledge of research methodology and data analysis led to a fruitful result. Mr. Richard L. Graham helped me recognize the importance of international design influences.

A special thanks to Dr. Chiyono Matsushima who made me realize the great value of studying Human Ecology in the United States, and who supported me from Japan.

And finally, but perhaps most importantly, I thank my family. My parents, Reiji and Masako Kohno, as well as my brothers, Yasushi and Takeshi Kohno, have given me constant support and love.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

A civilization based on fossil fuel energy (particularly oil and natural gas) has a questionable future. This is so even now when there are decreasing prices of OPEC oil for the first time in the group's 23-year history and therefore an apparent oil glut (The New York Times, March 15, 1983; Asahi News, March 15, 1983). Since it is generally recognized that the fossil fuels are finite resources and will be scarce and thus costly in the near future, nations worldwide have begun seeking new ways to use energy, such as: conservation, development of energy efficient equipment, houses and automobiles; and research into new energy resources such as nuclear, solar, geothermal, synthetic fuels, and seaplant oil.

It is understood that the energy-related problems are worldwide problems, every country in the world, therefore, must take some responsibility through technology and other activities to help resolve the problems. It is, however, impossible for every country to carry out the same kind of solutions, because each country has different characteristics in the self-supportable energy resources, the economic conditions, the politics, and technological development.

The researcher is a Japanese student who has studied in the United States, during which time she has formed a particular interest in comparing energy consumption and conservation between Japan and the United States.

Energy Consumption

The United States and Japan are the major capitalist countries which consumed the first and second most energy among OECD countries in 1979, U.S.A. 49.2 percent, Japan 9.7 percent (Yergin and Hillenbrand, 1982, p. 78).

However, the proportion of the household energy use compared to two other usages - industry and transportation - was far larger in the United States than it was in Japan as shown in Figure 1.1.

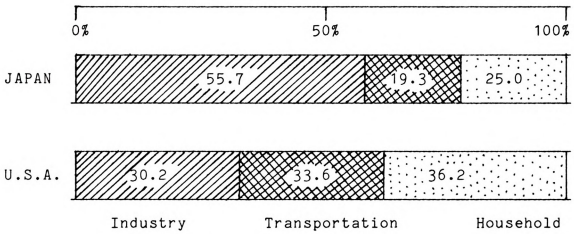

FIGURE 1.1. Energy Consumption Structure: Comparison of Japan and the United States, 1979.

Source: Energy Conservation Forum, How To Deal With Energy Skillfully, Electric News Publishing Co., Tokyo, 1981, p. 169.*

*This book was written in Japanese so that it was translated by the researcher. Other Japanese literature used throughout this thesis was also translated by the researcher.

While the United States used almost the same amount of energy in the household and the industry area, Japan used more than twice as much energy in the industry area when compared to the energy consumption in the household area. Moreover, the proportion of energy used for transportation in Japan was almost half of what it was in the United States (Energy Conservation Forum, 1981).

The Energy Conservation Forum indicated the reason why the percentage of the energy use in industry area was so high in Japan. Houses are small in Japan and automobiles are also extremely small in size. The reasons for the large percentage of energy use in the transportation sector in the United States has to do with the larger and heavier automobiles in general, and the fact that the population per car is 1.5 persons in the United States compared to 3.4 persons in Japan in 1979 (Energy Conservation Forum, p. 212). One major reason why Americans use automobiles more than the Japanese is the vast size of the country and the scattered population (Energy Conservation Forum, p. 168).

The National Living Bureau of the Economic Planning Agency of Japan indicated that energy consumption (except gasoline) per household in the United States was 4.2 times as much as in Japan when they compared 1979 data in Japan and 1978 data for the United States. The same data also identified the amount of energy in different usages such as heating, hot water, cooking, electric appliances and lighting, and air conditioning, as shown in Figure 1.2. The largest difference was in heating and cooling.

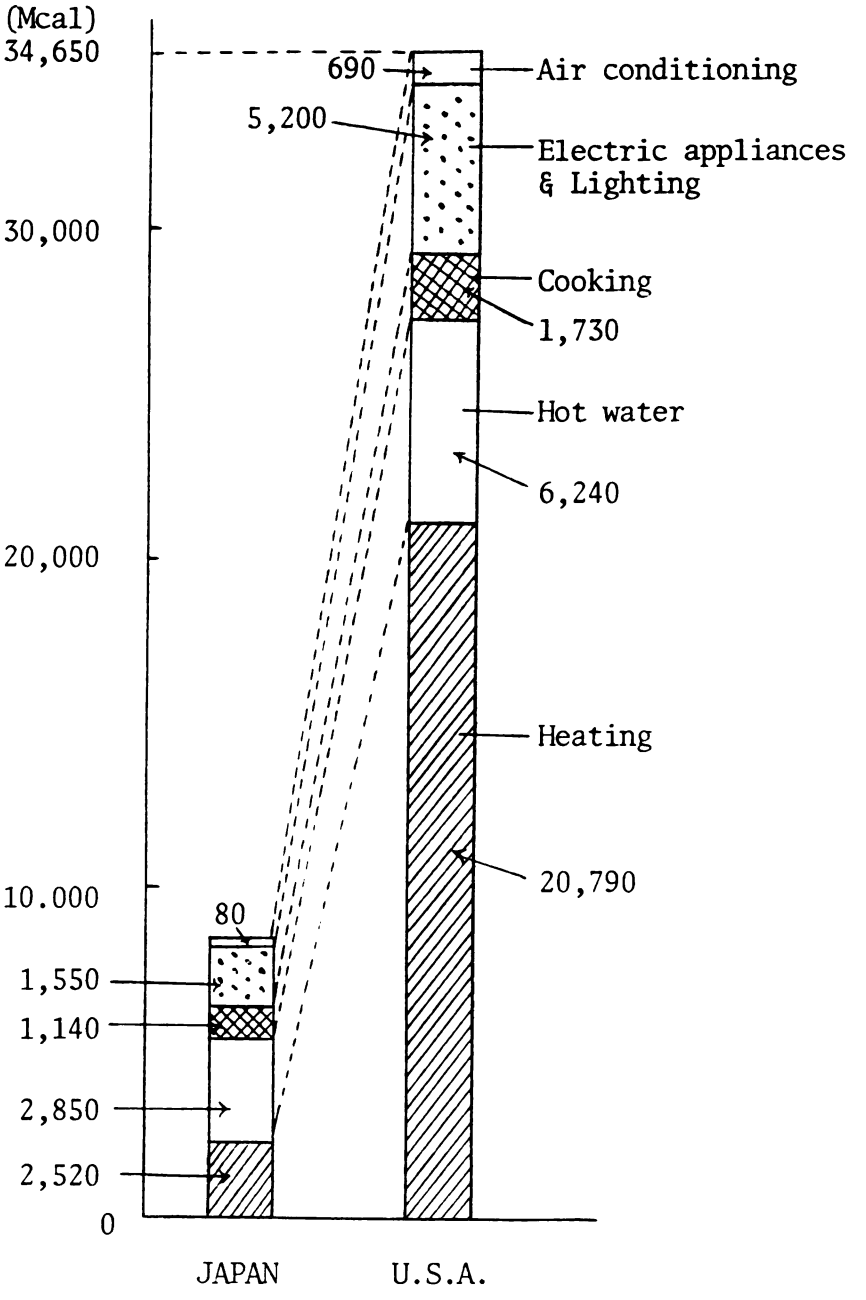

FIGURE 1.2. Energy Consumption Per Household Per Year, Japan(1979) Compared to the United States (1978).

Source: The National Living Bureau of the Economic Planning Agency, Encouraging Energy Conservation Living, 1981, p.14.

Heating and cooling energy in the United States was about eight times as much as it was in Japan. The energy for hot water in the United States was about twice as much, for electric appliances and lighting it was about three times as much, and for cooking it was 1.5 times as much as it was in Japan. The National Living Bureau indicated that the big difference in heating and cooling was because of the diffusion of central heating and air-conditioning and the larger floor area of houses in the United States.

Darmstadter et al., also pointed out similar differences for heating and cooling energy in Japan and the United States (1979, p. 35-61). They indicated that the reason for the difference is not only because of the differences in 1) the characteristics and sizes of the houses, 2) the amount and effectiveness of insulation, 3) the efficiency of heating system, and 4) differing fuels and their cost, but also because of 5) cultural differences such as tradition, customs and values.

These five points are described further according to other sources and the personal experience of the researcher.

1) Characteristics and sizes of the houses

Japanese houses are typically built of wood, paper, and two-inch-thick straw mats called "tatami" which are designed to minimize the discomforts of the hot, wet summer; while American houses are typically built of wood or masonry materials, with wood or concrete floors which are

often carpeted allowing for heat absorption and reradiation.

Japan has smaller houses on the average and it also has larger proportion of multi-family units than in the United States (United Nations, 1979, p. 141, 268).

2) Amount and effectiveness of insulation

Japan has not used insulation so much because the traditional houses were able to be adapted to the weather and to the lifestyle. For example, the building's orientation to the sun was often considered, and the landscape often used coniferous trees on the north side, planted to avoid winter wind, deciduous trees were planted on the west side to avoid strong summer sunshine, and finally, the use of evaporization in summer by watering the garden, supplied a comfortable environment for the people. However, the houses in large cities in Japan tend to be multi-built and multi-levels so that insulation is used in order to decrease noise and air pollution, as well as, save energy. It is possible to add insulation between plastered four-inch outside walls. Moreover, new thicker outside walls can be built for new houses. However, it is very difficult to insulate traditional one-inch sliding doors and drafts can come through space around the doors.

On the other hand, houses are well-insulated in the United States. Insulation has been installed widely since the 1940s. Insulation is installed in 86 percent of all houses (U.S. Department of Energy, Feb. 1980, p. 17-18).

3) Types of heating system

Heating equipment differs in both countries. In Japan, a cloth-covered table called "kotatsu" which has a heater inside was the most popular (55.4% of Japanese families have these), stoves fueled by kerosene oil were second most popular (24.5%), and central heating was the least popular (3.4%) (The National Living Bureau, 1981, p. 25).

In the United States, in 1975, central heating (with warm air, steam, or hot water) was the most popular (69% of American houses use these), room heaters were the second most popular (11.6%), floor, wall, or pipeless was the third most popular (9.0%) and built-in electric was the least popular (6.5%) (Oak Ridge National Laboratory, 1978, p. 44).

4) Differing household fuels and their cost

The most important fuels in both countries in 1979 were: kerosene and electricity in Japan, and natural gas and electricity in the United States (International Energy Agency, 1980, pp. 62-81).

When it comes to the cost of fuels, the United States has lower prices for all fuels than Japan (Darmstadter et al., 1977, p. 58). Japan's

dependence on imports is among the highest of the industrial countries. In 1981, Japan relied on imports for 85 percent of its energy needs (Yergin and Hillenbrand, 1981, p. 138). On the other hand, the United States imported only 17.2 percent in 1979 (U.S. Department of Energy, 1981, p. 8, 10).

5) Cultural differences

Japanese customs in their houses are also different from American customs. For example, Japanese take off their shoes before they go into their houses, in comparison to Americans who walk in their houses with their shoes on. This has implication for energy use in cleaning.

Privacy is a really important matter for Americans, so that every room is separated by use of the room; however, the rooms in Japanese houses are divided by sliding doors which can be removed for a party and for infiltration in summer.

In Japanese homes, the "kotatsu" heaters work very well, even though the heat loss between rooms is large (i.e., because the "kotatsu" keeps heat only inside of it). Also, Japanese people do not have to warm so many rooms because one room can be used for various activities. On the other hand, American homes require more heat in order to warm up many rooms, each of which is for a different activity.

Energy Conservation

Energy has been conserved since the first oil crisis in 1973 in Japan and the United States.

Table 1.1 indicates the index of energy consumption in seven countries. This index indicates that if it took 100 barrels of oil equivalent to produce a given amount of GNP in 1973, that same amount of GNP was produced in the United States by 86 barrels and by 82 barrels of oil by Japan in 1980.

TABLE 1.1. Index of Energy Consumption (Ratio of Oil Equivalent to Real GNP)

	U.S.A.	Japan	France	West Germany	Italy	Britain	Canada
1973	100	100	100	100	100	100	100
1980	86	82	90	85	88	88	103

Source: Daniel Yergin and Martin Hillenbrand, Global Insecurity, Houghton Mifflin Company, 1982, p. 10.

The country that has adjusted the most is Japan. The reason is that Japanese companies have been willing and able to invest heavily both directly in energy efficiency and in new plants that embody greater efficiency. Yergin and Hillenbrand concluded that increased energy efficiency was necessary in Japan to maintain competitiveness in the world market and to continue to succeed in exports (1981).

In the United States, instead of consensus, there were bitter battles over prices, the reality of the problem, the role of the state, and the respective virtues of the marketplace and regulation; between producers and consumers; between producers and environmentalists; and among regions.

However, a consensus did appear to emerge in the United States after the second oil shock in 1978 as the public began to accept the reality of the energy problem.

However, there are some worrisome aspects to the Japanese energy picture. Although energy efficiency in the industrial sector has improved greatly, energy consumption in the transport sector has changed little in the last few years, and energy consumption per unit of income of the household sector did not show a decline until the end of the decade (Yergin and Hillenbrand, p. 144). That is because of the advance in consumer oriented lifestyles with larger home appliances, in spite of their improved efficiency and consumers' efforts toward energy conservation (Energy Conservation Forum, 1981, p. 20).

On the other hand, the total residential energy consumption in the United States was 6.3 times as much as it was in Japan in 1975 and 5.9 times as much as in 1979. This indicates that the United States increased its energy use less than Japan between 1975 and 1979 (International Energy Agency, Organization for Economic Co-operation and Development, 1980, p. 32-41).

Energy Consideration in New Houses and Lifestyles Affected by Other Cultures

In architecture, both American and Japanese ideas and designs have been influenced by each other, especially since World War II.

American architects and designers such as Morse (1885), Hyde (Jaques,1908), Greene Brothers (Strand, 1974; Makinson,

1977), Wright (Heyer, 1966; Futagawa, 1980), Yamasaki (Heyer, 1966), and Fernandez (1980) favored the simplicity of Japanese architecture and the expansion of space related to the traditional Japanese garden. With respect to color, Americans prefer more vivid and brighter colors than Japanese do.

Japanese architecture has changed drastically, becoming more Western not only in design but also in materials, and even the lifestyle has changed. Many international style buildings and Western style houses have been built by new architects such as Tange (Riani,1970), Kurokawa (1977), and Maki (Marlin, 1980). Before World War II, almost all Japanese people sat on the "tatami" mat when they had dinner, studied, and relaxed. However, most Japanese use chairs now. These new customs affected Japanese people physically (Koike and Hamaguchi, 1956, p. 22). For example, people's knees are not exposed as much they once were. There is also less attention given to traditional customs and manners, such as the proper way to slide doors, sit down and serve Japanese tea.

Tange's idea was the Japanese should not persist in their traditional ways and that housing should reflect new ways of living. However, it must be remembered that deeply-rooted traditions still affect the architecture of most present day Japanese houses.

