

Frequency Distribution Analysis of a Survey on English Education and Attitudes of Japanese Mathematicians

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SUMMARY

One hundred eighteen Japanese professional mathematicians participated in a questionnaire to measure their feelings and attitudes regarding their formal and informal English education. The results demonstrated they felt their English education did not adequately prepare them to undertake research overseas. They were particularly disappointed with their listening and speaking skills. Many respondents felt it necessary to pursue outside studies to increase their oral/aural skills. While they thought their high school English studies were normal, they began to experience a disparity from university, i.e., their English studies were too broad and generalized. They felt they should have had more content based, mathematics related studies. Translation, conversation, hearing, and grammar, in that order, best helped to prepare them for overseas research.

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INTRODUCTION

It is generally assumed by the English teaching profession and Japanese students at the tertiary level that the students' English abilities are deficient in certain areas, in spite of having studied it for a minimum of 6 years at the junior and senior high school levels. What is not so clear is what and how do students who have gone on to become professionals in their chosen fields think and feel about their English education, and what kind of impact it has had on their ability to communicate effectively at the international level where the lingua franca is most often English.

As has been reported in the mass media and educational fields, and based on the authors own experience, Japanese who study English have a fairly sound educational background, but they are weak at communicating this knowledge. This is the general perception, but is it the reality for all cases? Are the people who need to use English communicative skills in their professional capacity really dissatisfied with their English education? If so, how are they dissatisfied, where, exactly, do they feel most deficient, and if they are lacking in vital skills, are they doing anything to correct the problem? In addition, what are the areas where they received better than average English instruction? In what years do Japanese professionals feel they had the best and/or worst education : high school, college/university, graduate school, or outside of the regular curriculum?

These and other questions need to be answered and analyzed in order to pinpoint the perceived weaknesses in English education in Japan from the viewpoint of the students who may have an opportunity to go on and use their English skills in the global community.

The authors have elected to focus on professional job categories, such as doctors, university educators, lawyers, scientists, and so on, because people in these professions often have opportunities to mix with colleagues from other countries to share and learn the latest developments in their fields through overseas research, international conferences, personal communication on the Internet, and so on. During these contacts, English is by far the most common communication medium. Therefore, it is incumbent for these professionals to develop their English skills as much as possible to be able to participate in global exchange to their best advantage. However, not all professionals choose to participate in global exchange and therefore may not need to develop advanced English skills. If so, are there differences in feelings and attitudes between those who participate in global communication and those that don't? In addition, is a lack of adequate English communication skills one reason why some experts in their respective fields elect not to share in international forums or do research overseas? Is it possible to glean some insight into the adequacy of English communication skills and participation in the predominately English-speaking community?

The authors have designed a questionnaire they feel will help in answering these questions and others. It has undergone rigorous testing to eliminate as much bias and ambiguity as possible. It has been organized to evoke the opinions and attitudes of Japanese professionals regarding their English education that should help in eliciting responses that will help to clarify the strengths and weaknesses in English education as perceived by those students who go on to become experts in their chosen professional fields.

METHODS

Questionnaire

Designed, developed, and tested over a period of 2 years, the questionnaire should provide data which can be utilized to analyze how Japanese professionals feel about their English education and their ability to function at the international level. A mail questionnaire was selected as the survey method because too much bias may be present if the authors, who are foreigners, conducted personal interviews. In addition, the number of respondents necessary to acquire statistically valid data precluded personal interviews. Also, a self-administered questionnaire takes less time to complete than an interview, and the type of information being sought could adequately be collected via this method.

The questionnaire was divided into seven sections: Personal Information, High School, Undergraduate School, Graduate School, English Studies Outside of Regular School Curriculum, Overseas Research, and Improvements in English Education.

Part One: Personal Information asked for such vital information as name, age, specialty, workplace, and whether and where respondents did overseas research. Respondents' names were kept strictly confidential, but the authors hoped to be able to build a database at which time names will become important.

Part Two: High School sought answers to such questions as how well the respondents felt about their English education, what kind of English instruction did they have, and what comments they had regarding the good and bad points of their English education in high school.

Part Three: Undergraduate School asked for the same kind of information as Part Two but at the college/university level.

Part Four: Graduate School also asked for similar items as in Part Two but at the graduate school level.

Part Five: English Studies Outside of Regular School Curriculum was designed to elicit information regarding whether respondents had studied more English outside of their regular school studies or not, how they felt about those studies, and whether those studies had a positive, negative, or no impact on the development of their English skills.

Part Six: Overseas Research sought to discover how many respondents actually did research overseas. Those that answered in the negative were requested to skip this section and go on to Part Seven. Those who answered in the affirmative were asked to state how well their English studies prepared them for overseas research and what type of English instruction helped prepare them the most. Next, they were asked to rate their level of satisfaction regarding their listening, speaking, reading, and writing abilities both before and after going abroad to do research. Finally, respondents provided information regarding the frequency of their trips overseas.

Part Seven: Improvements in English Education asked if respondents were continuing their English studies, if they had obtained some kind of English certification, and finally, to comment about improvements in English education at all levels.

Sample

Five hundred questionnaires were mailed to Japanese mathematicians working at universities, research institutes, or still studying at the graduate school level. Their institution addresses were randomly selected from the Japanese Mathematics Society Directory.

RESULTS

Out of 500 questionnaires mailed, 118 were returned, a response rate of 23.6%. This rate was high enough to provide statistically valid data. The results described here are the frequency distribution ratios of the answers to each question. The analysis follows the same order as the questionnaire.

