

Science-Related Attitudes of Korean Housewives

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ABSTRACT

The purpose of this research is to suggest the way to promote housewives' understanding of science and technology, based on the survey results of the attitude toward science and technology, the scientific attitude, and the interest in science and technology of housewives in Korea. The questionnaire was developed by researchers and administered to housewives who live in Seoul to get basic information. Housewives showed slightly positive attitudes toward science and technology, and similarly positive scientific attitudes. These scores were increased as monthly income and education level were raised. Housewives' interest of the science-technology related topics (foods, health, education, leisure, social issues, cooking, housing, everyday activity) was relatively high, and the interest of foods, health, education, and leisure was significantly correlated with the scores of housewives' attitude towards science and technology and their scientific attitudes. Housewives are shown to be curious to know these topics when they were asked by their children or do not know the terms appeared in media, or purchase home appliances and food. And they get the answers in a passive way by asking their family members or by watching TV or newspapers. They preferred TV program for enhancing their understanding of science. But such program could be proper to present science knowledge but not fulfill the role to promote scientific literacy. Specially designed programs through science centers or science museums would be suggested for their lifelong education.

Key words: attitude toward science, scientific attitude, housewives, scientific literacy, interest on science-related topics

I. Introduction

Citizens of modern society have been living in an age of science and technology. Continuing advances in science and technologies had a pervasive impact on both the methods of production and the products that are manufactured (Miller, 1998). As more products incorporate new technologies, consumers as well as workers in manufactural industry need more understanding of science and technology. Over recent decades, the number of public policy controversies that require scientific and technological knowledge has been increasing. Citizens' understanding of science and technology has been required for effective participation to democratic decision making.

Public understanding of science and technology has come to be considered an essential part of general education across the world(Osborne, 2000). Science was considered a specialized

discipline for only a few people to want to be scientists in the past, but it is now considered desirable that all citizens have scientific literacy (Popli, 1999). In scientifically literate society individuals have to be able to deal with the problems they face in the highly technology-based society (Kolsto 2001). Developing scientific literacy for all has been an important goal of science curriculum (AAAS, 1990; Bybee, 1999; Chiappetta & Koballa, 1998).

In recent years, much attention has been paid to public's scientific literacy. Being scientifically literate means not only having an understanding of science concepts and processes, but also being able to apply this understanding to the science-related matters in private or civic life. Promotion of public's scientific literacy cannot be exclusive responsibility of schools, but science museums and science centers can play an increasing part in this promotion (Daley, 2000; Henriksen & Froland, 2000). Missions of science centers and science museums have been changed from 'presenting objects in glass cases' to 'exploring not only scientific phenomena but also contemporary socio-scientific issues through interactive or hands on experiences' (Pedretti, 2002).

Housewives play an important part in managing affairs of a household in Korea. They have to prepare foods for their family, purchase proper household goods at reasonable price, and help their children study. Along with these roles of managers, consumers, and educators, they have responsibility as citizens in conserving democratic society by doing decision making about controversial issues. Housewives are required to be scientifically literate in modern society, however they have rarely been the subjects of related studies in Korea and across the world in general. With this background this study carried out a survey on housewives' understanding of science and technology and their interest in science, and discussed the need to enhance housewives' scientific literacy through relevant programs in science center and science museum.

II. Methodology

Sample

A sample of 534 housewives from Seoul completed a written questionnaire to examine their attitudes toward science and technology, the scientific attitude, and the interest in science related topics. For the survey, 4 elementary schools and 7 secondary schools in Seoul were selected, and the questionnaire was given to the mothers of the students of two classes in each school. Approximately 96% of respondents were at 30s to 40s, and about 90% have completed education at the level of high school or university.

Survey

A questionnaire was developed to investigate housewives' science-related attitudes and their interest about science-related topics. Items of the questionnaire were derived from a literature study, a previous survey by phone, and a discussion between research members. After a pilot study was conducted, a revised questionnaire having various types of response according to the content was made (See Table 1). Each scale of 'science attitudes toward science and technology' and 'scientific attitude' was composed of 7 and 8 items respectively, and its reliability was .55 and .64.