When we look at these architectural influences from the view point of energy, energy efficiency needs to be taken into consideration. In other words, a judgment needs to be

made about whether or not designs from other cultures are suitable to Japanese and American energy needs as well as lifestyle and culture.

Research Problems

Energy conservation in households is very important in the United States and Japan so that many investigations have been done from various aspects.

Special attention was given to the impacts of traditional and cultural behaviors on the difference of household energy consumption in Japan and the United States, because it was declared to be important in the literature (Darmstadter, et al., 1977; Yergin and Hillenbrand, 1982; National Living Bureau, 1981). Moreover, various studies have been conducted to analyze household energy attitudes and behaviors in both countries in their own ways.

However, no study was found that compared American and Japanese traditional and cultural impacts on household energy behaviors and attitudes.

Therefore, the research seeks to answer such critical questions as: What kind of behaviors based on cultures affect the energy consumption in households? Are there certain behaviors which people from the same countries do in common? And if there are such behaviors, what are they, and why do they do them? Are the behaviors and the reasons for the behaviors changeable or static over time given changing aspects of energy resources, technologies, economic growth, or politics generally? Are these behaviors changeable or

static over time given the adaptation to a place, a culture, or the weather?

There are three aspects in household energy: direct energy, indirect energy, and human energy (See definition on page 14). However, this study was focused on the relationships only between "direct energy" and "cultural behaviors and attitudes".

Research Objectives

Given the nature of the research problem, the following research objectives were established:

1. To find empirically the cultural or traditional characteristics of written attitudes and observed behaviors relative to energy consumption which change or remain the same in both American and Japanese families.
2. To discover empirically the individual characteristics of written attitudes and observed behaviors relative to energy consumption.
3. To develop and generate theories relative to cultural impacts on energy consumption in both American and Japanese families.

Definitions Relevant to the Study

For purposes of this study, the following definitions were considered relevant:

Family -- a married couple with or without children who lived in a dwelling unit.

Tradition -- the handing down of statements, beliefs, legends, and customs. (The Random House Dictionary of the English Language, 1967).

Culture -- the acquired knowledge people use to interpret experience and generate behavior (Spradley, 1980, p. 6).

Adaptation -- a slow, usually unconscious modification of individual and social activity in adjustment to cultural surroundings. (The Random House Dictionary of the English Language, 1967).

Direct Energy Use -- energy used in households: electricity, natural gas, water, and heat by coal.

Indirect Energy Use -- energy involved in producing products being used in households.

Human Energy -- energy from human's bodies.

British Thermal Unit (Btu) -- the amount of energy needed to raise the temperature of one pound of water by one Fahrenheit degree.

CHAPTER II

REVIEW OF LITERATURE

This study is associated with energy behaviors and attitudes, and cultural or individual differences between Japanese and American families.

The review of literature is, therefore, organized to reflect these four aspects. For clarity, studies pertaining to these areas have been categorized and are presented in the following sequence.

1. Energy Behaviors and Attitudes
    a. The importance of the behavioral and attitudinal aspect in the study of household energy
    b. Studies in the United States
    c. Studies in Japan
2. Cultural differences relative to energy behaviors and attitudes between Japan and the United States

Studies Related to Energy Behaviors and Attitudes

The Importance of the Behavioral and Attitudinal Aspect in the Study of Household Energy

While structural and technical variables influence a household's energy consumption, studies concluded that people's behaviors amounted to 50 percent of variance in the household's energy consumption (Morrison, 1975; Keith, 1977; Socolow, 1978). For instance, Socolow's experiments at Twin

Rivers (1972-1977) found that a half of the energy consumption variance in similar townhouses was due to the different behaviors of the people in the dwelling units. The noticeable point of this study was that they examined townhouses which were identical in floor plan, position in the interior of a townhouse row, builder, construction, materials and climate; however, the energy consumption varied substantially.

Similarly, in houses where occupants changed, Sonderegger (1980) discovered that the energy consumption of the new occupants was not able to be predicted from the amount of energy used by the prior residents.

Similar studies of Japanese households were not found; however, a recognition of the importance of energy behaviors was discussed. For example, the National Living Bureau of Japan indicated:

> "Now, the needed method of household energy conservation in this country is that everybody uses energy efficiently voluntarily" (1981, p. 114).

Studies in the United States

Behavioral Research. One problem with behavioral research was that it had been often quite difficult to monitor actual behavior. Details of actual driving habits, purchase decisions, or home related energy behaviors were difficult and expensive to obtain; so that studies frequently relied on either self-reported behavior measures or reported behavior intentions. For example, Beck (1980) conducted 779 personal interviews and found that homeowners were much more likely to report behavior to conserve energy than non-owners. Home

ownership accounted for 13 percent of the variance in conservation. Next, in significance were attitudes and perceptions, accounting for 10 percent. He implied that concentration on attitudes and perceptions should be a high priority of campaigns to increase conservation efforts. Murphy et al. (1979), conducted mail surveys of 760 residents (289 were returned) in 1977. The only demographic variables related to the attitudinal index were educational and occupational level (positively) and social class (also positively). No significant relationships were found between behaviors and the demographic variables. Implications for policy makers are that appeals need to be made to distinct demographic groups; those already holding positive attitudes have to be persuaded to increase the incidence of their behaviors, while the others first have to be informed so they become committed to conservation.

On the other hand, actual behaviors have often been investigated by measuring actual energy consumption (such as electricity and natural gas usually measured in British Thermal Units per degree day). For instance, Becker et al. (1980), measured actual electricity consumption of 549 homes in the summers of 1975 and 1976 (pretest and posttest) to investigate the impact of utilities providing customers with an average payment plan (a fixed sum utility bill each month with a final settlement at the end of the year), as opposed to the conventional "pay as you go" billing procedure. It appeared that the average payment plan had no effect on reducing electrical consumption.

Moreover, experimental studies with treatment conditions were crowned with success to explain some actual behaviors. For example, Bittle et al. (1979), experimented with 353 families which were assigned to one of four treatment groups for eight weeks in the summer of 1977. The four types of treatments were different kinds of feedbacks:

1. Number of kilowatt hours used during the previous day;
2. Cumulative number of kilowatt hours used since first of month;
3. Dollar cost of electricity used, the previous day;
4. Cumulative cost of electricity use, month-to-date.

For high consumers, cumulative kilowatt was the most effective feedback and daily kilowatt the least effective. It was concluded that feedback would appear to be effective, especially for high energy consumers. Moreover, cumulative type feedback was more effective than was a daily non-cumulative type of information.

Some studies obtained results measuring actual behaviors using ethnographic methods. Kempton and Montgomery (1982), for instance, used ethnographic methods, so that they could discover how laymen measured energy use, rather than evaluating their correctness from the perspective of an energy expert. They found that consumer methods were cognitively efficient. However, consumers tended to make "systematic quantification errors which both misdirect their planning of energy conservation actions and cause them to underestimate the benefits of previous actions" (p. 1).

Attitudinal Research. A number of studies provided insights into consumers' attitudes toward various aspects of the energy situation. The apparent hypothesis was that there are some relationships between energy-related attitudes and energy-related behaviors. Winett and Nietzel (1975), for example, conducted experimental research which used two groups in information and incentive conditions. It indicated that monetary incentive helped families achieve a greater amount of conservation than when no monetary incentive was present.

However, there continues to be a serious question as to whether attitude and self-reported energy related behaviors exhibit a strong degree of association with actual energy consumption. For instance, Geller, et al. (1978), provided an attitudinal and behavioral evaluation of a series of energy conservation workshops. Even though attitudes and/or opinions of workshop participants were influenced significantly by the workshop in planned and desired directions, there were no substantial behavioral changes affected by the workshop.

Gladhart et al. (1977), found that attitudes toward energy were found to be related to consumption levels. The study indicated four measures of attitudes which were related to residential energy consumption and policy acceptance by families. The study used questionnaires, interviews and records of energy consumption. Life Style Flexibility was positively related to income. Both Human Responsibility and Ecosystem Awareness were negatively related to the rate

of energy consumption per room. People with higher levels of awareness and concern did show evidence of less energy intensive lifestyles. Public policy acceptance was strongly related to Ecosystem Awareness and Human Responsibility and to belief in the energy problem.

Studies examining attitudes concerning the individual's role in conservation generally tried to discover if people felt they had a role to play in the conservation of energy or, conversely, whether they felt their individual efforts would have any effect on the nation's energy consumption (Bartell, 1974; Doering et al., 1974; Marsden and Burby, 1981; Kempton, 1982; Feldman and Awad, 1982). For instance, Marsden and Burby's research (1981), a telephone survey, suggested that energy conservation strategies based on changing consumers' attitudes and knowledge should be directed toward those groups with the most to gain from saving energy, such as: higher income households and the least efficient homes. Kempton's research (1982) discovered there was a big difference in what energy experts and the public believed when they were asked: "What works in energy conservation?". The three conservation measures which respondents stated most frequently were turning off lights, setting back thermostat, and adding insulation. Feldman and Awad (1982) conducted telephone and personal interviews and contended that intentions to conserve electricity might be promoted more effectively by focusing promotions and appeals on the efficacy of specific people's efforts than upon marginal cost savings or social responsibility. Among the reasons

for the relative ineffectiveness of appeals based on marginal cost savings are: 1. People's ignorance of the most efficacious actions (e.g., many continue to believe turning off lights is the most effective action available). 2. People's ignorance of alternative means of fulfilling wants or needs (e.g., methods of household cooling without total dependence upon air-conditioning). 3. Rate structures that fail to reward marginal decreases in electric consumption.

Attitudes toward new technology included not only reactions to nuclear power, but also people's belief in science's ability to solve the crisis and their opinions about the feasibility of solar and other energy sources (Cartee, 1976; Pilgrim et al. 1981). Pilgrim et al. (1981), for instance, described findings from a national survey of homeowners on solar energy. The data made clear that most homeowners were optimistic about the nation's future energy situation, ranked solar energy as the most preferred energy source and nuclear energy as the least, were not well informed about solar energy and were favorable to the use of solar energy in homes.

Attitudes concerning the environment and quality of life delved into people's reactions to tradeoffs between pollution, developing energy sources, and the perceived effects on quality of living with less energy. For example, Stout-Wiegand and Trent (1982) examined the differences between men and women in their attitudes toward proposed energy developments and opinions about environmental and

quality of life issues. The telephone interviews of 485 people found that women tended to oppose the developments significantly more often than do men. The main reason given was that women viewed the energy developments in terms of the environmental or quality of life consequences, while men were more concerned with the economic effects of the developments. Knutson (1982) developed, tested and refined a Lifestyle Expectation Index (LEI) to measure the relative energy intensiveness of a household's expected living style, five years hence. Households with high, medium, or low energy lifestyle expectations were found to differ significantly on present lifestyle characteristics. The findings suggested that there is a predictive relationship between present lifestyle and the relative energy requirements of a household's anticipated mode of living in the near future.

Studies in Japan

Behavioral Research. In Japan, studies also discovered that energy conservation behaviors were not put into practice even though people perceived the necessity of energy conservation like Americans. For example, the Prime Minister's Office Cabinet of Public Relations conducted a study of 5,000 people in November, 1980. The results indicated that eighty-one percent of the people said they were interested in energy conservation (The National Living Bureau, 1981, p. 114).

Japanese surveys also studied reported behaviors. For instance, Mitsubishi Synthetic Institute found some current

behaviors in energy conservation reported by Japanese households which were comparable with Kempton's research (1982) in the United States. This study found that people did not do conservation related to lowering their standard of living, for instance, only a small percentage reported taking baths fewer times (10.1%), using the car less (11.1%) watching TV less (16.2%), and keeping higher indoor temperatures in summer (17.9%). The three conservation measures stated more frequently were: turning off lights (64.1%), turning off pilot light of instant water boiler (44.1%) and using water less (47.9%) (The National Living Bureau, 1981, p. 57).

Japanese Energy Economics Institute found that an average household used burners for 80 minutes per day (670 Mcal per year), clothes washer for 48 minutes per day, bath by natural gas for 5.65 days per week (2,000 Mcal per year), vacuum cleaner for 17 minutes per day, TV for 8.5 hours per day, lighting 460 kWh per year, rice cooker 26.6 minutes per day (222 Mcal per year), heating (mainly kerosene stoves and "kotatsu") 2,300 Mcal per year (The National Living Bureau, 1981, pp. 61-68). It is important to notice that the television was on while doing something else 46 percent of the time according to NHK's "National Life Time Study" in 1975 (The National Living Bureau, 1981, p. 65). The amount of time the television was on was longer than 6.2 hours per day in the United States (Japan Energy Economics Institute, 1975).

New Lifestyle Campaign Association conducted a "Life Inspection" from the view of energy and resource conservation. It found that a large amount of energy was used in such activities as using the television as a substitution for the clock (48.5%) and opening the refrigerator more than 40 times a day (10%) (The National Living Bureau, 1981, p. 114).

In a public opinion poll conducted in February 1980, the majority (56%) of the respondents said that they were keeping the temperature in their home below 64 degrees Fahrenheit; that was, what the government recommended. Among those 56 percent, 30 percent said that they were keeping the room temperature below 60 degrees (Yergin and Hillenbrand, 1982, p. 180).

Some studies indicated guides for energy conservation. For example, the National Living Bureau (1981) recommended three ways of energy conservation which were: 1. rational and efficient use of home equipment and appliances, 2. adequate selection of home appliances, and 3. energy efficient construction. They described appropriate, effective energy conserving behaviors in detail (pp. 59-93). Moreover, the Japanese Ministry of Transportation and Industry (1981) suggested various ways of conserving energy at home. One such suggestion was that the same amount of brightness could be achieved by changing a 60W incandescent light to a 15W fluorescent light. Another suggestion was eating vegetables in season and using recycled materials would reduce indirect energy use in the home (pp. 54-57).

Attitudinal Research. After the oil crisis, the traditional Japanese values of frugality and savings regained their position. According to a public opinion survey conducted nationwide in July 1978, 85 percent of the respondents said that they were trying to be frugal in daily life. The breakdown of data showed a clear correlation with age: the older the people, the more conscious they were of thriftiness. This was especially true of people over fifty, who had been brought up under prewar indoctrination, which emphasized frugality, and who had experienced the austerity of the war and early postwar period. The survey also showed that frugality correlated inversely with level of education, indicating that this value comes out of the Japanese tradition. Another opinion poll, reported in Yergin and Hillenbrand which asks the same question every year, found an increase in respondents after 1976 who said that "spiritual richness is more important than material affluence." In this case, breakdown by age was random, but that of education showed a positive correlation: the higher the level of education, the greater the emphasis on spiritual richness. In contrast with the value of frugality this finding indicated that the emphasis on spiritual richness is related to the so-called postindustrial values rather than to traditional values (Yergin and Hillenbrand, 1982, p. 178). Various evidence suggests that, in the case of Japan, the oil crisis seemed to generate an alliance between the traditional values of frugality, the simple life, and a respect for nature with the post-industrial values that decry

materialism and work toward more humane life. This alliance nourishes attitudes favorable to energy conservation.