Those items requesting respondents comments will be analyzed and reported on in a separate study to follow this one.

Part One : Personal Information

The first item asked for the respondent's name. Even though such information will be kept strictly confidential, it is important to know for developing a database in the future.

The next item asked where the respondents worked. As stated earlier, the authors randomly selected respondents with addresses at universities or research institutes. These were subdivided into public and private categories, and it was found that 67% were employed at public or national universities and 33% at private universities or institutions, as shown in Table 1. Three persons did not respond to this item.

Table 1. Institution

Type	Frequency (%)
Public	77 (67.0)
Private	38 (33.0)
Total	115 (100.0)

The item asking for specialty was not analyzed as almost all respondents wrote "mathematics." Most of them made no attempt to differentiate the field of mathematics they specialized in.

Respondents were requested to indicate in which 5-year period they were born, as shown in Table 2. By dividing this item into pre- and post-WW II subcategories, 25 persons, or 21.1% were born before WW II, and 93, or 78.9%, were born after, making most respondents under 50 years of age.

Table 2. Period Born

Period	Frequency (%)
<1930	3 (2.6)
1930-34	4 (3.4)

1935-39	7 (5.9)
1940-44	11 (9.3)
1945-49	20 (17.0)
1950-54	23 (19.5)
1955-59	26 (22.0)
>1960	24 (20.3)
Total	118 (100.0)

The next item, Research Overseas, was inserted to discover how many respondents actually did go overseas in some kind of research capacity. Seventy-one respondents, or 60.7%, had gone overseas, as indicated in Table 3. One person failed to respond.

Table 3. Research Overseas

Response	Frequency (%)
No	46 (39.3)
Yes	71 (60.7)
Total	117 (100.0)

Table 4. First Region of Overseas Research

Region	Frequency (%)
North America	43 (60.6)
Australia/New Zealand	2 (2.8)
United Kingdom/EC countries	25 (35.2)
East Europe/Russia	1 (1.4)
Total	71 (100.0)

Table 5. Times Overseas

Number of Times	Frequency (%)
Once	44 (62.9)
Twice	13 (18.6)
Three Times	5 (7.1)
Four Times	3 (4.3)
Five Times	5 (7.1)
Total	70 (100.0)

Continuing with the overseas theme, those answering they had gone overseas to do research for at least two months were asked where they had conducted their research and how many times they had gone overseas in a research capacity. These results are shown in Tables 4 and 5, respectively. Forty-three persons, or 66.6% of those who went overseas, did their research in North America, and 44 people, or 62.9%, replied they had gone overseas only once in a research capacity.

Part Two : High School

All questions in this section pertained to the time respondents spent in high school, i.e., grades 10, 11, and 12.

Table 6 provides a breakdown of the total number of years of English study through high school. Seventy-three percent, or 84 persons, had studied English for 3 years in high school. Three persons did not respond.

Then, as Table 7 illustrates, respondents were asked to list whether they had gone to a public or private high school. One hundred persons, or 86.2%, went to public schools. Two persons failed to answer the question.

Table 6. Number of Years of English Study through High School

Number of Years	Frequency (%)
<3 years	1 (.9)
3 years	84 (73.0)
4 years	2 (1.7)
5 years	7 (6.1)
6 years	17 (14.8)
>6 years	4 (3.5)
Total	115 (100.0)

Table 7. Type of High School Attended

Type	Frequency (%)
Public	100 (86.2)
Private	16 (13.8)
Total	116 (100.0)

Respondents were then asked to indicate how many times per week they had English classes and how long was each class period. These results are shown in Tables 8 and 9. Fifty-six persons,

or 58.9%, replied having English classes from 4 to 6 times per week. Twenty-three people did not reply. Seventy-six persons, or 69.7%, said their English classes lasted for approximately 50 minutes, which corresponds to the average high school class period throughout Japan. Nine persons did not reply to this item.

Table 8. Times English Studied per Week in High School

Number of Times		Frequency (%)
From	To	
2	3	5 (5.3)
3	4	12 (12.6)
4	5	23 (24.2)
5	6	33 (34.7)
6	7	17 (17.9)
7	8	3 (3.1)
8	9	1 (1.1)
9	10	0 (00.0)
10	11	0 (00.0)
11	12	1 (1.1)
Total		95 (100.0)

Table 9. Length of English Class Period in High School

Number of Minutes		Frequency (%)
From	To	
40	45	0 (00.0)
45	50	19 (17.4)
50	55	76 (69.7)
55	60	1 (.9)
60	65	8 (7.3)
65	70	2 (1.9)
70	75	0 (00.0)
75	80	0 (00.0)
80	85	0 (00.0)
85	90	0 (00.0)
90	95	2 (1.9)
95	100	1 (.9)

Total 109 (100.0)

The next question required respondents to indicate the type of English instruction they had in high school. This result is tabulated as the number of instruction types listed per respondent on a multiple answer basis, as shown in Table 10. There was no clear demarcation according to the number of instruction types studied. However, 80 persons, or 70.2%, studied 3 to 6 different types, while two people, or 1.8% studied fewer than 3 types, and 32 persons, or 28.0%, studied more than 6 different instruction types. Four persons failed to reply.