Table 1. Contents of the questionnaire and response types

Contents	Response types
• Survey background information: age, children's grade, educational career, monthly income, occupation of herself / husband	Multiple choice (plural choice acceptable in children's grade)
• Attitudes toward science and technology, and scientific attitudes	15 items of 5 point Likert scale
• Interest about topical issues of science and technology	30 items of 3 point Likert scale
• Occasions to want to know scientific principles	2 multiple choice items (plural choice acceptable)
• Interest and difficulty toward school science	2 items of 5 point Likert scale and short answer
• Reason for difficulty in learning science	1 multiple choice item (plural choice acceptable)
• Usefulness of school science in daily life	1 multiple choice item (plural choice acceptable)
• Preferred program types	1 multiple choice item (plural choice acceptable)
• Willingness to participate them	1 multiple choice item

III. Results and Discussions

1. Attitudes toward science & technology and scientific attitude

Housewives were asked to respond to each item of the attitude toward science and technology and the scientific attitude on a 5-point Likert scale ranging Strongly Disagree to Strongly Agree. They showed slightly positive perception about science and technology. The average score of the attitude toward science and technology was 3.74 (See Table 2), and particularly the scores of items of 'the development of science and technology makes our lives more comfortable' and 'government has to support natural sciences even if there is no immediate outcome' were high.

The average score of scientific attitudes was 3.67 (See Table 3). Scientific literacy involves not simply knowing the facts, but also requires ability to think logically, draw conclusions, and make decisions based on careful scrutiny and analysis of those facts (National Science Board, 2002). Scientific attitude is required to be scientifically literate person. Our data indicate housewives in Korea are prone to agree that "science and technology are making our lives healthier, easier, and more comfortable", but their scientific attitudes are not sufficiently reasonable and logical.

Table 4 indicates that the education level is slightly associated with the attitudes toward science and technology, as well as the scientific attitudes. These results imply that formal education would be effective to enhance public attitudes toward science and technology, and to develop their scientific attitudes.

But housewives' scientific attitudes as well as the attitudes towards science and technology had association with their monthly income (See Table 5). Housewives with high monthly income perceived science and technology making our lives more comfortable and bought some household goods through scientific thinking. Their positive perceptions of scientific and technological outcomes might be caused by the fact that housewives share in more benefits of civilization

Table 2. Housewives' attitudes toward science and technology

Items	Mean	S.D.
1. The development of science and technology makes our lives more comfortable.	4.24	.63
2. The harmful effects of science and technology are greater than beneficial ones.*	3.01	.91
3. Outcomes of science and technology are over-rated.*	3.04	.85
4. Scientists and engineers make a valuable contribution to our society.	3.86	.63
5. Government has to support natural sciences even if there is no immediate outcome.	4.37	.62
6. The development of science and technology makes the next generations live better lives.	3.99	.77
7. The development of science and technology gives us more opportunities for the job.	3.61	.98
Total	3.74	.39

* These items are scored 5, 4, 3, 2 and 1, respectively, for the responses Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree.

Table 3. Housewives' scientific attitude

Items	Mean	S.D.
8. I trust the blurb, 'verified scientifically' and purchase the goods.*	3.27	.88
9. I try to know the technologies newly added to new products.	3.53	.70
10. I'm not willing to read the manual of domestic electronics.*	3.79	.87
11. I consider the energy efficiency when buying the domestic electronics.	3.95	.84
12. When buying processed food, I check the additives and nutrients.	3.85	.90
13. I have much interest about TV programs or articles in newspaper presenting scientific facts newly discovered.	3.78	.77
14. I admit other persons' various opinions, and analyze and compare them.	3.45	.82
15. I am prone to believe superstition (such as augury, Saju, Goonghab).*	3.71	1.00
Total	3.67	.44

* These items are scored 5, 4, 3, 2 and 1, respectively, for the responses Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree.

Table 4. Housewives' attitude differences according to the level of education

	Education level	Frequency	Mean	S.D.	F
Attitude toward S & T	Middle school	41	3.56	.47	7.68**
	High school	231	3.70	.37	
	Above college	233	3.38	.38	
Scientific attitude	Middle school	42	3.52	.55	4.99**
	High school	239	3.64	.43	
	Above college	234	3.73	.43	

** p < .01

Table 5. Housewives' attitude differences according to the monthly income

	Monthly income (thousand won)	Frequency	Mean	S.D.	F
Attitudes toward S & T	below 2,000	128	3.62	.41	12.38**
	2,000-4,000	276	3.74	.38	
	above 4,000	96	3.80	.33	
Scientific attitude	below 2,000	133	3.59	.43	3.63*
	2,000-4,000	281	3.68	.45	
	above 4,000	98	3.74	.43	