However, there were many studies which indicated small awareness of energy conservation. For example, the Japanese Prime Minister's Cabinet Office of Public Relations conducted a survey called "The Public-opinion Poll about Energy and Resource Conservation" in November 1980. The answers to the question of "What do you want to know about energy and resource conservation?" were "Outlook of supply" (44%), "Conservation effectiveness" (29%), "Government's counterplan of conservation" (22%), and "Concrete measure of conservation" (21%). This poll indicated that people's interest in "concrete measure of conservation" and "conservation effectiveness" should still be awakened (The National Living Bureau, 1981, p. 3).

The Japan Energy Economics Institute found that homes which had solar system or insulation consumed more energy than the homes without solar system or insulation. It indicated that they believed they could conserve energy by installation of insulation and solar system; however, they actually increased their comfort level (The National Living Bureau, 1981, p. 16).

Energy conservation was related to attitudes about the standard of living. For example, Mitsubishi Synthetic Institute conducted a survey called "Analysis of Energy Conservation Influence and Effectiveness in National Life". The study indicated people's opinions about the relationships between standard of living and energy consumption.

Most people (48%) supported the idea that they could conserve wasteful energy consumption while maintaining the current standard of living. The second most important notion supported by the people (28%) was the idea that they could conserve energy while improving the standard of living (The National Living Bureau, 1981, p. 16).

Studies indicated attitudes about the future of energy. For instance, Japan Energy Economics Institute conducted research in 1980 entitled "National Standard of Living and the Energy Supply". The desirable energy for heating 10 years ahead were electricity (35%), new energy such as solar (32%), kerosene oil (17%) and city gas (13%). The reasons for these selections were given as: safety (36%), economic (32%), easy control (28%), stability of the supply (25%), and sanitary (23%) (The National Living Bureau, 1981, p. 77).

Cultural Differences Relative to Energy Behaviors and Attitudes between Japan and the United States

Although much has been written comparing American culture with Japanese culture (Chapter I pp. 5-8, and previous section of this chapter), very little has been found which exemplified the cultural differences in energy behaviors. However, a few examples are of interest.

Murayama (1982), a Japanese professor in international business administration in Japan, described his American wife's behaviors and ways of thinking while living in the Japanese culture. They had been living in Japan for 15 years. He indicated that his wife had never tried to change

her American ways, even while being exposed to the Japanese culture. He indicated three aspects which were considered to be related to energy behaviors.

1. No difference of clothes in summer and winter.

He indicated that his wife let their children wear thin summer clothes and wool winter blankets all year around. He pointed out that American houses shut out the outside weather changes and thus had a stable, comfortable environment, whereas Japanese houses necessitated that people had to change their clothes to make them comfortable in changing season (e.g., heavier and more layers of clothing in the cold seasons, lighter and fewer layers in hot seasons). He indicated that Americans coped with winter by living in housing with thick insulated walls and central heating sources; whereas, Japanese people lived in housing where coping with winter meant enduring drafts and wearing more clothes.

2. Cooking methods

Professor Murayama indicated that his wife served reheated soybean soup, "Misoshiru"; whereas a typical Japanese housewife usually made the soup fresh and cooked it only for a few seconds. The Japanese housewives regarded the fresh smell and taste important. He understood that his wife thought the quality of the soybeans' protein did not change at all because of the reheating.

3. "Traditional Culture" and "Free Culture"

He described "Culture" as behavioral patterns which had become "settled" by being repeated. He indicated that his

family's culture was being "settled" as a new mixed culture of Japanese "traditional culture" and American "free culture". He pointed out that the "traditional culture" had the tendency of creating prejudice and restraint, whereas, the "free culture" had fluidity and fast change in replacing the old with the new.

Yoshikawa (1981), a nuclear energy researcher at Princeton University, told of his experience living in the United States. He suggested that there were not so many different ways of cooking in the United States; whereas in Japan, there were many more. He also said that it appeared to him that Americans spent a substantial share of their money for housing and automobiles rather than for clothing and food. Moreover, he indicated that private automobiles in the United States were necessary for going to work and shopping; whereas, Japanese people could use a good and readily available public transportation system instead of the private car.

CHAPTER III

METHODOLOGY

In this study, data were collected comparing Japanese and American families' energy attitudes and behaviors. The methodological aspects of the research process, discussed in this chapter, are therefore presented in the following order.

1. Theoretical Framework
2. Methodological Framework
    a. Ethnographic method
    b. Survey method
3. Assumptions Underlying the Study
4. Limitation of the Study
5. Selection of the Case Families
6. Description of the Case Families
7. Collection of the Research Data
    a. Rank Order and Incomplete Sentences of Important Social Issues
    b. Observation
8. Analysis Procedures

Theoretical Framework

This research is based on "grounded theory" by Glaser and Strauss (1967), which is the theory discovered from systematically obtained and analyzed data in social research.

Grounded theory is derived from data and then illustrated by characteristic examples from the data. The theory provides clear enough categories and hypotheses so that crucial ones can be verified in present and future research. The theory is also readily understandable to everyone. Theory that can meet these requirements fit the present research situation.

To generate theory, the approach is an initial, systematic discovery of the theory from the data. Then one can be relatively sure that the theory will fit and work. Theory based on data can usually not be completely refuted by more data or replaced by another theory. Since it is too intimately linked to the data, it is destined to last despite its inevitable modification and reformulation.

Generating a theory from data means that most hypotheses and concepts not only come from the data, but are systematically worked out in relation to the data during the course of the research. Generating a theory involves a process of research. In discovering theory, one generates conceptual categories or their properties from evidence; then the evidence from which the category emerged is used to illustrate the concept. The evidence may not necessarily be accurate beyond a doubt, but the concept is undoubtedly a relevant theoretical abstraction about what is going on in the area studied. By comparing where the facts are similar or different, properties of categories that increase the categories' generality and explanatory power can be generated.

Allowing substantive concepts and hypotheses to emerge first, on their own, enables the analyst to ascertain which, if any, existing formal theory may help one generate one's substantive theories. To generate substantive theory, many facts are needed for the necessary comparative analysis; ethnographic studies, as well as direct gathering of data, are immensely useful for this purpose.

Glaser and Strauss indicated:

> One strategy for bringing the generation of theory to greater importance is to work in non-traditional areas where there is little or no technical literature (1967, p. 38).

This research is within this general strategy.

The comparison of differences and similarities among groups not only generates categories, but also rather speedily generates generalized relations among them. It must be emphasized that hypotheses have at first the status of suggested, not tested, relations among categories and their properties, though they are verified as much as possible in the course of research.

Theoretical sampling is the process of data collection for generating theory whereby the analyst jointly collects, codes, and analyzes the data and decides what data to collect next and where to find them, in order to develop the theory as it emerges.

One may begin the research with a partial framework of "local" concepts, designating a few principal or gross features of the structure and processes in the situations that

the researcher will study. These concepts give a beginning foothold on the research.

Theoretical sampling is done in order to discover categories and their properties, and to suggest the interrelationships to a theory. Statistical sampling is done to obtain accurate evidence on distributions of people among categories to be used in descriptions or verifications. Thus, in each type of research the "adequate sample" is very different.

The adequate theoretical sample is judged on the basis of how widely and diversely the analyst chose groups for saturating categories according to the type of theory being developed.

Random sampling is not necessary for theoretical sampling, either to discover the relationship or to check out its existence in other groups. However, when the researcher wishes also to describe the magnitude of relationship within a particular group, random sampling, or a highly systematic observation procedure done over a specified time is necessary.

This research was begun with a partial framework of concepts thought to be important to the further development of a substantial theory. These concepts were:

1. Traditional or cultural behaviors and attitudes have relationships with energy consumption.
2. Individual (non-cultural) behaviors and attitudes have relationships with energy consumption.

Methodological Framework

Ethnographic Method

Ethnography offers an excellent strategy for discovering grounded theory. Ethnography is the work of describing a culture. The central purpose of ethnography is to understand another way of life from the native point of view. Moreover, rather than studying people, ethnography means learning from people.

In this study, American and Japanese cultural impacts on household energy behaviors were observed and attitudes were measured. The observer, Rie Kohno, had been in the United States for two years and able to speak English and Japanese fluently.

This was a study of behaviors and attitudes, and also a case study of four families (two American and two Japanese). Since this was the first known study of cross cultural comparison in energy behaviors and attitudes, a case study which could delve into the problem as background for further research was used.

The observer dealt with three fundamental aspects of human experience: what people did, what people said they knew, and the things people made and used. When these aspects of human experience were learned and shared by members of the two groups (Japanese and American), they were called cultural behavior, cultural knowledge, and cultural artifacts. The observer's intent was to see activities, artifacts and objects, but went beyond them to discover what meanings people assigned to them.

Cultural knowledge exists at two levels of consciousness. Explicit culture makes up part of what we know, a level of knowledge people can communicate about with relative ease. At the same time, a large portion of our cultural knowledge remains tacit, outside our awareness. Ethnography is the study of both explicit and tacit cultural knowledge (Spradley, 1980, p. 8).

In doing the fieldwork, the researcher was constantly making cultural inferences from what people said, from the way they acted, and from the artifacts they used. At first, each cultural inference was only an assumption about what people knew. These assumptions were used over and over again until she became relatively certain that people shared a particular system of cultural meanings. For example, both the Japanese families commented that it was dark in their living rooms even if two or three lights were on, whereas neither of the two American families said it was dark even if only one light was on. An assumption was made that American families were used to using one incandescent light for each activity; whereas, Japanese families had to use many incandescent lights in order to gain the same brightness as the fluorescent light which they were used to using to light a whole room in Japan. This example of lighting use happened many times. In addition, the two Japanese families turned on most of the lights in the living room and kitchen as soon as they came back from outside; whereas, the two American families turned on a few lights and the lights were activity specific. Moreover, the Japanese families

indicated that they preferred fluorescent lighting rather than incandescent lighting. Thus, the assumption became a cultural meaning that Japanese are used to using fluorescent lighting to light a whole room; whereas, Americans are used to using an incandescent light for each activity.

Survey Method

Ethnographic method was the major methodological framework in this study. However, the survey method was also used for the initial interview. Specific questions were asked of the families in order to discover their demographic characteristics. Moreover, rank order and incomplete sentences of the "important social issues" were used to reveal the families' energy attitudes. The survey method used for these aspects of the study was considered the most expedient way to collect this information.

Assumptions Underlying the Study

This study was based upon the following assumptions, which have been accepted as reasonable.

1. The ethnographic method is considered an appropriate research method for comparing cultural and individual differences in energy behaviors between Japanese and American families.
2. The survey method was considered appropriate to reveal the families' demographic characteristics and energy attitudes' measured by the rank order

and incomplete sentences of the several important social issues.

3. Space heating is the largest proportion of household energy use according to the literature reviewed; therefore, winter is considered the most appropriate season for studying energy behaviors and attitudes.

Limitations of the Study

1. Because the research focused on a few units, the case study is limited in its representativeness. It does not allow valid generalizations to the population from which its units came; that is, until the appropriate follow-up research can be accomplished, focusing on specific hypotheses and using proper sampling method.
2. The case study is particularly vulnerable to subjective biases. The case itself was selected because of its dramatic, rather than typical, attributes. To the extent selective judgments rule certain data in or out, or assign a high or low value to their significance, or place them in one context rather than another, subjective interpretation influences the outcome.
3. Typical winter behaviors were not observed since the winter of 1983 was unusually warm.
4. The behaviors were observed only limited hours over three months so that it is difficult to generalize

the behaviors as usual behaviors of the family members.

Selection of the Case Families

In order to study cultural and individual behaviors and attitudes relative to energy consumption, several variables had to be controlled and variation minimized.

For a household to be eligible for inclusion in this research case, four criterion variables had to be met.

1. The families (both Japanese and American) had to be new at Michigan State University in 1982. The Japanese families especially had to have just come to the United States from Japan, and also not lived in the United States at any prior time. The American families had to have just come to Michigan from some other state of the United States.
2. The families had to be living in Michigan State University campus housing.
3. The location and level of the families' apartments in a building and the orientation to the sun had to be similar.
4. The heads of the families had to be Michigan State University faculty members or graduate students. The education of the wives had to be about equal.
5. The number of children and their ages had to be similar.

Selection of Japanese Case Families

A list of new Japanese faculty members' names and addresses (since the summer 1982) was obtained from the International Center at Michigan State University. Since only six Japanese families were new to Michigan State University, all these Japanese families were approached and the Japanese case families were selected from them.

The six Japanese families were contacted first by mail (see Appendix A), and then by telephone to gain cooperation in doing a short interview and completing a questionnaire. Japanese language was used in contacting the Japanese families. For clarity, in discussing the selection procedures these six families were each given a number in the order contacted (Family 1, Family 2, Family 3, Family 4, Family 5, and Family 6).

Four (Family 1, 2, 3, and 4) of the six families showed their cooperation in doing the interview and completing the questionnaire. One husband (Family 5) refused firmly because he did not want his family's privacy disturbed. The husband of the last family (Family 6) was traveling at that time so that his wife asked the researcher to contact him later.

Three families (Family 1, 2 and 3) of the four were visited at their apartments and completed the interview and questionnaire.

The information gained in the interview and questionnaire was demographic in nature and also measured the husbands' and wives' attitudes about several serious social

problems, including energy. While they were writing answers for the questionnaire, characteristics of the apartments were observed and noted by this researcher (see Appendix B). One husband (Family 4) was visited at his office and completed his interview and questionnaire. He said that he would ask his busy wife to fill out her questionnaire and return it to the researcher when it is completed, but this commitment was not fulfilled.

Next, two families of the four (Family 3 and 4) who had children were sent a letter (see Appendix C) and asked if they would be able to cooperate in the main part of the research (observation). The word "observation" was not used in the letters to or conversations with the families. Instead, in the telephone calls the researcher indicated that she would like to have the honor of seeing their families' activities.

The husband of the Family 4 said, "We are very busy and we are beginning to settle in this new place, so we do not want to take any new big things in our life right now." His wife told me that she was busy every day with taking care of children, going to English conversation school, and other family management things. She emphasized the difficulty of communicating with people in English which made her daily activities more difficult and time consuming. When the researcher visited the Family 3's apartment for the initial interview, the husband asked the researcher if she had books or articles written in English and related to Japanese culture or management. Since the researcher was eager to

gain their cooperation and confidence, she supplied them with several books and articles immediately. A few days later, he indicated the materials were extremely helpful for him and his professor in his "management" class. Thus, there was some communication established with the Family 3 which appeared promising. However, the Family 3 eventually refused to cooperate. The wife told me that she was baby-sitting Japanese children at home in the morning and she had to take care of her own child the rest of the time, so she would not have time to be a part of the study. The husband told the researcher that they would feel uncomfortable being observed. According to the conversation with these two families, two main reasons of their refusal were found. They were: 1. Busy schedules and confusion related to adjustment to new culture and environment and 2. Expected uncomfortableness and infringement of privacy during the observations.

These two reasons for possible refusals were expected prior to the families being asked for their cooperation in the study. Therefore the families were given assurances that their privacy would not be infringed upon and the information provided would be held in strict confidence. The researcher also offered help in shopping, babysitting and tasks (in order to make their lives easier in this new place), in compensation for cooperation. In spite of the explanation and offered help, families 3 and 4 still refused.