Table 10. Distribution of Number of Instruction Types in High School

Number of Types		Frequency (%)
From	To	
2.0	2.9	2 (1.8)
2.9	3.8	22 (19.3)
3.8	4.7	23 (20.2)
4.7	5.6	20 (17.6)
5.6	6.5	15 (13.2)
6.5	7.4	7 (6.1)
7.4	8.3	12 (10.5)
8.3	9.2	7 (6.1)
9.2	10.1	3 (2.6)
10.1	11.0	3 (2.6)
Total		114 (100.0)

Table 11. Ranking of Instruction Types in High School (MA)

Type	Frequency (%)
Grammar	112 (98.2)
Translation	111 (997.4)
Writing	101 (88.6)
Reading	79 (69.3)
Vocabulary	64 (56.1)
Calligraphy	47 (41.2)
Pronunciation	30 (26.3)
Dictation	27 (23.7)
Hearing	22 (19.3)

Recitation	16 (14.0)
Conversation	10 (8.8)
Speech/Debate	1 (0.9)
Drama	0 (00.0)
Total Respondents	114

These instruction types were further analyzed to see what types were the most common among the respondents, and these results are shown in Table 11. They were asked to indicate as many classes as they felt appropriate. Grammar, Translation, and writing classes were the top three with frequency ratings of 98.2%, 97.4%, and 88.6%, respectively. The bottom three were conversation, speech/debate, and drama at 0.1%, 0.01%, and 0.0%, respectively. The other classes rated from 69.3% for reading to 140.0% for recitation.

Respondents were then asked to rate the level of satisfaction with their high school classes on a five point rating scale , as shown in Table 12. Discounting 10 people who did not reply, 62 persons, or 57.4% of 108 respondents, were satisfied, while 15 persons, or 13.9%, were more than satisfied, and 31, or 28.7%, were less than satisfied. Only one person rated his/her satisfaction level as “completely satisfied,” while 6 persons were “extremely dissatisfied.”

Table 12. Satisfaction with High School English Classes

Rating	Frequency (%)
COMPLETELY SATISFIED	1 (.9)
VERY SATISFIED	14 (13.0)
SATISFIED	62 (57.4)
VERY DISSATISFIED	25 (23.1)
EXTREMELY DISSATISFIED	6 (5.6)
Total	108 (100.0)

A simple yes/no question asked whether the respondents had been members of the English Speaking Society (ESS) in high school. Out of a total response rate of 114 persons, only 3 people, or 2.6%, replied “yes.” The overwhelming majority, 111 persons, or 97.4%, replied “no.” Those responding in the affirmative were then asked to state how many years they had participated in ESS activities, and one person replied for one year, another stated two years, and the other replied all three years of high school.

The next question sought whether respondents had received English instruction from a native English speaker, and if so, for how many years. One hundred fifteen people replied, and six

persons, or 5.2%, said “yes.” Of those six persons, 3, or 50.0%, studied with a native English speaker for one year, and 3, or 50.0%, studied with a native speaker for 2, 4, or 6 years, respectively. They were also requested to rate the effectiveness of their native English instructor from “Extremely effective to extremely ineffective.” Only 3 of 6 respondents who answered in the affirmative replied, and 2 people rated their instructor as “effective” and one person replied “very effective.”

The next item required the respondents to rate the fluency level of their English Listening, Speaking, Reading, and Writing abilities after having completed high school on a five point rating scale as shown in Tables 13, 14, 15, and 16, respectively. Six persons did not respond to this item.

Table 13. Level of English Listening Ability after High School

Rating	Frequency (%)
FLUENT	2 (1.8)
BETTER THAN AVERAGE	10 (8.9)
AVERAGE	26 (23.2)
LESS THAN AVERAGE	28 (25.0)
POOR	46 (41.1)
Total	112 (100.0)

Table 14. Level of English Speaking Ability after High School

Rating	Frequency (%)
FLUENT	1 (.9)
BETTER THAN AVERAGE	12 (10.7)
AVERAGE	24 (21.4)
LESS THAN AVERAGE	31 (27.7)
POOR	44 (39.3)
Total	112 (100.0)

Table 15. Level of English Reading Ability after High School

Rating	Frequency (%)
FLUENT	11 (9.8)
BETTER THAN AVERAGE	48 (42.9)
AVERAGE	40 (35.7)
LESS THAN AVERAGE	9 (8.0)
POOR	4 (3.6)

Total	112 (100.0)
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Table 16. Level of English Writing Ability after High School

Rating	Frequency (%)
FLUENT	7 (6.3)
BETTER THAN AVERAGE	38 (33.9)
AVERAGE	43 (38.4)
LESS THAN AVERAGE	13 (11.6)
POOR	11 (9.8)
Total	112 (100.0)

Listening Ability : Twenty-six persons, or 23.2%, rated their fluency as average, while 12 people, or 10.7%, rated their fluency as above average, and 74, or 66.1%, as below average. In the below average category, 46 people, or 41.1% of the total, rated their listening fluency as “poor.”

Speaking Ability : Twenty-four persons, or 21.4%, rated their fluency as average, while 13 persons, or 11.6%, rated their fluency as above average, and 75, or 67.0%, as below average. In the below average category, 44 people, or 39.3% of the total, rated their speaking fluency as “poor.”

Reading Ability : Forty persons, or 35.7%, rated their fluency as average, while 59 people, or 52.7%, rated their fluency as above average, and 13, or 11.6%, as below average. In the above average category, 48 people, or 42.9% of the total, rated their reading fluency as “better than average.”