* $p < .05$, ** $p < .01$

Table 6. Interest in science and technology related topics in daily life

Topics	Item number	Content	Mean	S.D.
Leisure	9	Sports	2.62	0.63
Education	12	Educational effect of cultivating animals and plants	2.62	0.56
Health	8, 10, 11, 28	Disease pertaining to woman, Antibiotics, New drugs, Supersonic waves · MRI · CT · X-ray	2.61	0.38
Cooking	16, 18, 19	Refrigerator for Kimchi, Microwave, Water purifier	2.59	0.49
Social Issues	13, 14, 15	DNA analysis, Human cloning, Paternity test	2.58	0.48
Housing	17, 20, 21, 22, 24, 30	Remote control, Washing machine without detergent, Mobile phone, Auto flashing light, Wattmeter, Fiber-softner	2.53	0.43
Food	1, 2, 3, 4, 26	GMO, Fermented food, DHA, Diet, Hat-ban	2.48	0.26
Artifacts in everyday life	23, 25, 27, 29	Cloth color, LCD, ABS, Magnetic card	2.40	0.50
Cosmetics	5, 6, 7	Functional cosmetics, Suntan, Skin care	2.37	0.52

based on science and technology. Their higher score of scientific attitude may be owing to having more opportunities to purchase goods and to incorporate decision-making.

2. Interest in topical issues of science and technology

Housewives were asked to respond to each item of interest of topical issues on a 3-point Likert scale ranging Not Curious to Curious. Thirty items to ask their curiosity about topical issues of science and technology were categorized into 9 topics (See Table 6). Housewives had interest more than neutral about science and technology related topics. Particularly they showed higher interest on the following items: 'How new washing machine makes the cloths clean

without detergent', 'How a water purifier makes stained water clean', and 'Can we know child's intelligence with DNA analysis'. Housewives are thought to have interest in the use of new technology that is familiar in their everyday life.

Interest in topical issues is shown to be highly associated with their monthly income (See Table 7) and level of formal education (See Table 8). Housewives were interested more in wider range of science and technology related topics as their monthly income and level of education were higher. In National Science Foundation surveys conducted during the past two decades, those with more years of formal education are more likely than others to express a high level of interest in science and technology (National Science Board, 2002). Our data also indicate that formal education in Korea has contributed to developing housewives' interest in science related topics as well as the attitudes toward science and technology.

Table 7. Differences of housewives' interest in science topics according to the monthly income

	Monthly income (thousand won)	Frequency	Mean	S.D.	F
Cooking	Below 2,000	132	2.48	.54	8.22**
	2,000-4,000	279	2.61	.45	
	Above 4,000	99	2.73	.43	
Housing	Below 2,000	131	2.45	.46	5.97*
	2,000-4,000	276	2.54	.42	
	Above 4,000	97	2.65	.39	
Artifacts in daily life	Below 2,000	130	2.48	.93	2.15
	2,000-4,000	279	2.42	.53	
	Above 4,000	100	2.58	.48	
Social Issues	Below 2,000	130	2.46	.52	7.43**
	2,000-4,000	276	2.59	.47	
	Above 4,000	100	2.71	.44	
Health	Below 2,000	129	2.54	.37	7.97**
	2,000-4,000	278	2.61	.39	
	Above 4,000	99	2.73	.29	
Food	Below 2,000	132	2.58	.37	10.42**
	2,000-4,000	276	2.70	.35	
	Above 4,000	100	2.78	.31	
Leisure	Below 2,000	129	2.30	.54	2.67*
	2,000-4,000	281	2.37	.51	
	Above 4,000	100	2.46	.49	
Cosmetics	Below 2,000	128	2.35	.48	3.90
	2,000-4,000	279	2.44	.45	
	Above 4,000	100	2.52	.41	
Education	Below 2,000	133	2.59	.60	.77
	2,000-4,000	281	2.61	.56	
	Above 4,000	100	2.68	.49	

* $p < .05$, ** $p < .01$

Table 8. Differences of housewives' interest in science topics according to the education level

	Educational level	Frequency	Mean	S.D.	F
Cooking	Middle school	42	2.29	.56	9.03**
	High school	237	2.59	.46	
	Above college	235	2.63	.47	
Housing	Middle school	41	2.41	.45	5.08**
	High school	234	2.49	.43	
	Above college	233	2.59	.41	
Artifacts in daily life	Middle school	41	2.42	.49	2.08
	High school	235	2.41	.80	
	Above college	237	2.52	.47	
Social Issues	Middle school	40	2.41	.45	5.06**
	High school	238	2.54	.49	
	Above college	232	2.64	.46	
Health	Middle school	41	2.46	.34	7.33**
	High school	236	2.57	.38	
	Above college	234	2.67	.36	
Food	Middle school	42	2.52	.36	11.25**
	High school	234	2.63	.34	
	Above college	236	2.75	.35	
Leisure	Middle school	42	2.48	.67	4.53*
	High school	239	2.56	.66	
	Above college	238	2.71	.58	
Cosmetics	Middle school	40	2.18	.54	5.15**
	High school	239	2.33	.50	
	Above college	235	2.43	.51	
Education	Middle school	41	2.49	.71	2.13
	High school	239	2.59	.45	
	Above college	238	2.66	.52	