Family 1 (husband and wife) was then contacted and asked for cooperation. They said they would cooperate. The Family 2, another couple with no child, was not contacted, because the Family 6, who had two children, met the study criteria more closely.

Finally, the husband of the Family 6 was asked for cooperation. He showed understanding of the difficulty in conducting observational studies, however, he refused the observation but allowed the interview and completed the short questionnaire. A research adviser and the researcher went to his office for the initial interview. He understood the observational approach to doing research, having conducted some research like this himself, and he said that he would like to cooperate. In order to gain this family's full cooperation, the researcher offered to help his wife practice driving. He thought that this was a good idea. Nevertheless, he told me that his wife was a traditional Japanese housewife, who managed the household affairs, which was interpreted to mean that the researcher must talk to her personally about the research and the offer to help her with the driving practice. Therefore, the researcher called his wife at home. She asked her children if it would be all right with them for the researcher to do the study in their home (children were boys aged 15 and 11). Since she was still somewhat reluctant to cooperate in the study, it was decided to do the first driving practice in order to get acquainted. After the researcher helped with the driving practice and shopping several times, she made up her mind

and gave permission for the observations. Thus, two Japanese families, one with no child and another with two children were obtained. The Family 2 was thanked by letter for their willingness in the interview and questionnaire, but was not further contacted for the observations.

Selection of American Case Families

Nineteen new American faculties' names were selected from 1982 Michigan State University Faculty and Staff Directory. A comparison with 1981 directory allowed new faculty to be identified.

In order to match the characteristics of the American families to the Japanese families, four factors were considered. These factors were: 1. Graduate assistants were excluded because none of the Japanese faculty were graduate assistants. 2. Women faculty were excluded since all the Japanese faculty were men. 3. Foreign sounding names were excluded since the researcher thought that there would be the possibility of behavioral and attitudinal influence from other cultures. 4. People who were in natural science area were included since the Japanese faculties were all in natural science area.

Letters requesting cooperation in this study were sent to the nineteen families (see Appendix D). A few days later they were called and asked for their cooperation. English language was used in contacting American families.

The first telephone call was to a couple, who indicated they would have time for the initial interview. In the interview, it was found that the wife was working fulltime

unlike the Japanese couple's wife. A housewife was desirable to match the Japanese wife, however, such a family was not found in further phone interview. In order to get their permission for the observational part of the study, a research advisor and the researcher visited their apartment and explained the study in general terms. Their cooperation was gained, thus, the first couple with the working wife, became one of the American case families.

Unfortunately, fourteen out of the nineteen were unqualified to become case families for reasons specified in Table 3.1.

TABLE 3.1. Characteristics of Unqualified American Case Families

Reasons of Unqualification	Foreigners	Married but no wife here	single	no answer	Moved to off-campus	Total
Number of people	1	1	1	3	8	14

Eight moved to off-campus housing; the new residents in the eight apartments were all foreigners and therefore not eligible for the study.

Another four people were married and had a child or children. However, they did not match the Japanese family with children. One was divorced and had a son 22 years old, so that they were unqualified to be one of the American sample families even if they had been willing to cooperate. One parent (who was single) refused this study completely since he was too busy. The other two families were willing

to do only the interview and questionnaire; however, they only had one child so they too were unlike the Japanese case family.

One day the research adviser talked about the difficulty of getting cooperation in studies of this nature, using experience as an example in her class. After class one student said that she would like to cooperate. So, she was called and asked her family's characteristics. Her family had only one 17 month-old child, her husband was working off-campus as a high school teacher, and they had been on campus for three years. Even though their willingness was greatly appreciated, they could not be one of the case families. After the researcher's explanation, she said she had a neighbor who had two children and who had just come here from California. She kindly talked to the neighbor about this research. Then, the researcher called the family. From the initial interview, the family was very helpful and they said they would cooperate with this research. The husband was a Ph.D. student instead of a faculty member.

Thus, two American families from California were obtained as the American case families. It took over two months to gain the four families (two Japanese and two American). (See Appendix E)

Description of the Case Families

In this research, the four families were given code names to protect their real identities. These code names

were: JC(A Japanese family with children), JN(A Japanese family with no child), AC(An American family with children), AN(An American family with no child).

Table 3.2 describes characteristics of the four families according to the initial interview.

Both JC and AC had two children; however, the ages and sex of the children differed slightly. Both JN and AN reported that they married coincidentally at about the same time, May 1982, in Japan and in Michigan.

All of the families came to Michigan after March 1982. The two Japanese families came from Tokyo, and the two American families came from California. The reasons why the families came here were that the husbands were offered jobs (for JN and AN) and scholarships (for JC and AC).

The husbands' study or research areas and status were desired to be matched as faculty members in natural science area, however, AC family's husband was a Ph.D student in an agricultural area. Because of the time limitation and the difficulty of case selection, the two characteristics (level of status and discipline) were not matched.

Their previous shelters were a typical Japanese house for JC, a typical Japanese apartment for N, a university apartment for AC, and an apartment for AN. At the time of study, all the families lived in the second floor of university housing and the colors on the walls were white or off white. JC and AC were in two bedroom apartments where the two children shared a bedroom, and JN and AN were in one

bedroom apartments. All of the apartments except that of JN were facing to the East.

TABLE 3.2. Characteristics of the Case Families

	Japanese		American	
	JC	JN	AC	AN
Children	two boys (15 & 11)	None	a girl (11) a boy (4)	None
Date when they came to MSU	Aug. 1982	Sep. 1982	Sep. 1982	Mar. 1982
Previous home	Tokyo, Japan	Tokyo, Japan	California	California
Reasons why they came here	Fulbright	Job	Fellowship	Job
Level of the status at MSU	Visiting Professor	Visiting Research Associate	Ph.D Student	Assistant Professor
Previous Shelter	Typical Japanese House	Typical Japanese Apartment	University Apartment	Apartment
Bedroom(s)	Two	One	Two	One
Location and level of the Building	South edge of the Second level	Middle of the Second level	Middle of the Second level	Middle of the Second level
Orientation (face to..)	East	South	East	East
Colors on Walls	White	White & Cream	White & Cream	White
Travel Experience in Foreign Countries	H-all over the world W-many countries in Asia & C-Europe	H-None W-Europe (10 days)	H-Hawaii W-Mexico (1 day) C-None	H-Mexico Canada (every year vacation) W-Europe (1 year)

When their travel experiences to foreign countries were asked, many of them answered they had been to other countries. However, it was the first time for the two Japanese families to come and live in the United States except the husband of JC family who had traveled to the United States.

Collection of the Research Data

Rank Order and Incomplete Sentences of Important Social Issues

The initial interview which investigated the sample families' demographic characteristics, also included a short questionnaire for both adult members of the family. The questionnaire consisted of a rank order question and several incomplete sentences. The husbands and wives were asked to rank-order eight social problems (Crime, Education, Unemployment, Inflation, World Trade, Energy Consumption, Family Relationships, Drug and Alcohol Use) according to their attitudes about how serious the problems were (1 being the most serious, 8 the least serious). The order of the listed problems was randomly selected. Then, they were asked to complete sentences using the same eight words. The eight words were selected from the "most important social issues questions" used by the Social Research Center, University of Michigan in their national yearly surveys.

The questionnaire indicated the sample families' energy attitudes. Since the word "Energy Consumption" was enumerated with the other seven words, the respondents did not know that the "Energy" was a focused issue within this particular research.

Observation

The four families were visited and their behaviors were observed. They were not told that the study was focused on energy related behaviors. They were told, however, that the observation was focused on how families use the resources in their housing environments very generally.

The visitations were made from December, 1982 through February, 1983. The aim of the study was to visit each family approximately ten hours per month. However, as indicated by the description in the Observation Procedure section (Appendix F), about five to six hours of observations were made in December, about seven to ten hours of observations were made in January, and over ten hours of observation were made in February. It was much easier to make appointments with the families with children than the couples. The young couples (JN and AN) often did activities outside of their homes, whereas families with children (JC and AC) stayed at home more of the time.

Fifteen minutes before and after each observation, the out-of-door's temperature was measured. Then, fifteen minutes after each observation began and at the end of each observation, the temperature inside each apartment was measured by a concealed thermometer (hidden inside of a three ring binder), so that none of the four families would suspect any measurement of temperature. The families were very surprised when they were told after the observations that the thermometer was used to measure their homes' temperature.

The observer sometimes participated in the families' activities; however, most of the time the observer sat and took notes. The observation notes were written in English at the American homes and in Japanese at the Japanese homes.

Each time the observation was done, the first page of the observation notes was filled with particulars on seven items: 1. Date and time, 2. Which family, 3. Inside and outside temperature, 4. The clothes family members wore, 5. How many lights were on and where, 6. Thermostat setting, and 7. If windows were open or closed.

Observed behaviors were energy related behaviors such as: thermostat setting change, opening or closing windows, turning on or off lights, use of water for cooking and bathing, energy used for cooking, clothes that were changed (i.e., more clothing put on or some clothing removed), and families' conversation. When temperature-related behaviors were observed, the thermometer inside of the binder was referred to and the temperature was noted. The thermostat setting was also observed.

Even though the observation was focused on energy behaviors, a broad descriptive observation was also made. Moreover, at the end of each month's observation, the analysis of the observation for each of the four families was made and selective observations were made thereafter.

At the end of the three months of observations, short interviews were conducted and several questions were asked of the families to discover the meanings of their behaviors. At last, they were asked if they were trying to conserve

energy or not. They were also asked the reasons why or why not they conserved energy (see Appendix G).

Analysis Procedures

Energy attitudes were analyzed from the rank order and incomplete sentences of the "important social issues".

Energy behaviors were analyzed from the observation notes which were rewritten more in detail within 24 hours after each observation. The original observation notes in Japanese were translated to English by the researcher. The second rewritten notes were copied and the copied notes were coded into the following four categories.

1. Space heating
    a. Measured temperature and thermostat settings
    b. Opening windows
    c. Clothing changes
2. Energy in the kitchen
    a. Energy for cooking
    b. Water use
    c. Opening refrigerator
3. Appliances
    a. Lighting
    b. Radio, record, TV, and cassette tape recorder
4. Other Observations
    a. Laundry
    b. Vacuuming
    c. Bathing and showering

Moreover, conversations related to energy use were carefully investigated to discover the reasons for the families' energy use.

In each category, cultural and individual energy behaviors were examined to understand if the observed behaviors

were related to culture or individual conception. The changes over the three month period were also investigated to discover if the changes would suggest similar changes in household energy use in the future.

CHAPTER IV

FINDINGS AND DISCUSSION

Findings and Discussion are presented in the following order.

1. Attitudes About the "Important Social Issues"
    a. Rank Ordering of the "Important Social Issues"
    b. Results of the Incomplete Sentences of the "important Social Issues"
2. Energy Behaviors and Attitudes According to the Observations
    a. Space Heating
        1) Measured Temperature and Thermostat Settings
        2) Opening Windows
        3) Clothing Changes
    b. Energy in the Kitchen
        1) Energy for Cooking
        2) Water Use
        3) Opening Refrigerator
    c. Appliances
        1) Lighting
        2) Radio, Record, TV, and Cassette Tape Recorder
    d. Other Observations
        1) Laundry
        2) Vacuuming
        3) Bathing and Showering
    e. Summary

The members of the four families were given code names to protect their real identities. The husbands were given "h", the wives were given "w", the first born children were

given "1", and the second born children were given "2" after their code family names as follows:

JC -- JCh, JCw, JC1, JC2. = Japanese family with children
JN -- JNh, JNw. = Japanese family with no child
AC -- ACh, ACw, AC1, AC2. = American family with children
AN -- ANh, ANw. = American family with no child

Attitudes About the "Important Social Issues"

Rank Ordering of the "Important Social Issues"

The rank order revealed their sensitivity to and awareness of "Energy Consumption" as an issue, when they compared it with other social problems.

The following Table 4.1. shows the husbands' and wives' attitudes about several "important social issues" which were Crime, Education, Unemployment, Inflation, World Trade, Energy Consumption, Family Relationships, and Drug and Alcohol Use (ordered as per initial interview -- see Appendix B). They rank-ordered the eight issues according to their ideas about how serious they were, one being the most serious, eight is the least serious. ACh's questionnaire was not obtained. The issues in Table 4.1 are reorganized according to the average of the two Japanese wives' rank-ordering, from "Family Relationships" as the most serious issue to "Drug and Alcohol use" as the least serious issue.

The two Japanese wives ranked the three most serious issues as "Family Relationships," "Inflation," and "Education;" which indicated that they were typical Japanese wives who were interested in making good family relationships, managing home budgets and encouraging their children to get

good educations. They showed less concern about "Energy Consumption".

TABLE 4.1. Husbands' and Wives' Attitudes About "Important Social Issues"

	JC		JN		AC	AN	
	JCh	JCw	JNh	JNw	ACw	ANh	ANw
Family Relationships	5	2(1.5)*	4	1(1.5)*	4	2	7
Inflation	6	1(2)	6	3(2)	6	8	2
Education	8	3(2.5)	1	2(2.5)	3	4	4
Unemployment	2	6(5)	2	4(5)	5	3	6
Energy Consumption	1	4(5.5)	3	7(5.5)	2	1	1
Crime	3	7(6)	7	5(6)	7	5	5
World Trade	4	5(6.5)	5	8(6.5)	1	7	3
Drug and Alcohol Use	7	8(7)	8	6(7)	8	6	8

*Number in parentheses is the average response each Japanese wife gave.

However, JCh, ANh, and ANw ranked "Energy Consumption" as the most serious issue which indicated that they were very concerned with energy. ACw ranked "Energy Consumption" as the second most serious issue which indicated that she was concerned with energy also.

Results of the Incomplete Sentences of the "Important Social Issues"

Since this research was focused on energy, only the completed sentences related to "Energy Consumption" were analyzed.

ANh and ANw indicated their daily effort and strong feeling about decreasing energy consumption. ANh wrote, "I feel strongly about minimizing energy consumption in day to day living, as I do about other nonrenewable resources." ANw wrote, "Energy Consumption should be decreased in order to provide for future generations."

ACw wrote sentences supporting energy conservation at the national level. She wrote, "The industrialized countries must shift to renewable resources. They are using more than their share of world resource."

JCh and JCw indicated their feeling about wasted energy in the United States. JCh wrote, "Energy consumption in the United States is the largest and the most wasteful in the world, just like the military expenses." JCw wrote, "One thing I felt when I came to the United States was that a lot of energy was being wasted. I wonder what a real comfortable life is."

JNw indicated human-beings' effort of minimizing energy consumption. She wrote, "A problem which human-beings put effort on the earth is how we keep energy consumption at minimum level."

JNh showed his interest in new energy resources. He wrote, "Because of increasing energy consumption in the world, the development of new energy resources is becoming a matter of concern."

Energy Behaviors and Attitudes According to the Observations

Several questions were asked of the case families at the end of the observation to explain their observed behaviors. The responses revealed that AC and AN were trying to conserve energy, and JC and JN were not trying to conserve energy. AC and AN indicated that they were concerned with the energy problem. On the other hand, JC and JN said that the utility cost was included in their apartment cost so that they did not pay much attention to energy conservation. During most of the observation, JCh was back in Japan so that JCw controlled the energy use in the family.