Writing Ability : Forty- three persons, or 38.4%, rated their fluency as average, while 45 people, or 40.2%, rated their fluency as above average, and 24, or 21.4%, as below average. In the above average category, 38 persons, or 33.9% of the total, rated their writing fluency as “better than average.”

The last item in this section asked the respondents to rate how well their high school English classes prepared them to do research overseas on a five point rating scale, and the results are shown in Table 17. Ninety-four persons responded to this item which was more than the 71 people who actually did research overseas. Sixteen persons, or 17.0%, replied their high school English classes prepared them to do research overseas, while 8 people, or 8.5%, replied they were more than prepared, and 70, or 74.5%, were less than prepared.

Table 17. Level of Preparation for Overseas Research from High School Education

Rating	Frequency (%)
COMPLETELY PREPARED	1 (1.1)
WELL PREPARED	7 (7.5)
PREPARED	16 (17.0)
SLIGHTLY PREPARED	35 (37.2)
DIDN'T PREPARE	35 (37.2)
Total	94 (100.0)

Part Three : Undergraduate School

In describing the type of university attended, 97 persons, or 82.9%, replied attending a public university to earn their B.A. or B.S. degree, and 20 persons, or 17.1%, attended a private university. One person did not respond.

The next item asked for the type of college degree. The authors hoped to gain information regarding the particular field of study, but many respondents appeared confused by this item, writing only B.S. or B.A. Therefore, this item could not be analyzed.

Table 18 illustrates the distribution of the years each respondent received their undergraduate degree.

Table 18. Year Degree Granted

From	To	Frequency (%)
1940	1945	0 (0)
1945	1950	2 (2)
1950	1955	3 (3)
1955	1960	4 (4)
1960	1965	4 (4)
1965	1970	14 (14)
1970	1975	19 (16)
1975	1980	24 (21)
1980	1985	25 (22)
1985	1990	14 (14)
Total		109 (100)

Respondents were then asked to state how many years they studied English in university. The results are shown in Table 19. One hundred persons, or 88.5%, stated they studied English for 3

years, 9 persons, or 8.0% replied less than 3 years, and 4, or 3.5%, more than 3 years. Five people did not respond.

Table 19. Number of Years English Studied in University

Number of Years	Frequency (%)
One Year	2 (1.8)
Two Years	7 (6.1)
Three Years	100 (88.5)
Four Years	2 (1.8)
Five Years	2 (1.8)
Total	113 (100.0)

The next two items asked how many times per week English classes were conducted and how many minutes one class period was. These results are shown in Tables 20 and 21. Ninety-one respondents, or 83.5%, replied having English classes twice a week, while 11 people, or 10.1%, replied once a week, and 7, or 6.4%, more than two times a week. Nine people did not respond. Eighty-nine persons, or 79.5%, replied each class lasted 90 minutes, which is the standard class time at the university level.

Table 20. Times English Studied per Week in University

Number of Times	Frequency (%)	
From	To	
1	2	11 (10.1)
2	3	91 (83.5)
3	4	4 (3.7)
4	5	2 (1.8)
5	6	1 (.9)
Tota		109 (100.0)

Table 21. Length of English Class Period in University

Number of Minutes	Frequency (%)	
From	To	
50	55	3 (2.7)
55	60	0 (00.0)
60	65	1 (.9)

65	70	0 (00.0)
70	75	0 (00.0)
75	80	1 (.9)
80	85	0 (00.0)
85	90	0 (00.0)
90	95	89 (79.4)
95	100	0 (00.0)
100	105	15 (13.4)
105	110	0 (00.0)
110	115	2 (1.8)
115	120	1 (.9)
Total		112 (100.0)

As was done in the high school section, respondents were asked to indicate the types of English they studied based on a list provided in the questionnaire on a multiple answer basis. These results, shown in Table 22, were then ranked according to the number of times each class type was checked, as shown in Table 23. There was a fairly even distribution of the number of classes taken. Thirty-four people, or 30.1%, had one class, 33 persons, or 29.2%, had two classes, and 24, or 21.2%, had three. The remaining number of types ranged from 4 to 9 English classes. Regarding the rank distribution, translation was the most selected class type at 91.1%, followed by reading at 37.5%, hearing at 23.2%, conversation at 21.4%, writing at 18.8%, vocabulary at 17.9%, and grammar at 15.2%. Five people did not respond to this item.

Table 22. Distribution of Number of Instruction Types in University

Number of Times		Frequency (%)
From	To	
1	2	34 (30.1)
2	3	33 (29.2)
3	4	24 (21.2)
4	5	12 (10.6)
5	6	4 (3.5)
6	7	3 (2.7)
7	8	1 (.9)
8	9	0 (00.0)
9	10	2 (1.8)

10	11	0 (00.0)
11	12	0 (00.0)
Total		113 (100.0)

Table 23. Ranking of Instruction Types in University (MA)

Type	Frequency	(%)
Translation	102	(91.1)
Reading	42	(37.5)
Hearing	26	(23.2)
Conversation	24	(21.4)
Writing	21	(18.8)
Vocabulary	20	(17.9)
Grammar	17	(15.2)
Dictation	8	(7.0)
Calligraphy	7	(6.2)
Pronunciation	5	(4.4)
Speech/Debate	4	(3.5)
Recitation	2	(1.8)
Drama	1	(0.9)
Total Respondents	113	

The next item asked respondents to rate their satisfaction level regarding their feelings about the quality of their university English education on a five point scale, as shown in Table 24. Forty-three persons, or 38.7%, felt satisfied with their university English education, while 6 people, or 5.4%, felt more than satisfied, and 62, or 55.9%, were less than satisfied. In the latter category, 21 persons, or 18.9% of the total, felt "extremely dissatisfied." Seven persons did not respond.