* p < .05, ** p < .01

3. Science education in elementary and secondary school

Table 9 indicates housewives' interest in studying science decreased, but their learning difficulties increased as the level of education became high. Many respondents had learning difficulties in science because school science had little relevance with everyday life (31%) and there were many jargons (24%). Other reasons were presented such as 'because there were many things to memorize', 'because high level of thinking skills were required' and 'because of many numerical formulae'.

Housewives had learning difficulties about science, but about 90% of them responded that there were some opportunities when science education in elementary and secondary school was helpful. About 32% of respondents indicated that school science was helpful when using electric home appliances such as computers. Other answers were 'when teaching their children or giving guide for children's job', 'when going to science centers or museums', and 'when buying goods

for health'. But approximately two out of ten respondents answered that science education in primary and secondary school was never helpful.

Formal education is shown to make housewives have positive science-technology related attitudes and be interested in broad range of science and technology topics, though learning science in school was perceived to be difficult.

Table 9. Interest and difficulties in learning science

	Interest in science learning		Difficulty in science learning	
	Mean	S.D.	Mean*	S.D.
Elementary school	3.58	.84	3.21	.76
Middle school	3.37	.76	2.85	.69
High school	3.16	.85	2.44	.74

* A high score means less difficulty in science learning. That is, this item is negatively rated.

4. When they are curious and how to solve it

Housewives were asked to answer the question "Did you have any experiences to be curious to know the scientific principles? If you did, when?". Above 95% of respondents were shown to get such experiences. Respondents were curious to know the scientific principle 'when their children asked difficult questions about science', 'when she did not know the meaning of scientific terms on TV or newspaper', 'when buying food or equipment for health, when inconvenient or suffering a loss because of lack of knowledge about the principle or the way to use', or 'when new electric home appliances come out' (See Table 10). Housewives were found to get the answer in a passive way. More than half respondents solved their problems by asking to her husband or other family members or through newspaper and broadcast (see Table 11). Many housewives were found to get the information from other person or from other sources passively rather than searching for knowledge actively in the internet or the reference books.

To the question "which way do you prefer if the program for housewives' understanding of science and technology would be produced", about three out of ten respondents wanted to watch TV programs. In addition, the use of web sites, publication of books, lecture in the cultural center, and regular e-mail services were preferred.

Table 10. When housewives were curious to know the scientific principles

Did you have any experiences to be curious to know the scientific principles? If you did, when? (Plural choice acceptable)	Frequency	Percent (%)
When the children asked difficult questions about science	218	22.73
When I didn't know the meaning of scientific terms on TV or newspaper	193	20.12
When buying food or equipments for health	190	19.81
When inconvenient or suffering a loss because of a lack of knowledge about principle or the way to use	163	16.99
When new electric home appliances come out	155	16.16
None	40	4.17

Table 11. How to get the answers

What did you do to get the answer (Plural choice acceptable)	Frequency	Percent (%)
Ask husband or other family members	212	28.92
Through newspaper and broadcast	201	27.42
Use Internet	160	21.83
Look up reference books	100	13.64
None	60	8.18

IV. Conclusions and Implication

Housewives who play an important role as household managers, educators of their children, customers, and members of democratic society, have to be scientifically literate persons. To suggest a way to develop their scientific literacy, science-related attitudes were surveyed on 534 housewives from Seoul.

Housewives showed slightly positive science-technology related attitudes, which was associated with their educational level and their monthly income. They were found to have interest on the science-technology related topics, and their interest was also associated with educational level and monthly income. These results indicate that formal education made contribution to developing their positive science-related attitudes and improving their interest about science-related topics. But many housewives were found to get the information from other person or from other sources passively rather than searching for knowledge actively in the internet or the reference books, even when they were curious to know the scientific principles.

To solve the problems related with science and technology in everyday life, seeking information and making decision through critical thinking are very important. In this research housewives were found to prefer TV programs for enhancing their understanding of science, but such program has a limitation to fulfill the role to promote scientific literacy. Specially designed programs would be required which include activity and ideas through interactive or hands-on experiences that encourage housewives to explore not only scientific phenomena, but also contemporary socio-scientific issues. These kinds of attributes are needed as a next generation program of science center and science museum (Pedretti, 2002). Lifelong education programs through science center or science museum is suggested as a way to promote housewives' scientific literacy.

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