The observed behaviors and verbalized attitudes related to various energy use activities follow.

Space Heating

Measured temperatures, two behavioral measures (opening windows and clothing changes), and people's conversation revealed their use of the space heating.

In all apartments, steam heat with energy produced by the university's coal plant was used. AN and JC had thermostats and AC and JN had valves on the heating radiators; however, neither the thermostats nor the valves could be controlled accurately.

One change that was apparent for the Japanese families, but not for the American families related to clothing behavior. The Japanese families almost always wore lighter weight and thinner clothing than would normally be the case

in Japan. Both Japanese families indicated their preference for the American central heating system compared with the traditional partial heating system back in Japan, so that they took advantage of the central heating system and kept the inside temperature high in their homes. Since it was colder in their homes in Japan and they were used to the temperature where they wore sweaters in Japan, they wore thinner clothes in the United States in the warmer indoor temperature. This indicates the acclimation in the Japanese families. They said it would have been expensive if they had had to pay the heating cost independently of their rent. The clothing change indicated a changed cultural behavior, because they were responding to the change in the level of indoor temperature in the United States.

Other than the Japanese cultural behavior related to the temperature and clothing, many individual behaviors related to space heating were found. The measured temperature, opened windows and clothing changes were found to be related to each other. The observed cultural and individual behaviors are discussed.

Measured Temperature and Thermostat Setting. Measured inside and outside temperatures were compared.

AN had the lowest temperature (66^{o} - 73^{o}F) among the four families throughout the three months. At the AN's apartment, the thermostat was always set between 50 and 55 degrees. They talked about their thermostat setting as follows:

> ANh and ANw explained that they have heat from downstairs and neighbors so that they don't have to have the higher temperature on the thermostat. ANw says, 'We are a kind of ignoring it, covering it with the flowers.' The thermostat is covered by artificial flowers (Field notes, 12/20/82).

Since they hardly used the thermostat, the inside temperature of AN's apartment changed very similarly to the outside temperature. In other words, it was colder inside when it was colder outside. On the other hand, the inside temperature of the other homes was consistently kept at about the same degree regardless of the outside temperature. At the end of the observation, ANh and ANw said:

> They were using a gas heater in California. They said it was hard to say which system was better. They said the gas heater was noisier and this apartment's heater worked slower (Field notes, 2/23/83).

At AC's apartment, the inside temperature was lower in December (65°F and 75°F), but it was among the highest in January and February (78° - 81°F). In December, ACw thought their heaters were not working, however, actually the cold temperature was because the housing office shut off the master valve. Since it was cold at AC's apartment, they used the natural gas oven of the stove for heating.

> ACh says to ACw, 'I left the oven on because that room (He points out his bedroom) is cold.' ACw says, 'OK.' (Field notes, 12/12/82).

ACh liked higher temperature than the ACw. For example:

> ACh says, 'Would you shut the window?'
> ACw says, 'I'm boiling hot.'
> ACw says, 'I have an idea. ACh! Why don't you come to this place near the oven.'
> ACw and ACh trade places
> (Field notes, 12/14/82).

In February ACw told me that she and her husband quarreled about the heating.

> ACw says, 'We are too hot all the time.' She says it takes several days to cool down and heat up the rooms by using the valves. She says she has always been hot and her husband has always been cold. She says that she and her husband had fights about the heating. ACh won and the heat has been on all the time. ACw says, 'I'd rather have a wood stove.' She says, 'It's waste of energy.' ACh's idea was keeping the heater on and opening windows sometimes when they were hot. ACw says, 'I'd rather sit in cold places.' (Field notes, 2/27/83).

ACw said the family used a gas heater in California, and that it was much better because she could control the temperature.

JN's house was consistently warm throughout the three months (72° - 79°F). JNw said that she had become used to the central heating system in the United States.

> She says she might not be able to live in Japan again since she is used to this warm central heating. She asks me, 'Is it warm like this much in other Americans' homes?' I answer, 'Some homes are warm but some are cool.' (Field notes, 12/15/82).

JNh and JNw talked about "Kotatsu" heater[1] a few times. JNh indicated his feeling with regard to the "Kotatsu" heater and winter.

> JNh says it is better to have a cold back using the "Kotatsu" when he is eating hot food in winter. (Field notes, 12/20/82)

They said they used three different heaters (a "Kotatsu"

---

[1]The "Kotatsu" heater is an electric heater attached to a table and covered with a blanket. People sit on the floor and cover their legs and hands to keep warm. Their backs are exposed to cooler air, however.

heater, a kerosene heater, and an electric heater) in Japan. When they were asked at the end of the observation in February if they liked the heating system here in the United States or the Japanese systems, they said they liked the American central heating system better. They also mentioned it in January.

> I ask them about the heating system here. They say it is definitely good (Field notes, 1/26/83).

They said it would have been very expensive if they had had to pay for the utilities. JNh said he had to warm up his body in "Kotatsu" heater or hot bath when he came home from work in Japan, but the whole apartment was warm here in the United States, so that he felt comfortable very quickly after he came home.

JC's home was warm (72^{o} - 80^{o}F) throughout the three months. Especially in February, the temperature was 79^{o}F on the average. JCw said that they set the thermostat at 68^{o}F at night and 77^{o}F at daytime (Field notes, 12/3/82); however, their thermostat was set at 80^{o}F three times out of four visitation times in February. JCw indicated that her American friend suggested that JC family should wear sweaters when they visited other homes off campus.

> JCw laughs and says that her American friend told her, 'Remember to wear sweaters when you go to other homes otherwise you will get a cold.' (Field notes, 2/7/83).

When JCw was asked what kind of heating appliances her family used in Japan, she said kerosene heaters were used in the kitchen and in a room for calligraphy, a "Kotatsu" heater was used for her husband's room and a natural gas

panel heater was used in the children's room. At the end of the observation, JCw and her children indicated that they preferred the central heating system in the United States to the Japanese system. JCw indicated that the American system gave the family great comfort; however, it may not have been economical.

At most of the respondents' homes the inside temperature was not easily controlled by the thermostats or valves accurately. Even if AN set their thermostat between 50°F and 55°F, the actual temperature was between 66°F and 73°F. Also, when JC family set their thermostat at 70°F one day, their actual temperature was 79°F. These incidents showed that heat came in through the walls from neighbors and downstairs. The families knew that. JN and AC indicated that they could not control their valves, either.

Opening Windows. At the homes of AC, JN and JC, people opened the windows many times; however, at the home of AN, they hardly ever opened the windows.

At the homes of AC and JN, they opened windows when they were hot and closed them when they became cold. At AC's home, the wife often opened windows when she felt too warm. The recorded temperatures when she opened the windows were between 75°F and 77.5°F. At the home of JN, they often opened windows when they were eating hot food during supper. The recorded temperatures when they opened the windows were between 72°F and 79°F.

At the home of JC, two windows (one in the kitchen and another one in the living room) were kept open about six

inches most of the time (seven out of ten visitations), and additional opened windows were observed at several times. This indicated that the JC family wasted a large amount of energy through the opened windows.

Clothing Changes. The AN family hardly ever took off their sweaters at home. They wore them most of the time.

At the AC's home, ACw wore sweaters or two layers of shirts as well as heavy boots most of the time; however, the other members of the AC family wore only one layer of long or short-sleeved shirts and socks sometimes without shoes. That is why ACw and the other members of the family disagreed about their comfortable temperature.

> ACw says, 'I cannot stand it. It's hot.' (77.5°F). AC2 says, 'No.' ACw answers, 'Yes,' and opens two windows (one in the living room and one in the children's room). AC2 says, 'But you are wearing a lot.' ACw says, 'Yes, true,' and takes off her sweater (Field notes, 1/12/83).

At JN's home, the husband took off his sweater several minutes after he came home. Both husband and wife wore one shirt most of the time. They were not wearing shoes but socks.

At JC's home, the husband and the children wore long-sleeve shirts, the wife wore a short-sleeve or long-sleeve shirt, and all of them wore slippers and socks in December. In January and February, the wife often wore a summer one-piece dress (cotton, short-sleeves, of a thin material) and often the whole family wore only slippers on their bare feet. When the JC family came home from outside, they all took off their sweaters as soon as they were inside.

Energy in the Kitchen

Three behavioral measures (cooking, water use, and opening the refrigerator) revealed their use of the energy in the kitchen.

Every family used originally installed four burner stoves (one was large and the other three were small), with the oven under the burners. The energy for the burners and ovens was electricity at JN, JC and AN, and natural gas at AC.

In addition to the installed appliances, AN used a microwave oven and a coffee pot, JN used an electric frying pan, and JC used an electric wok and an electric rice cooker.[1] Dishwashing by hand was necessary at every home since dishwashers were not installed in the apartments.

The two American wives were working during the day; whereas, the two Japanese wives did not have jobs. So, it affected their time use for cooking. Two non-changed cultural behaviors were observed at the Japanese homes. One was that the Japanese wives cooked meals in the traditional Japanese way, thus, they mainly used the burners and hardly ever used the ovens. However, over the three months they gradually began to use the ovens. The Japanese families used more dishes (plates and bowls) for the meals than did American families, so that they had to do more dirty dishes than the American families.

---

[1]The rice cooker is an electric pan, into which rice and water are placed. This cooker stops automatically when the rice is cooked.

Energy for Cooking. Japanese wives prepared meals mainly on the stove burners; whereas, the American wives used the ovens.

A selected typical Japanese meal prepared by JN and typical American meal prepared by AN were compared, to examine which way was more energy efficient. Figure 4.1 shows the appliance use in these selected American and Japanese meals.

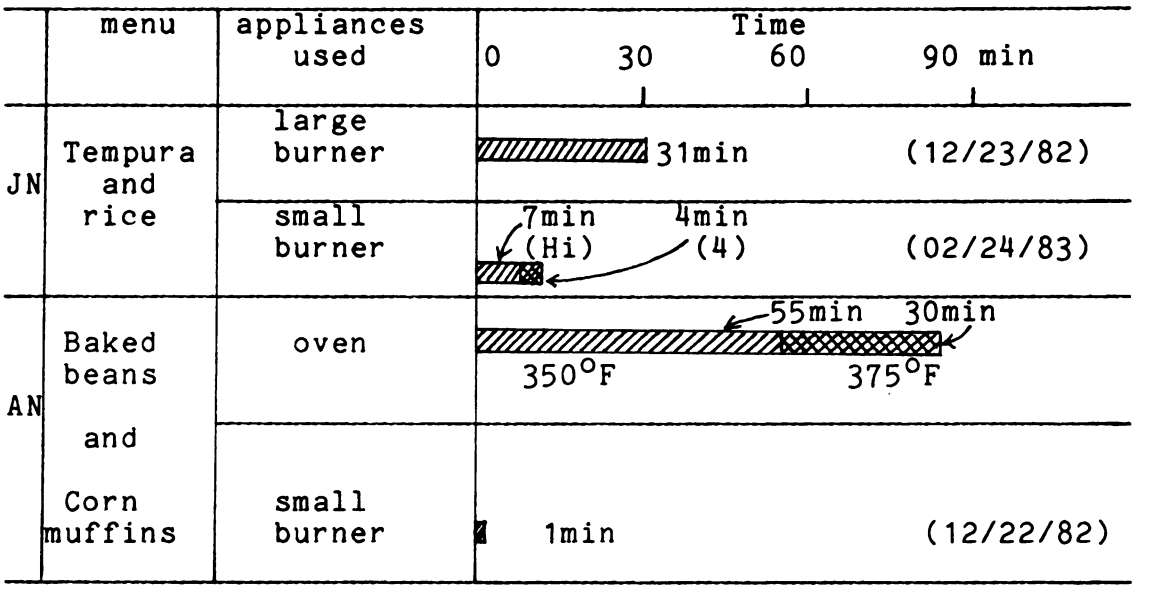

FIGURE 4.1. Appliance Use in A Typical American and Japanese Meal

The Btus of the two meals were calculated by using the wattage of the particular burners and the heat loss of the oven.

At the JN's home, a typical Japanese dish, "Tempura" (which is deep-fried vegetables) and cooked rice were prepared by using only two burners on December 23, 1982. The typical way of rice cooking was selected from the observation on February 24, 1983. The Btus for the Japanese cooking were:

	Rating (W/hr)		hours	
Large burner	2,100	x	0.51	= 1,071
Small burner(Hi)	1,250	x	0.12	= 150
Small burner(4)	500	x	0.07	= 35
			Total	1,256 W

Since 1 Btu/hr = 0.293 W 1,256 W = 4,287 Btu

At the AN's home, a typical American dish, "baked beans" and "corn muffins" were cooked by using the oven (December 22, 1982). A small burner was used for only one minute to melt butter. The number of Btus needed for melting butter was:

Small burner(Hi) 1,250 W x 0.02 hr = 25 W

25 W = 85 Btus

The number of Btus used for the oven was calculated by adding four different energies: 1) energy to heat the air, 2) energy to heat the food and the bowl, 3) energy loss through the walls, and 4) infiltration loss caused by opening the door.

1) The number of Btus needed to heat the air in the oven was:

$67^{o}F \longrightarrow 350^{o}F$

$q = m.Cp.\Delta T$ (Milson and Kirk, 1980, p.87)

$= pV.Cp.\Delta T$

$= (0.06\ lb/ft^3) \times (3.15\ ft^3) \times (0.24\ Btus/lb^{o}F) \times (350^{o} - 67^{o})$

$= 12.83$ Btus

m = mass
p = density of the mass
V = volume of the mass
Cp = specific heat[1]
ΔT = temperature difference
(heated temperature - original inside temperature)

$350^{\circ}F \rightarrow 375^{\circ}F$

$q = (0.06)x(3.15)x(0.24)x(375^{\circ} - 350^{\circ})$
$= 1.13$ Btus

2) The number of Btus needed to heat the food and the bowl inside the oven was:[2]

Beans --- $q = (2\ lb)x(0.8)x(350^{\circ}-67^{\circ}) + (2\ lb)x(0.8)x(375^{\circ}-350^{\circ})$
$= 452.8 + 40 = 492.8$ Btus

Muffins - $q = (1\ lb)x(0.4)x(375^{\circ}-67^{\circ}) = 123.2$ Btus

Ceramic bowl --- $q = (1\ lb)x(0.2)x(350^{\circ}-67^{\circ}) + (1\ lb)x(0.2)x(375^{\circ}-350^{\circ})$
$= 56.6 + 5 = 61.5$ Btus

3) The number of Btus lost through the walls of the oven was:

$$q = \frac{Btu}{hr} = \frac{\lambda A(\theta 1 - \theta 2)}{\ell}$$

$$= \frac{(0.03)(12.32)(350^{\circ}-67^{\circ})}{0.25}$$

$= 418.4$ Btus/hr

418.4 x 0.92 hr = 384.9 Btus

λ=a wall material of low thermal conductivity 0.03 Btus/hr ft^2 F (Glass wool insulation)
ℓ =thickness of the wall (ft)

A=walls of low surface area area (ft^2)
($\theta 1 - \theta 2$) = temperature difference

$q = (0.03)\ (12.32)(375^{\circ}-350^{\circ})$ (Milson and Kirk, 1980, p. 80)
$= 9.24$ Btus
9.24 x 0.5 hr = 4.62 Btus

---

[1]The specific heat is different for each substance. air = 0.24, beans = 0.8, muffins = 0.4, and ceramic bowl = 0.2.