Table 24. Satisfaction with University English Courses

Rating	Frequency	(%)
COMPLETELY SATISFIED	1	(.9)
VERY SATISFIED	5	(4.5)
SATISFIED	43	(38.8)
VERY DISSATISFIED	41	(36.9)
EXTREMELY DISSATISFIED	21	(18.9)

Total

111 (100.0)

A yes/no question asked whether respondents had been members of ESS in university. Of a total of 116 replies, 2 persons, or 1.7% of the total, answered "yes." Those answering in the affirmative were then requested to write the number of years they were members, and one person replied one year and the other 4 years.

The next item asked if the respondents were taught by a native English instructor, and out of a total of 114 replies, 20 persons, or 17.5%, answered "yes," and 94 people, or 82.5%, replied "no." Those answering in the affirmative were asked to state the number of years they had such an instructor, and the results are shown in Table 25. They were also requested to rate the effectiveness of their native instructors on a five-point scale as shown in Table 26. Seven persons, or 36.8%, replied studying with a native English instructor for less than one year, 9 persons, or 47.4%, stated one year, and 3, or 16.8%, replied two years or more. One person did not respond. Regarding the effectiveness of the native English instructor, 9 people, or 45.0%, stated s/he was effective, while 5 persons, or 25.0%, said s/he was very effective, and 6, or 30.0%, very ineffective.

Table 25. Number of Years with Native English Instructor in University

Years		Frequency (%)
From	To	
0	1	7 (36.8)
1	2	9 (47.4)
2	3	2 (10.5)
3	4	0 (00.0)
4	5	1 (5.3)
Total		19 (100.0)

Table 26. Effectiveness of Native English Instructor in University

Rating	Frequency (%)
EXTREMELY EFFECTIVE	0 (00.0)
VERY EFFECTIVE	5 (25.0)
EFFECTIVE	9 (45.0)
VERY INEFFECTIVE	6 (30.0)
EXTREMELY INEFFECTIVE	0 (00.0)
Total	20 (100.0)

Respondents were then asked to rate the fluency of their listening, speaking, reading, and writing abilities after completing university, and the results are shown in Tables 27, 28, 29 and 30. Listening Ability: Twenty-three persons, or 20.7%, rated their fluency as average, while 15 people, or 13.5%, rated themselves as above average, and 73, or 65.8%, as below average. In the below average category, 40 people, or 36.0% of the total, replied their listening fluency was "poor." Seven people did not respond.

Speaking Ability: Twenty-five people, or 22.5%, rated their fluency as average, while 14 persons, or 12.6%, rated themselves "better than average," and 72, or 64.9%, as below average. No one rated their speaking fluency as "fluent." In the below average category, 38 persons, or 34.2% of the total, replied their speaking fluency was "poor." Seven people did not respond.

Reading Ability: Forty-four people, or 39.6%, rated their fluency as average, while 53 persons, or 47.7%, rated themselves as above average, and 14, or 12.7%, as below average. In the above average category, 12 persons, or 10.8% of the total, stated their reading fluency was "fluent." Seven people did not respond.

Writing Ability: Forty-seven persons, or 42.0%, rated their fluency as average, while 38 people, or 33.9%, rated themselves as above average, and 27, or 24.1%, as below average. Ten persons, or 8.9% of the total, rated their writing fluency as "poor." Six persons did not respond.

Table 27. Level of English Listening Ability after University

Rating	Frequency (%)
FLUENT	2 (1.8)
BETTER THAN AVERAGE	13 (11.7)
AVERAGE	23 (20.7)
LESS THAN AVERAGE	33 (29.7)
POOR	40 (36.1)
Total	111 (100.0)

Table 28. Level of English Speaking Ability after University

Rating	Frequency (%)
FLUENT	0 (00.0)
BETTER THAN AVERAGE	14 (12.6)
AVERAGE	25 (22.5)
LESS THAN AVERAGE	34 (30.6)
POOR	38 (34.3)
Total	111 (100.0)

Table 29. Level of English Reading Ability after University

Rating	Frequency (%)
FLUENT	12 (10.8)
BETTER THAN AVERAGE	41 (36.9)
AVERAGE	44 (39.7)
LESS THAN AVERAGE	10 (9.0)
POOR	4 (3.6)
Total	111 (100.0)

Table 30. Level of English Writing Ability after University

Rating	Frequency (%)
FLUENT	5 (4.5)
BETTER THAN AVERAGE	33 (29.5)
AVERAGE	47 (41.9)
LESS THAN AVERAGE	17 (15.2)
POOR	10 (8.9)
Total	112 (100.0)

The last item in this section asked respondents to rate how well their university English studies prepared them to do research overseas on a five-point scale as shown in Table 31. Out of a total of 88 responses, 9 people, or 10.2%, stated their university English studies prepared them for research overseas, while 3 persons, or 3.4%, felt they were more than prepared, and 76, or 86.4%, felt less than prepared. In the less than prepared category, 43 people, or 49.9% of the total, replied their university English studies “didn’t prepare” them to do research overseas.

Table 31. Level of Preparation for Overseas Research after University

English Study	Rating	Frequency (%)
COMPLETELY PREPARED		0 (00.0)
WELL PREPARED		3 (3.4)
PREPARED		9 (10.2)
SLIGHTLY PREPARED		33 (37.5)
DIDN'T PREPARE		43 (48.9)
Total		88 (100.0)

Part Four : Graduate School

The first item in this section requested respondents to state where they did they graduate studies. Out of a total of 99 responses, 93 persons, or 93.9%, went to graduate school in Japan, and 6 persons, or 6.1%, did graduate work abroad. Of the 93 people who attended graduate school in Japan, 90 people, or 97.8%, studied at public universities, and 2, or 2.2%, at private universities. One person did not respond.

The next item asked if they had used English in their graduate studies, and 32 persons, or 29.4%, stated "no," and 77 people, or 70.6%, replied "yes," for a total of 109 responses. Those who answered in the affirmative were asked to write the number of years they used English, and the results are shown in Table 32. Forty-six persons, or 71.9%, stated they had used English for two to five years, while 2 people, or 3.1%, replied one year, and 16, or 25.0%, replied they used English for more than 5 years. Thirteen people did not respond to this item.

Table 32. Number of Years English Was Used in Graduate School

Years		Frequency (%)
From	To	
1	2	2 (3.1)
2	3	18 (28.1)
3	4	9 (14.1)
4	5	3 (4.6)
5	6	16 (25.0)
6	7	4 (6.3)
7	8	1 (1.6)
8	9	0 (00.0)
9	10	2 (3.1)
10	11	0 (00.0)
11	12	1 (1.6)
12	13	1 (1.6)
13	14	0 (00.0)
14	15	1 (1.6)
15	16	2 (3.1)
16	17	0 (00.0)
17	18	0 (00.0)
18	19	0 (00.0)

19	20	0 (00.0)
20	21	3 (4.6)
21	22	0 (00.0)
22	23	0 (00.0)
23	24	0 (00.0)
24	25	1 (1.6)
Total		64 (100.0)

Respondents were then asked to rate how satisfied they were with the quality of those courses where English was used, and the results are shown in Table 33. Thirty-nine people, or 60.9%, replied they were satisfied with their English usage in graduate school, while 11 persons, or 17.2%, were more than satisfied, and 14, or 21.9%, were less than satisfied. Thirteen persons did not respond to this item.

Table 33. Level of Satisfaction with Classes Taught in English in Graduate School

Rating	Frequency (%)
COMPLETELY SATISFIED	2 (3.1)
VERY SATISFIED	9 (14.1)
SATISFIED	39 (60.9)
VERY DISSATISFIED	12 (18.8)
EXTREMELY DISSATISFIED	2 (3.1)
Total	64 (100.0)

The last item in this section required respondents to rate the level of their fluency for listening, speaking, reading, and writing abilities after completing graduate studies. The results are shown in Tables 34, 35, 36 and 37, respectively.

Listening Ability: Twenty-three persons, or 21.5%, rated their fluency as average, while 19 people, or 17.7%, rated themselves as above average, and 65, or 60.8%, as below average. In the below average category, 37 persons, or 34.6% of the total, replied their listening fluency was "poor."

Speaking Ability: Twenty-five persons, or 23.4%, rated their fluency as average, while 21 people, or 19.6%, rated themselves as above average, and 61, or 57.0%, as below average. In the below average category, 31 persons, or 29.0% of the total, replied their speaking fluency was "poor."

Reading Ability : Thirty-eight people, or 35.5%, rated their fluency as average, while 59 persons, or 55.1%, rated themselves as above average, and 10, or 8.4%, as below average. In the above average category, 15 people, or 14.0% of the total, replied their reading fluency was “fluent.”

Writing Ability : Forty-eight persons, or 44.9%, rated their fluency as average, while 43 people, or 40.2%, rated themselves as above average, and 16, or 14.9%, as below average. In all cases, 11 people did not respond to this item.

Table 34. Level of English Listening Ability after Graduate School

Rating	Frequency (%)
FLUENT	4 (3.7)
BETTER THAN AVERAGE	15 (14.0)
AVERAGE	23 (21.5)
LESS THAN AVERAGE	28 (26.2)
POOR	37 (34.6)
Total	107 (100.0)

Table 35. Level of English Speaking Ability after Graduate School

Rating	Frequency (%)
FLUENT	3 (2.8)
BETTER THAN AVERAGE	18 (16.8)
AVERAGE	25 (23.4)
LESS THAN AVERAGE	30 (28.0)
POOR	31 (29.0)
Total	107 (100.0)

Table 36. Level of English Reading Ability after Graduate School

Rating	Frequency (%)
FLUENT	15 (14.1)
BETTER THAN AVERAGE	44 (41.1)
AVERAGE	38 (35.5)
LESS THAN AVERAGE	6 (5.6)
POOR	4 (3.7)
Total	107 (100.0)

Table 37. Level of English Writing Ability after Graduate School

Rating	Frequency (%)
FLUENT	6 (5.6)
BETTER THAN AVERAGE	37 (34.6)
AVERAGE	48 (44.9)
LESS THAN AVERAGE	9 (8.4)
POOR	7 (6.5)
Total	107 (100.0)

Part Five : English Studies Outside of Regular School Curriculum

The first item asked if respondents had studied outside of the regular school system, and 59 persons, or 51.3%, replied “yes,” and 56 people, or 48.7%, said “no.” Three people did not respond to this item. Those responding in the affirmative were asked to state how many years they had studied, and 42 persons, or 82.4%, replied less than 5 years, and 19 persons, or 17.6%, replied more than five years. Four people did not respond.