[2]Since the temperature of the air was increased from $350^{\circ}F$ to $375^{\circ}F$, the temperature of the beans and ceramic bowl was also increased from $350^{\circ}F$ to $375^{\circ}F$.

4) The number of Btus needed each time they opened the door was estimated to be half of the air that had to be reheated.

$q = (0.06)(1.58)(0.24)(350^{o}-67^{o})=6.44$ Btus

$q = (0.06)(1.58)(0.24)(375^{o}-67^{o})(4)=27.9$ Btus

The total number of Btus used for the oven is 1200.32 Btus.

Therefore, for a typical meal the Japanese family used 4,287 Btus; whereas, the American family used 1,200.32 Btus. The American oven cooking was more efficient than the Japanese cooking using the burners. The reason of the difference was considered by the National Living Bureau: Burner stoves are only 45 percent energy efficient and 55 percent of the energy is wasted into the air. However, ovens are insulated boxes and the heat loss was smaller than the burner stoves.

The two Japanese wives did not change their way of cooking very much over the three months. They declared that they were not sure how to use the oven.

> JNw says she doesn't know how this oven works (Field notes, 12/15/82).

> I remember JCw was telling me the other day that she had not baked cookies or bread in Japan (Field notes, 12/3/82).

JNw said she learned how to bake cookies and bread at a cooking school in Japan; however, the oven she used in Japan was smaller in size, separate from the burners, and operated by propane gas. She and her husband indicated that they liked the convenience of the oven and burner arrangement found in the United States.

The two Japanese wives increased their oven use through three months (a little), in the course of experimenting with the American oven. For example, JNw baked bread more often in spite of some errors.

> JNw tells me that she burned bread. She says she is baking the bread up side down now since this morning's baking was not enough (Field notes, 1/12/83).

JCw also baked fish (12/3/83) and casseroles (2/17/83) in the oven instead of cooking them on the burners (the way she did in Japan). She talked about her Japanese friend who was still cooking fish in the Japanese way.

> JCw puts the fish pieces on a sheet of aluminum foil. She pours a little of Sake on them, and puts them in the oven which was set on 'broil'. She laughs and says that she remembers her Japanese friend fried fish on a burner and the smoke was all over in her apartment when she visited the friend (Field notes, 12/3/83).

JCW indicated that she was using the rice cooker every day, just like she did in Japan. She said that she brought it with her when she came to the United States. On the other hand, JNw did not bring a rice cooker with her.

> They use a pressure pan for cooking rice. JNw says she really wants to have a rice cooker (Field notes, 12/20/82).

Water Use. The Japanese families used many more dishes than the Americans did for evening meals, so that they had to wash more dishes. The Americans used one large dish per person; whereas, the Japanese used at least a rice bowl, a soup bowl and a middle-size dish per person, most of the time. JNw indicated that Japanese families in this community were beginning to use only one plate sometimes;

however, she still thought she had to keep her Japanese way especially for the time when she goes back to Japan.

> JNw tells me that she went to a potluck party held with three other Japanese families. She says that they had Hokkaido's king salmon. She says it was very delicious so that she could not stop eating it. She tells me that they used only one plate for one person at the party, but she says, 'It would be impossible for us to do it in Japan.' She says she would have to use each dish for each food. She says the harmony created by the dish and food is important (Field notes, 2/24/83).

JNw also declared that she did not have a constant source of hot water in the kitchen in Japan (Field notes, 2/9/83). At the interview after the observation, JNh also indicated that the constant hot water from the faucet was "wonderful."

The National Living Bureau indicated that the constant hot water system was hardly available in Japan; however, the percentage of the instant water boiler's diffusion in Japan was 76.1 percent (1981, p. 62). The boiler's source of energy is natural gas and usually set above the sink, so that hot water is used only when they need it. The bureau encouraged people to use the boiler because the energy efficiency was 75 percent compared with 45 percent for water heated on the burners.

Other than those cultural behaviors, many individual behaviors related to water use were observed.

At the home of AN, both ANh and ANw washed the dishes with soaped sponge first, and then rinsed them with running water. At AC's home, both ACh and ACw used a plastic pan to soak and wash dirty dishes in soapy water and then rinsed

them with running water. Both American families turned on and off the faucet many times. However, at JC's home, JC1 often did dishes using non-stop running water. Water was kept running even when he was washing dishes with soap brush. His mother, JCw washed dishes just like the Americans. Therefore, it was interesting that she did not try to change her son's water use. One day during dish-washing JC1 left the kitchen to go into the living room to adjust the TV picture while he left the water running in the kitchen sink the whole time. JCw and JC2 were in the living room.

> JCw cannot get clear picture. JC1 comes to the living room to help her, but he let the water run in the kitchen sink. JCw says to JC1, 'Water! Water!' But nobody turns off the water. JCw says, 'JC2! Please turn off the faucet. Because it is a waste of water.' JC2 goes to the kitchen and turns off the water (Field notes, 2/9/83).

Opening Refrigerator. The number of times the refrigerator was opened was noticeable at JN's home, especially at evening meal preparation time. They opened the refrigerator 10 times on December 23, 1982, seven times on January 18, 1983, and eight times on February 9, 1983. Also, JNw often opened the door wide open to 180 degrees (Field notes, 2/9/83, 2/4/83, 12/23/82). This behavior reflects findings in the New Lifestyle Campaign Association's study. JNw may be one of the ten percent of the people who opened the refrigerator more than 40 times a day.

Appliances

Two behavioral measures (lighting use and other appliances use -- radio, record, TV and cassette tape recorder) revealed the use of appliance energy.

In lighting, substantial differences between American and Japanese uses were found. Also incidents related to nonchanged cultural behaviors were found in Japanese homes.

In the Japanese homes, the number of lights turned on was always more than the number at the American homes. Moreover, once the Japanese families turned on the lights, early in the evening, they hardly turned them off until their bed time.

These incidents were explained by a cultural behavior. The Japanese families were used to using fluorescent lighting to light a whole room; whereas, Americans were used to using an incandescent light for each activity.

Other than the cultural behaviors for lighting, several individual behaviors were observed related to the use of the radio, record, TV, and cassette tape recorder.

Lighting. Both Japanese families declared that their homes were dark even though they turned on more lights than the American families did. The Japanese families often said it was dark; whereas, the American families never said it was dark.

> JCw says she could not stand only two lights in the living room so that she got the light used for construction site. She says she made a lamp cover by using light purple sheets (Field notes, 12/3/82).

> JCw says, 'This room (living room) is still dark even if we added a light.' She says, 'Why is it dark in this room?' (Field notes, 1/13/83).
>
> JCw comes to the living room and says, 'It is dark, isn't it?' She turns on a light. Now, three lights are on in the living room (Field notes, 1/25/83).

Especially, JC family used three lights in the living room, an entrance light, two lights in the kitchen, a light in the corridor and a light in the bathroom most of the time.

> JCw tells me that the electric fuse box was turned off because of over heat the other day. She says her family was using all lights, tape recorder, an electric pan to fry meat (Field notes, 12/13/82).

JNw indicated her preference for ceiling lighting instead of lamps; however, she had not realized her feelings about the darkness came from the difference between the incandescent light used in the United States, compared to the fluorescent light used in Japan.

> JNw tells me that she wishes she had a ceiling light in the living room like Japan. She says she is accustomed to this lighting system, but she still wants to have a light on the ceiling. I ask her if she means she needs fluorescent lights or not. She answers that she doesn't care what kind of light it is (Field notes, 1/26/83).

At the interview after the observation, the Japanese families said they were very surprised that it was dark in these apartments. JNh indicated that he definitely preferred fluorescent light, and he suggested that incandescent light was a symbol of poor people in Japan. JCw indicated that she liked the color of the incandescent light for dining because the color made the food look delicious; however, the fluorescent light was more economical. They

said that they were using ceiling fluorescent lighting in Japan.

On the other hand, the American families said that they much preferred incandescent lighting. ACw said that she just did not like the fluorescent light in the ceiling of the kitchen (which the Japanese said they wish they had). AN strictly turned off each light when it was not needed. The behavior was consistent over time.

It was found that the Americans used a light for each activity; whereas, the Japanese lighted a whole room for various activities.

> ACc1 says, 'I need light!' ACw turns on a light for her. ... She says it is still dark. She changes her place near another brighter light (Field notes, 12/14/82).

The occasions when JC and AN came from outside made these behaviors especially clear.

> 5:25 p.m. I have been waiting for them since 5:15 p.m. ACw comes back home. She opens the front door. She puts her bag on a chair. She turns on a light at the entrance and puts her coat away in a closet, but soon she turns it off. She goes to living room and turns on a lamp (Field notes, 2/15/83).
>
> 7:15 p.m. JCc1 and JCc2 come from outside. I have been waiting for them since 7:00 p.m. at the front of the door. JCc1 turns on two lights in the living room, one light at the entrance, and one light in corridor. JCc1 turns on a cassette tape. JCc1 and JCc2 play with a bowl.
>
> 7:18 p.m. JCw comes from outside. She turns on a light in the kitchen. She goes to her room. She did not stay in the kitchen (Field notes, 2/14/83).

As the Japanese Ministry of Transportation and Industry (1981) suggested, the same amount of brightness could be achieved by changing 60 W incandescent light to a 15 W fluorescent light. It means that the Japanese families must have been more energy efficient in Japan since they were using fluorescent lighting.

Radio, record, TV, and cassette tape recorder. No specific cultural behavioral differences were found between any of the four families in the use of radio, record, TV, or cassette tape recorder; however, different individual behaviors were found.

AN always listened to the radio. JN's TV was often on and JC often listened the cassette tape. However, AC occasionally listened to records and radio, and watched TV.

Special notice was made that the JN family did not watch TV most of the time when it was on. The TV was used as a substitution background sound at the JN's home. As the NHK (Nippon Hoso Kyokai = Japan Broadcasting Corporation) indicated in 1975, this incident is one example that people were doing something else 46 percent of the time when TV was on.

Other Observations

Three additional behavioral measures (laundry, vacuuming, and bathing and showering) revealed the use of energy in these home activities.

In doing laundry, a changed cultural behavior was observed in the Japanese families. They came to use dryers and they came to be good at using American washing machines.

In the American families' homes, they knew how to do laundry, but they said they did not like doing it.

In vacuuming, an incident related to two non-changed cultural behaviors was observed in the Japanese families. One of the behaviors was that both Japanese families strictly took off their shoes at the entrance; whereas, both Americans wore shoes most of the time and they sometimes took them off when they felt like doing that. The Japanese homes were carpeted and they vacuumed the carpet quite often; however, the American homes were partly carpeted and they did not vacuum as often as the Japanese wives did. Another behavior was that the Japanese sat down on the floor even though they had couches because they were used to sitting on the "Tatami" mat in Japan. That was why they had to keep the floor clean.

In bathing and showering, a non-changed cultural behavior was found in the Japanese adults and a changed behavior was found in the Japanese children. The Japanese adults still took a bath (just like when they were in Japan); whereas, the Japanese children took a shower (like Americans).

Laundry. AC and JN did laundry about once a week, JC did it twice or three times a week, and AN did it once in a month.

> AC say they do laundry once a week. They say ACw did it last Saturday using three machines, and ACh did it this Friday using three machines also (Field notes, 2/13/83).

The Japanese wives indicated their surprises and experiments while using the American machines. They did not

use dryers in Japan, but hung clothing outside. The Japanese washing machine was different from the American machines.

> JNw tells me that she was using an automatic washing machine in Japan. She tells me that she was washing every morning at home. She says she washed bath towels (2 or 3), her and her husband's underwear, etc. She also says she hung clothes outside on fine days and inside on rainy days in Japan (Field notes, 2/4/83).

> JCw tells me that she experienced scratchy feeling from clean clothes, and she realized she should not have put so many clothes in a washing machine. She recognized that too many clothes don't get rinsed enough in a washing machine. Also, she takes out clothes from dryer early when they are still a little wet and hangs them in her bedroom in order to avoid wrinkles (Field notes, 1/11/83).

> JCw says she is surprised to see Americans put many different clothes in a washing machine...She says she does laundry twice or three times a week, using two machines (white and color clothes). She tells me that in Japan she was using a bigger washing machine by Hitachi which could hold 2 sheets at once (Field notes, 1/25/83).

> JCw tells me that it takes almost one hour for a whole process of washing in a Japanese machine because it rinses twice unlike American machines which rinse only once (Field notes, 1/25/83).

ANh talked about sunshine drying; however, he said that it was not common anymore.

> ANh says his mother used to hang clothes outside to dry, but she does not do it anymore. He tells me that he likes the smell of the clothes after getting sunshine (Field notes, 2/13/83).

Vacuuming. The Japanese families vacuumed more often than the Americans and their way of cleaning was more precise.

> JNw says she vacuums rooms once in two or three days. She smiles and says she has to vacuum the floor in front of the couch more often since her husband eats snacks there and spills potato chips and things there (Field notes, 2/6/83).

> I ask JNw how she was cleaning rooms in Japan. She answered she was using broom since the floor was 'Tatami' mat where she thought it was better to use brooms (Field notes, 2/6/83).
>
> JCw dusts all the furniture (such as, bookshelves, TV, window sills), and then she vacuums the floor. She says she is going to wash window screens which haven't been washed since last summer (Field notes, 2/17/83).
>
> JCw tells me that even if she uses bleach, kitchen sink and bathroom sink don't become clean (Field notes, 2/17/83).

Since the American homes did not have carpet, they often used brooms for cleaning. They vacuumed only once a week.

> ACw tells me that she or her husband did vacuuming once a week (Field notes, 2/25/83).
>
> ACh cleans the floor of the kitchen by broom (Field notes, 12/14/82).
>
> ANh brings a broom and cleans the kitchen floor (Field notes, 12/22/82).

One day ACw and AC2 were planting seeds in pots in the middle of the living room. Dirt was scattering. ACw indicated her meaning of the house.

> I tell ACw that they would not be able to do this kind of activity (planting) if they had carpets. She answers, 'The house is for use. I don't want to worry about it. You cannot keep carpet clean.' ACw cleans the floor with a broom and a dust pan (Field notes, 1/12/83).

JNh and JNw often sat down on the carpeted floor just like the way of sitting down on the "Tatami" mat in Japan. That was why they vacuumed quite often.

Bathing and Showering. The Japanese adults indicated their preference for bathing rather than showering.

> JCw tells me that she takes a bath at night. She says it sometimes takes almost one hour. She says she cannot believe Americans can take a shower in the morning. She tells me that she takes a bath

> every other day. She says she fills up the bathtub with water (Field notes, 1/25/83).
>
> JNw tells me that they take a bath every other day. She tells me that it takes 30 minutes (Field notes, 1/26/83).

The Japanese children adapted to the American way quickly.

> JC1 and JC2 tell me that they take showers instead of baths. JCw tells me that she takes a shower sometimes but she takes baths on Wednesday and Friday to relax. JC2 says that it is hard to relax in an American bathtub because it is not deep enough and he has to bend his knee (Field notes, 2/14/83).