Table 38 illustrates when respondents did study outside of the regular school system. They were allowed to mark as many items as was appropriate. Out of a total of 59 persons who had done outside studies, 56 provided multiple answers. Thirty-seven responses, or 62.7%, indicated outside study was done after completing regular school, 31 responses, or 52.5%, indicated it was done during their regular school period, and 11, or 18.6%, indicated doing it while overseas.

The type of outside study and when it was done were the next items in this section, and the results are shown in Table 39. This item could be marked as many times as was appropriate. Twenty-eight responses, or 47.5%, listed “English Language School” as their outside study type. Within this category, 13 responses, or 46.4% of the total, stated this type of study was done after completing school, 13 responses, or 46.4%, stated this was done during their school days, and 2, or 7.1%, replied doing it overseas. Eighteen responses, or 30.5%, stated doing “other” types of study (listening to the radio, bible study, etc.). Within this category, 11 responses, or 61.1% of the total, stated this type of study was done after completing school, 13 responses, or 72.3%, said it was done during their school days, and 7, or 38.9%, did it overseas. Fourteen responses, or 23.7%, listed “private lessons” as their outside study type. Within this category, 10 responses, or 71.4%, replied doing this type of study after completing school, 3 responses, or 21.4%, stated they did it during their school days, and 2, or 14.3%, did it overseas. Seven responses, or 11.9%, stated doing “self-study” as their outside study type. Within this category, 6 responses, or 85.7% of the total, stated doing this type of study after completing school, 5 responses, or 71.5%, stated they

did it during their school days, and one, or 8.5%, did it overseas. Five responses, or 8.5%, replied they attended “cram school.” Within this category, 2 responses, or 40.0%, replied attending after completing school, and 3 responses, or 60.0%, attended during high school.

Table 38. When Outside Studies Were Conducted (MA)

When	Frequency	(%)
High School	10	(16.9)
University	8	(13.6)
Graduate School	13	(22.0)
After Completing School	37	(62.7)
Overseas	11	(18.6)
Total Responses	79	

Table 39. Type of Outside Study and When Studied (MA)

Type	Frequency	(%)	When	Frequency
Cram School	5	(8.5)	High School	3
			University	
			Graduate School	
			After School	2
			Overseas	
Private Lessons	14	(23.7)	High School	1
			University	
			Graduate School	2
			After School	10
			Overseas	2
Self-Study	7	(11.9)	High School	2
			University	1
			Graduate School	2
			After School	6
			Overseas	1
			High School	1
			University	5

English Language School	28 (47.5)	Graduate School	7
		After School	13
		Overseas	2
		High School	5
		University	3
Other	18 (30.5)	Graduate School	5
		After School	11
		Overseas	7
Total Responses	72		

In the last item in this section, the 59 respondents who had done outside studies were asked to rate how well they felt these studies helped prepare them for doing research overseas on a five-point rating scale, and the results are shown in Table 40. Seventeen persons, or 34.0%, said their outside studies prepared them for overseas research, while 17 people, or 34.0%, replied they were more than prepared, and 16, or 32.0%, replied they were less than prepared.

Table 40. Level of Preparation for Overseas Research from Outside Study

Rating	Frequency (%)
COMPLETELY PREPARED	2 (4.0)
WELL PREPARED	15 (30.0)
PREPARED	17 (34.0)
SLIGHTLY PREPARED	14 (28.0)
POOR	2 (4.0)
Total	50 (100.0)

Part Six : Overseas Research

Seventy-one respondents initially stated they had gone overseas for research, and they were requested to complete this section. However for some items, 75 persons responded. In those cases, the extra four responses are included, as these may be younger professionals about to embark or thinking of going overseas to do research and feel their input is valid and important.

The first item in this section required respondents to rate how well all English studies helped to prepare them for doing research overseas, and the results are shown in Table 41. Eighteen persons, or 24.7%, stated their English studies prepared them, while 10 people, or 13.7%, replied

they were more than prepared, and 45, or 61.6%, stated they were less than prepared. In the less than prepared category, 17 people, or 23.3% of the total, replied their English studies “didn’t prepare” them to do research overseas. Two persons did not respond.

Table 41. Level of Preparation for Overseas Research from All English Studies

Rating	Frequency (%)
COMPLETELY PREPARED	2 (2.7)
WELL PREPARED	8 (10.9)
PREPARED	18 (24.7)
SLIGHTLY PREPARED	28 (38.4)
POOR	17 (23.3)
Total	73 (100.0)

Respondents were then requested to select those courses which they felt had the most positive impact in helping them to prepare for going overseas. They could choose as many courses as they felt applicable. These results, shown in Table 42, were then ranked according to the number of times each course was marked as shown in Table 43. Fifty-one persons, or 77.3% of the total, replied that three courses or less had a positive impact on their preparation. Nine people failed to respond to this item. As for the courses deemed to have helped the most, translation was first with 30 responses (45.5%), followed by conversation with 27 (40.1%), hearing with 23 (34.8%), grammar with 21 (31.8%), and so on.