The Americans indicated when they were interviewed after the observation that they were showered not bathed. The Energy Conservation Forum (1981) indicated that showering was more economical because it did not use as much hot water as bathing (p. 69).

The Japanese families did not take baths quite as often as the American families took showers. The amount of water and length of time they used the water must be measured in order to compare the energy of bathing with the energy of showering.

Summary

From the findings of the study it is possible to say that the Japanese families were attempting to carry out their cultural ways and traditional Japanese lifestyles in the United States. However, because they were living in American style apartments with central heating and using the appliances provided in university housing, they appeared (from the observation) to use energy inadvertently. Also, the Japanese families did not indicate that energy was a

major social issue in the initial survey; whereas, the American families considered energy the most important social issue. The difference in attitude about energy between the American and Japanese families also appeared to be expressed in the ways energy was used in their homes. The American families were trying to conserve energy; whereas, the Japanese families were not.

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

Conclusions and implications are presented in the following order.

1. Overview of the Study
2. Conclusions of the Study
    a. The Cultural Energy Behaviors
    b. The Relationships Between Energy Attitudes and Behaviors
3. Generated Theory of the Study
    a. Theory of Cultural Adaptation
    b. Theory of Energy Attitudes and Behaviors
4. Implications for Further Research
5. Implications for Other Energy Research
    a. Indirect Energy
    b. Human Energy
6. Implications for Research on Cultural Adaptation

Overview of the Study

Energy conservation in households is extremely important in the United States and Japan. In this study, special attention was given to the impacts of traditional and cultural behaviors on the difference of household energy consumption, because no study was found that compared

American and Japanese traditional and cultural impacts on household energy behaviors and attitudes.

The objectives of the study were to find empirically the cultural or traditional characteristics of written attitudes and observed behaviors relative to energy consumption, and to develop and generate theories relative to cultural impacts on energy consumption in both American and Japanese families.

Four case families (two Americans and two Japanese) who were new at Michigan State University in 1982 were selected. Their energy attitudes were obtained by survey method, and their energy behaviors and the additional energy attitudes were obtained by ethnographic method.

Conclusions of the Study

The Cultural Energy Behaviors

The Japanese families showed their surprises, questions, confusions, and experiments about the new system and new appliances of the American homes; whereas, the American families were already used to the system and appliances from previous places and experiences. The Japanese families adapted some behaviors to the American ways; however, they kept most of their cultural behaviors in the American home settings. They tried to achieve the same kind of atmosphere in the United States as in their Japanese homes, while using new American systems and appliances. For example, they cooked the same fish by using the oven in the United States, where they used burners in Japan; they washed

a similar number of plates by using constant hot water in the United States, where they used cold water or instant hot water in Japan; they tried to achieve the same brightness from the incandescent light in the United States, and from the fluorescent light in Japan; and they wanted to sit down on the floor so that they put carpet on their floors in the United States instead of "Tatami" mat as in Japan.

From an energy point of view, the Japanese families used more energy than the Americans. They used more energy unconsciously and inadvertently. On the other hand, the two American families were energy conscious so that they used less energy.

The Japanese behaviors indicated that their cultural behaviors were rooted in the Japanese energy settings. Therefore, energy behavioral consideration about the adaptation of Western systems and appliances is tremendously important for Japan to examine: Are the new systems and appliances from America appropriate to the Japanese cultural behaviors or not? One possible reason why the Japanese families retained most of their cultural behaviors is that they had just come to the United States. It would be very interesting to conduct observations of the same four families over a period of several winters.

The Relationships Between Energy Attitudes and Behaviors

As described in Chapter II, there is a serious question as to whether attitude and self-reported energy behaviors exhibit a strong degree of association with actual energy consumption. However, an indirect relationship was

established between energy attitudes and energy behaviors in this research.

The two American families who indicated their awareness of energy problem at the initial interview showed their behaviors and attitudes related to energy conservation during the observation. On the other hand, the two Japanese families who did not indicate their awareness of energy problem at the initial interview did not show their behaviors and attitudes related to energy conservation, except on a few occasions during the observation.

One possible reason why their energy attitudes in the initial interview and the observed energy behaviors had the indirect relationships is that the four families were not told that the focus of this research was energy attitudes and behaviors.

Generated Theory of the Study

Theory of Cultural Adaptation

A theory of cultural adaptation was generated. The hypothesis of the theory is: "People try to maintain cultural practices even in new culture settings."

The Japanese families tried to maintain their Japanese culture such as the bright atmosphere, the traditional food, and sitting on the floor by using new American material culture such as incandescent lights, oven cooking, and carpets.

The sequence of the adaptation was as follows. First, they examined the new material culture. Second, they were

surprised at and confused about the difference between the new material culture and their native material culture. Third, they came to manipulate the new material culture in a way in order to get the same outcomes which they could get in Japan.

Moreover, dealing with the material culture as found in the United States, meant that the Japanese families encountered and practiced some new ideas about doing household activities. For example, the idea of partial heating in Japan was different from the idea of central heating in the United States.

The American families also maintained their culture by using the same material culture which they had in the previous places.

Theory of Energy Attitudes and Behaviors

A theory of energy attitudes and behaviors was generated. The hypothesis is: "People who are energy conscious use less energy."

The two American families said they were concerned about energy conservation and they tried to use energy less. However, the Japanese families who did not show their concern about energy conservation did not care how much they used energy.

Implications for Further Research

The methodology used in this research was survey and ethnographic techniques which revealed various energy behaviors and attitudes related to direct energy use.

Further research using energy measurement in addition to this methodology may reveal more clear findings with regard to actual direct energy consumption. Moreover, the comparison of energy behaviors and attitudes of Americans in Japanese home settings and Japanese in American home settings may be interesting, or perhaps comparing Japanese families in their own cultural settings with American families in their own settings.

Implications for Other Energy Research

Indirect Energy

This methodology allowed several other interesting aspects of possible study. For example, this study revealed indirect energy use in the American homes and the Japanese homes as well as direct energy use.

> JCw offers cookies to me. The peanut butter cookies were from a packaged dough which I saw yesterday. ... She told me that her husband saw the packaged dough and said it was just like "America." She said he had the idea that Americans used a lot of ready-made (instant) products (Field notes, 12/3/82).

> ACh opens freezer and takes out frozen fried potatoes. He puts the potatoes from the two bags onto the metal cookie sheet (Field notes, 2/13/83).

These incidents suggest that some energy was used to make the packaged dough and the frozen potatoes before JN and AC bought them. Therefore, when the energy of the baked cookies and the fried potatoes is calculated, not only energy used for cooking but also the energy used in the process of the production must be included.

The Japanese families received a lot of packages from Japan and also they bought imported products at oriental stores. Those Japanese products included much indirect energy also. For example:

> They received a package from Japan this afternoon. They open it delightfully. Japanese rice crackers, dried seaplant called 'Hijiki' and 'konbu,' warm socks and things were inside of the box. JC1 and JC2 say, 'This is mine.' JCh is smiling. JCw got a beautiful muffler, too (Field notes, 12/9/82).

Human Energy

In the American homes, the wives and the husbands took turns at doing laundry and vacuuming, and many other home tasks such as cooking, dishwashing, and taking out garbage, were shared between them. However, in the Japanese homes, mainly the wives did home tasks and the husbands seldom helped. In other words, in the American homes both wives' and husbands' human energy was used; whereas, in the Japanese homes only the wives' human energy was used for the home tasks.

When the AN used the oven for cooking beans and muffins, ANw was drawing calendars for Christmas present and ANh was cooking another dish; whereas, when the JNw was cooking "Tempura" and rice by using burners, she had to be in front of the stove all the time, in order to put the vegetables into the pan and take them out from the pan, constantly. In other words, ANw used less human energy than the JNw for some cooking tasks.

JCw described the "less human energy" idea, when she used the oven, by using the word "lazy."

> JCw tells me that she used oven when she is lazy (Field notes, 2/17/83).

ANw described the "less human energy" idea when she used the microwave oven by using the word "convenient."

> ANw tells me that the microwave oven is very convenient. She says she often puts leftovers in there, so that supper is ready in 30 minutes (Field notes, 12/22/82).

It would be very interesting to compare human energy, and the perception and meaning of the human energy in the American homes and the Japanese homes.

Implications for Research on Cultural Adaptation

The Japanese families were trying to adapt to the American culture.

> JNw tells JNh that they will need a car seat for their baby. JNh looks at a community paper called 'Wheeler Dealer' and finds a baby seat (Field notes, 1/26/83).

> JCw says she really wants to have a dishwasher in Japan because it is very useful. She says she saw it in many American homes (Field notes, 1/25/83).

Not only the Japanese families but also one of the American families were having a hard time adapting to Michigan's way of life, especially the weather.

> ACw says, 'I felt much better in California. I don't mind cold weather, but I need sunshine.'
> ACh says, 'I cannot take it any more. I look for a job in California and Masschusetts' (Field notes, 2/25/83).

> ACw does dishes. ACh is looking at California pictures. ACw says to me, 'See, how sunny it is there!' (Field notes, 2/25/83).

It would be very useful for counselors and employers to a know how people new to a place, struggle and adapt to the new society.

APPENDICES

APPENDIX A

The Initial Letter to the Japanese Families

はじめまして。

私はミシガン州立大学人間生態学部で修士論文に取り組む河野りえと申します。

私のコースは、家族と流行の話題に対する家族の反動の研究を強調しております。そこで、今回私は大変短かい質問事項に対する皆様の反動とお答えを15分ほどのインタビューによって知ることができたらと考えております。

その情報を提供して下さいますご協力をよろしくお願いいたします。

私はこの後近々お宅にお電話をいたします。その時にインタビューの日どりをお約束できましたら幸いです。

1982年10月　日

様

河野りえ

The Initial Letter to the Japanese Families (Translation)

I am Rie Kohno, a graduate student in Human Ecology, and I am working on a Master's thesis.

My graduate program emphasizes families and their reactions to current issues; therefore, I would like to know your reaction and your answers to a very short set of questions which will take about 15 minutes to answer.

Your cooperation and your willingness to supply me with this information is very greatly appreciated. I will telephone you soon to make an appointment with you.

Sincerely,

Rie Kohno

APPENDIX B

INITIAL INTERVIEW

Interview -- I ask the families several things after the questionnaire. "Now, I would like to ask you several things about your family."

1. Would you tell me how many children you have?

   Could you tell me their ages?

2. May I ask you where you are from? (In other words, where were you living in Japan?)

3. Would you tell me why you came here?

4. What kind of house/or apartment were you living in?

   Size --

   Characteristics --

5. Would you tell me what department you are in?

6. Are you a professor, assistant professor, associate professor, or visiting scholar?

   Are you teaching or researching?

7. Could you tell me if you have a Ph.D or Master's?

   In which country did you get it?

8. Have you ever been to (this country or) other foreign countries?

   If "Yes", How long were you there?

9. Would you tell me if this apartment has one bedroom or two bedrooms?

Observation

1. Which level do they live in the apartment building?

2. Orientation to the sun

3. Colors on walls

4. Colors on carpets

5. Others

Rank Order and Incomplete Sentences of Important Social Issues (English)

I have a list of current issues which are important to families in most countries today. There are two things I would like you to do.

1. Rank order the following issues according to your idea about how serious they are, 1 being the most serious, 8 is the least serious, please.

2. Please complete a sentence or two using these same words.

- [ ] Crime
- [ ] Education
- [ ] Unemployment
- [ ] Inflation
- [ ] World
- [ ] Energy Consumption
- [ ] Family Relationships
- [ ] Drug and Alcohol Use

Crime

Education

Unemployment

Inflation

World Trade

Energy Consumption

Family Relationships

Drug and Alcohol Use

Rank Order and Incomplete Sentences of Important Social Issues (Japanese)

これらは今日 ほとんどの国において 家族にとって重要な話題をあげたリストです。

2つのことをお願いしたいのですが.

まず. これらの論点の中で. 一番重大と思われるものに「1」. 一番重大ではないと思われるものに「8」というように 1から8までのランクづけをお願いいたします。

次に. これらの同じ言葉を使って. 1つか2つの文を完成させて下さい。

☐ 犯罪

☐ 教育

☐ 失業

☐ 物価騰貴

☐ 世界貿易

☐ エネルギー消費

☐ 家族関係

☐ 麻薬やアルコール

犯罪

教育

失業

物価騰貴

世界貿易

エネルギー消費

家族関係

麻薬やアルコール

APPENDIX C

The Second Letter to the Japanese Families

拝啓。10月　日には、インタビューをさせていただきまして大変ありがとうございました。私の研究を快く受け入れて下さり、また貴重なお時間を割いて下さいましたことに、本当に感謝いたします。

お宅のご家族は、格別に重要な情報を提供して下さいました。それで、できますならば、お宅のご家族に、私の次のやや大きな研究の1部分になっていただけたらと存じます。この11月から1月に渡って、1ヶ月に数日（1日2時間ほど）お宅にお伺いすることによって興深い研究ができましたら幸いです。

私の修士課程における研究は、家庭環境の中での家族をじっくりと見つめることによって、現代社会における家族を理解しようとするものです。

また、お電話を差し上げまして、なお一層のご協力をお願いいたしたいと存じます。そのお電話の際に、私の研究の課程をご説明し、また、ご質問にもお答えしたいと思います。

さらに、私の論文アドヴァイザーのモリソン教授（Dr. Bonnie Morrison, 353－3717）も、皆様がお持ちのご質問について、喜んでお答えいたします。

このさらに深い依頼を、真剣に考慮に入れて下さいましたことに感謝いたします。

敬具

10月26日

様

河野りえ（355－3579）
人間環境とデザイン学科修士課程
人間生態学部

The Second Letter to the Japanese Families (translation)

October 26, 1982

Dear Mr. and Mrs. J:

Thank you very much for allowing me to interview you on October____. I really appreciated your time and willingness to be involved in my study.

Since you gave me exceptionally important information, I would like your family to be a part of my larger study.

I would like to visit your family further by coming to your home a couple of hours a day for several days during the months of November, December and January.

My masters research design requires that I look at families in their home environment as a part of understanding families in today's world.

I will give you a call to ask your further cooperation. When I call you, I will explain my research process, and answer any questions you have. Also, my thesis adviser, Dr. Bonnie Morrison (353-3717) will be happy to discuss any questions you have.

Thank you for seriously considering my further request.

Sincerely,

Rie Kohno, Master's student
Department of Human Environment and Design
College of Human Ecology

APPENDIX D

November 5, 1982

Dear

I am Rie Kohno, a Master's student in the Department of Human Environment and Design, College of Human Ecology.

I am conducting the research for my master's thesis, and would like to invite you and your family to consider participation.

The Master's thesis is designed to study cross-cultural comparisons of newly arrived Japanese and American families here at Michigan State University. The comparisons focus on reactions to current social, economic, and resource issues and further, to compare how families use the resources in their housing environments.

The first objective will be accomplished by answering a very short questionnarie, taking 15 minutes time. From the answers to the short questionnaire, two Japanese and two American families living in university housing will be asked to cooperate in accomplishing my second objective. The second objective will be accomplished by visitation to the families' homes during the months of November, December and January. The visitations will be about two hours each, requiring five visits per month. The visitation hours will be arranged at times of greatest convenience for the family and will be at times which do not interfere with family privacy.

All of the information gathered in the questionnaires and in the visitations will be held in STRICT confidence. At no time in the research reporting (Master's thesis) will the families' names be revealed. The family may also terminate these visitations, if and when they become inconvenient for the family.

Your cooperation and willingness to participate in my master's research is very important to me. Therefore, I will telephone you to set up the initial appointment and to further answer any questions you might have. My major professor and thesis advisor, Dr. Bonnie Morrison, will also be willing to answer any questions. Her office telephone number is 353-3717.

Although your cooperation and possible involvement is strictly voluntary, I thank you in advance for seriously considering my request.

Sincerely,

Rie Kohno

APPENDIX E

Case Families' Selection Procedure

Oct. 1 (Fri)	Japanese faculty workers' names and addresses were obtained at International Center.
Oct. 12 (Tue)	Letters are mailed to the six Japanese faculties.
Oct. 16 (Sat)	Communication with Japanese Family 1 at MSU Japanese Club's party.
Oct. 17 (Sun)	The 6 Japanese families were called and 4 appointments for initial interviews were made. (Family 5 refused and the Family 6's male heed of household was in Canada.)
Oct. 18 (Mon)	6:00-10:00 p.m. Interview - Family 1. I was also invited for dinner.
Oct. 19 (Tue)	9:30-10:30 p.m. Interview - Family 2.
Oct. 20 (Wed)	12:20-12:50 p.m. Interview - Family 4.
Oct. 21 (Thu)	6:20-7:00 p.m. Interview - Family 3.
Oct. 22 (Fri)	2:00-5:30 p.m. Shopping with Family 1's wife.
Oct. 26 (Tue)	Letters of asking cooperation in observational study were sent to the 1 to 4 Japanese families.
Oct. 28 (Thu)	Family 3 and Family 4 were called and asked their cooperation. Family 3 said they would think about it for a while. Family 4 refused to cooperate.
Oct. 29 (Fri)	Family 1's wife was visited.
Oct. 30 (Sat)	Family 3 refused to cooperate.
Nov. 1 (Mon)	Family 6's husband who came back from Canada was called. Thank you note was sent to Family 3 and 4.
Nov. 5 (Fri)	Shopping with Mrs. 1 1:30-5:00 p.m.

Nov. 8 (Mon)	The researcher and the research adviser visited Mr. 6's office. 1:30-2:30 p.m. Initial letters were sent to 12 American faculties.
Nov. 9 (Tue)	Mrs. 6 was called. 8:00-8:10 p.m.
Nov. 11 (Thu)	Mrs. 1 was called.
Nov. 14 (Sun)	Mrs. 1 was called and made an appointment of the first visitation on Nov. 16 (Tue). She and her friend were invited to an opera performance.
Nov. 14 (Sun) Nov. 16 (Tue)	The 12 American families were called and one appointment for the initial interview was made.
Nov. 17 (Wed)	Interview - An American couple's home. 7:30-8:30 p.m.
Nov. 18 (Thu)	Took Mrs. 1 and her friend to the opera performance.
Nov. 19 (Fri)	Mrs. 6's driving practice. 2:00-5:00 p.m.
Nov. 22 (Mon)	Additional 7 letters were sent to other American faculties. 1:00-2:30 p.m. Mrs. 6's driving practice. 5:00-8:00 p.m. Visiting Mrs. 1 and help packing. Mrs and Mrs. 1 gave permission for observation.
Nov. 23 (Tue)	11:00-11:30 a.m. Helped sending packages to Japan. (Mrs. 1) 7:30-9:30 p.m. Brought books to Mrs. 1.
Nov. 26 (Fri)	8:20-8:40 p.m. Two of the seven American faculties were called.
Nov. 27 (Sat)	1:00-7:30 p.m. Driving practice and dinner at Mrs. 6's.
Nov. 28 (Sun)	6:45-7:30 p.m. Five of the seven American faculties were called.
Nov. 29 (Mon)	1:00-2:30 p.m. Driving practice with Mrs. 6.
Dec. 1 (Wed)	1:00-2:30 p.m. Driving practice with Mrs. 6. 6:45 p.m. The American couple was called and made an appointment for the researcher and the research adviser's visitation.

Dec. 2 (Thu) 1:00-6:45 p.m. Driving practice and dinner at Mrs. 6's.
10:00 p.m. The student in the research adviser's class was called.

Dec. 5 (Sun) 1:00-2:30 p.m. An American family with two children were interviewed, and they showed cooperation with the observational study.

Dec. 8 (Wed) 7:00-8:00 p.m. The researcher and the research adviser visited the American couple's home and asked to cooperate. They gave me the permission of this observational study at their home.

APPENDIX F

Observation Procedure

(Date and Amount of time of the Observation)

Date	Amount of time JC	JN	AC	AN
12/3 (Fri)	3:15			
12/9 (Thu)	2:53			
12/11 (Sat)		:10		
12/12 (Sun)		:25	2:17	
12/13 (Mon)		:10	:05	
12/14 (Tue)			3:50	
12/15 (Wed)		1:02		
12/20 (Mon)		1:30		2:00
12/22 (Wed)				3:00
12/23 (Thu)		2:06		
December Total	6:08	5:23	6:23	5:00
1/11 (Tue)	1:18			2:10
1/12 (Wed)		1:00	2:05	

Date	Amount of time			
	JC	JN	AC	AN
1/13 (Thu)	2:00			
1/16 (Sun)		1:35	2:00	
1/20 (Thu)				1:00
1/21 (Fri)		1:15		
1/24 (Mon)			2:00	
1/25 (Tue)	4:00			
1/26 (Wed)		2:05		
1/27 (Thu)			:05	2:30
1/28 (Fri)			3:50	
1/30 (Sun)	:50			:05
January Total	10:18	6:55	10:00	6:50
2/1 (Tue)				2:10
2/3 (Thu)	2:35			
2/4 (Fri)		2:55		
2/6 (Sun)		1:00		

Date	Amount of time			
	JC	JN	AC	AN
2/7 (Mon)	2:25			
2/9 (Wed)		1:00		
2/13 (Sun)			2:00	2:15
2/14 (Mon)	3:00			
2/15 (Tue)				1:00
2/16 (Wed)			1:55	
2/17 (Thu)	2:25			
2/18 (Fri)			2:17	
2/23 (Wed)				2:00
2/24 (Thu)		2:10		
2/25 (Fri)			2:10	
2/27 (Sun)			2:00	2:35
2/28 (Mon)		3:02		
February Total	10:25	10:07	10:22	10:00

APPENDIX G

Questions at the end of Observation

1. Why did you have the car you presently own?

2. Did you do your laundry more or less frequently in your previous home?

3. On the average, how many times do your family members bathe or shower per week?

4. How often do you clean your house?

5. What kind of primary and secondary heating equipment did you have in previous home? And what kind of energy was used for your primary heating?

6. Which heating system do you prefer, the one in your previous home or in this home?

7. Were you aware of the difference between fluorescent and incandescent lighting?

8. How long does it take to prepare major meals of the day?

9. Were you trying to conserve energy?

10. Why? or Why not?

BIBLIOGRAPHY

(In Japanese)

Energy Conservation Forum (Sho Enerugi Foramu). How To Deal With Energy Skillfully (Enerugi To Jozuni Tsukiau Ho). Tokyo, Japan: Electric News Publishing Co. (Denryoku Shinpo Sha), 1981.

The Ministry of Transportation and Industry (Tsusan Sangyo Sho). Energy '81 (Enerugi '81). Tokyo, Japan: Electric News Publishing Co. (Denryoku Shinpo Sha), 1981.

Murayama, Motohide. "Cultural Friction of Marriage - Discord of the Stomach (Kekkon no Bunka Masatsu- Ibukuro no Katto))." Current Spirit (Gendaino Esupuri) 182 (September 1982): 41-58.

The National Living Bureau of the Economic Planning Agency (Keizai Kikaku Cho Kokumin Seikatsu Kyoku). Encouraging Energy Conservation Living (Sho Enerugi Seikatsu no Suishin no Tameni). Tokyo, Japan: The Japanese Government, 1981.

Yoshikawa, Shoichi. The Challenge to the Energy - A Letter to Japan - Comparison of Japanese Culture with American Culture (Enerugi eno Chosen - Nippon eno Tegami - Nichibei Bunka o Hikaku Suru. Tokyo, Japan: Sankei Publishing Co. (Sankei Shuppan), 1981.

(In English)

Bartell, Ted. "The Effects of the Energy Crisis on Attitudes and Life Styles of Los Angelos Residents." Paper presented at 69th Annual Meeting of the American Sociological Association, August 1974.

Beck, Paul A. "Correlates of Energy Conservation." Public Policy 28, 4 (1980): 451 - 471.

Becker, Lawrence J., Rabinowitz, Vita C., and Seligman, Clive. "Evaluating the Impact of Utility Company Billing Plans on Residential Energy Consumption." Evaluation and Program Planning 3 (1980): 159 - 164.

Bittle, Ronald G., Valesano, Robert M., and Thaler, Greg A. "The Effects of Daily Feedback on Residential Electricity Usage As A Function of Usage Level and Type of Feedback Information." Journal of Environmental Systems 9,3 (1973): 275 - 286.

Cartee, Charles. "Solar Energy Installations: Trends and Lender Attitudes." Real Estate Management - Operating Techniques and Products 315 (Jan/Feb/1976): 21 27.

Darmstadter, Joel, et al. How Industrial Societies Use Energy: A Comparative Analysis. Baltimore: The Johns Hopkins University Press, 1977.

Doering, O. C. et al. "Indiana's Views on the Energy Crisis." (CES Paper No. 6, September 1974.

Feldman, Shel, and Awad, Ziyad. "What Appeals Should We Use to Promote Electricity Conservation?" American Council for an Energy-Efficient Economy, July 1982.

Fernandez, Larry C. "Oriental Echoes - Blending East & West in Northern California." Architectural Digest (August 1981): 50 - 55.

Futagawa, Yukio. House by Frank Lloyd Wright. Tokyo, Japan: 1980.

Geller, E. S., Ferguson, John F., and Brasted William S. "Attempts to Promote Residential Energy Conservation: Attitudinal versus Behavioral Outcomes." Working paper, Department of Psychology, Virginia Polytechnic Institute and State University, 1978.

Gladhart, Peter M., Zuiches, James J., and Morrison, Bonnie M. "Impacts of Rising Prices upon Residential Energy Consumption, Attitudes, and Conservation Policy Acceptance." Occasional Paper No. 9, Project 3152. East Lansing, MI, Michigan Agricultural Experiment Station, Michigan State University, 1977 (Mimeographed).

Glaser, Barney G., and Strauss, Anselm L. The Discovery of Grounded Theory: Strategies for Qualitative Research. New York: Aldine Publishing Company, 1967.

Heldman, Dennis R. Food Process Engineering. Westport, Conn.: The Avi Publishing Company Inc., 1975.

Heyer, Paul. Architects on Architecture - New Directions in America. New York: Walker and Company, 1966.

International Energy Agency, Organization for Economic Cooperation and Development. Energy Statistics 75/79. 1980.

Jaques, Bertha E. "Artist's Home in Japan: Helen Hyde Has Modified an Eastern Environment." Craftsman (November 1908) 15: 186 - 191.

Keith, Joanne G. "Direct Household Energy Consumption, 1973 - 74, 1975 76: The Impact of Family Microdecisions upon Levels of Consumption." Ph.D. dissertation, Michigan State University, 1977.

Kempton, W., et. al "Do Consumers Know 'What Works' in Energy Conservation?" American Council for an Energy - Efficient Economy, July 1982.

Kempton, W., and Montgomery, L. "Folk Quantification of Energy." The International Journal, January 1983.

Knutson, Bonnie J. "Energy Intensive Lifestyle Expectations: An Index Is Developed and Tested." American Council for An Energy - Efficient Economy, July 1982.

Koike, Shinji, and Hamaguchi, Ryuichi. Japan's New Architecture. Tokyo, Japan: Shokokusha Publishing Company, 1956.

Kurokawa, Kishio. Metabolism in Architecture. Colorado: Westview Press Inc., 1977.

Makinson, Randell L. Greene & Greene - Architecture as a Fine Art. Salt Lake City: Peregrine Smith Inc., 1977.

Marlin, William. "Maki House Interlocks with a Hilly Tokyo Site." Architectural Record (April 1980) 162: 92 - 95.

Marsden, M., and Burby, R. "Energy Conservation Behavior and Retrofitting: Educational Strategies and Conservation Contexts." Paper Submitted to Energy/Environment Session 1981 American Sociological Association Annual Meetings.

Milson, A., and Kirk, D. Principles of Design and Operation of Catering Equipment. Westport, Conn.: Avi Publishing Company, 1980.

Morrison, Bonnie M. "Socio-Physical Factors Affecting Energy Consumption in Single Family Dwellings: An Empirical Test of a Human Ecosystems Model." Ph.D. dissertation, Michigan State University, 1975.

Morse, Edward S. Japanese Homes and Their Surroundings. New York: Harper & Brothers Franklin Square, 1885.

Murphy, Patrick E., Laczniak, Gene R., and Robinson, Richard K. "An Attitudinal and A Behavioral Index of Energy Conservation." The Conserver Society American Marketing Association, 1979.

Oak Ridge National Laboratory. Building Energy Use Data Book, Edition 1. April 1978.

Pilgrim, B. F., et al. The National Study of the Residential Solar Consumer: Decision Factors and Experiences. Colorado: Solar Energy Research Institute, May 1981.

Riani, Paolo. Kenzo Tange. Hamlyn, 1970.

Shippee, Glenn. "The Psychology of Energy Consumption and Conservation: A Review and Conceptual Analysis." East Lansing: Department of Psychology, Michigan State University, 1980 (Mimeographed).

Socolow, Robert H. Saving Energy in the Home - Princeton's at Twin Rivers. Cambridge, Massachusetts: Ballinger Publishing Company, 1978.

Spradley, James P. Participant Observation. New York: Holt, Rinehart and Winston, 1980.

Stein, Jess (Ed.) The Random House Dictionary of the English Language. New York: Random House, 1967.

Stout-Wiegand, N., and Trent, R. B. "Sex Differences in Attitudes Toward Energy Developments." 1982.

Strand, Janann. A Greene & Greene Guide. Pasadena, California: Castle Press, 1974.

United Nations. Yearbook of Construction Statistics, 1969 - 78. 1979: 141, 268.

U.S. Department of Energy. Monthly Energy Review. Washington D.C.: The U. S. Government, September 1981.

U.S. Department of Energy. Residential Energy Consumption Survey: Conservation. Washington D.C.: The U. S. Government, February 1980.

Winett, R. A. & Nietzel, M. T. "Behavioral Ecology: Contingency Management of Consumer Energy Use." American Journal of Community Psychology, 1975.

Yergin, Daniel, and Hillenbrand, Martin. Global Insecurity: A Strategy for Energy & Economic Renewal. Boston, Massachusetts: Houghton Mifflin Company, 1982.