Table 42. English Instruction Types that Best Prepared for Overseas Research (MA)

From	To	Frequency (%)
0	1	0 (00.0)
1	2	10 (15.1)
2	3	25 (37.9)
3	4	16 (24.2)
4	5	6 (9.1)
5	6	4 (6.1)
6	7	4 (6.1)
7	8	0 (00.0)
8	9	1 (1.5)

9	10	0 (00.0)
10	11	0 (00.0)
11	12	0 (00.0)
12	13	0 (00.0)
13	14	0 (00.0)
Total		66 (100.0)

Table 43. Ranking of Instruction Types that Best Prepared for Overseas Research (MA)

Type	Frequency (%)
Translation	30 (45.5)
Conversation	27 (40.1)
Hearing	23 (34.8)
Grammar	21 (31.8)
Reading	19 (28.8)
Writing	17 (25.8)
Vocabulary	15 (22.7)
Pronunciation	11 (16.7)
Calligraphy	9 (13.6)
Speech/Debate	7 (10.6)
Dictation	3 (4.5)
Recitation	2 (3.0)
Drama	0 (00.0)
Total Responses	66

The following two items asked respondents to rate the level of satisfaction of their listening, speaking, reading, and writing abilities both at the beginning of their overseas research and at the end on a five-point rating scale. These results are shown in Tables 44, 45, 46, 47, 48, 49, 50, and 51, respectively.

Beginning Listening Ability : Twenty-six persons, or 34.7%, replied they were satisfied with their English listening ability at the beginning of their overseas research, while 6 people, or 8.0%, stated they were more than satisfied, and 33, or 57.3%, were less than satisfied. In the less than satisfied category, 13 persons, or 17.3% of the total, replied they were “completely dissatisfied” with their English listening ability before going overseas to do research.

Beginning Speaking Ability : Thirty-one persons, or 41.3%, stated they were satisfied with their

English speaking ability at the beginning of their overseas research, while 6 people, or 8.0%, were more than satisfied, and 38, or 50.7%, less than satisfied. In the less than satisfied category, 31 persons, or 41.3% of the total, replied they were “very dissatisfied” with their English speaking ability before going overseas to do research.

Beginning Reading Ability : Thirty-eight persons, or 50.7%, were satisfied with their English reading ability at the beginning of their overseas research, while 29 people, or 38.7%, stated they were more than satisfied, and 8, or 10.6%, less than satisfied. In the more than satisfied category, 11 people, or 14.7% of the total, replied they were “completely satisfied” with their English reading ability before going overseas to do research.

Beginning Writing Ability : Forty persons, or 53.3%, stated they were satisfied with their English writing ability at the beginning of their overseas research, while 23 people, or 30.7%, replied they were more than satisfied, and 12, or 16.0%, less than satisfied. In the more than satisfied category, 19 persons, or 25.3% of the total, said they were “very satisfied” with their English writing ability before going overseas to do research.

Table 44. Level of Satisfaction of English Listening Ability at Beginning of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	1 (1.3)
VERY SATISFIED	5 (6.7)
SATISFIED	26 (34.7)
VERY DISSATISFIED	30 (40.0)
EXTREMELY DISSATISFIED	13 (17.3)
Total	75 (100.0)

Table 45. Level of Satisfaction of English Speaking Ability at Beginning of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	1 (1.3)
VERY SATISFIED	5 (6.7)
SATISFIED	31 (41.3)
VERY DISSATISFIED	31 (41.3)
EXTREMELY DISSATISFIED	7 (9.4)
Total	75 (100.0)

Table 46. Level of Satisfaction of English Reading Ability at Beginning of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	11 (14.7)
VERY SATISFIED	18 (24.0)
SATISFIED	38 (50.7)
VERY DISSATISFIED	7 (9.3)
EXTREMELY DISSATISFIED	1 (1.3)
Total	70 (100.0)

Table 47. Level of Satisfaction of English Writing Ability at Beginning of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	4 (5.3)
VERY SATISFIED	19 (25.4)
SATISFIED	40 (53.3)
VERY DISSATISFIED	9 (12.0)
EXTREMELY DISSATISFIED	3 (4.0)
Total	73 (100.0)

End Listening Ability: Thirty-seven persons, or 53.6%, replied they were satisfied with their English listening ability after completing overseas research, while 17 people, or 24.6%, stated they were more than satisfied, and 15, or 21.8%, less than satisfied. Since 71 people actually completed research overseas, only two people did not respond to this item.

End Speaking Ability: Thirty-five persons, or 50.0%, stated they were satisfied with their English speaking ability after completing overseas research, while 20 people, or 28.5%, replied they were more than satisfied, and 15, or 21.5%, less than satisfied. One person did not respond.

End Reading Ability: Thirty-seven persons, or 52.9%, stated they were satisfied with their English reading ability after completing overseas research, while 29 persons, or 41.4%, replied they were more than satisfied, and 4, or 5.7%, less than satisfied. In the less than satisfied category, no one stated they were "completely dissatisfied" with their English reading ability after doing research overseas. One person did not respond.

End Writing Ability: Thirty-eight persons, or 54.3%, stated they were satisfied with their English writing ability after completing overseas research, while 24 people, or 34.3%, replied they were more than satisfied, and 8, or 11.4%, less than satisfied. One person did not respond.

Table 48. Level of Satisfaction of English Listening Ability at End of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	3 (4.4)
VERY SATISFIED	14 (20.3)
SATISFIED	37 (53.6)
VERY DISSATISFIED	11 (15.9)
EXTREMELY DISSATISFIED	4 (5.8)
Total	69 (100.0)

Table 49. Level of Satisfaction of English Speaking Ability at End of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	3 (4.3)
VERY SATISFIED	17 (24.3)
SATISFIED	35 (50.0)
VERY DISSATISFIED	12 (17.1)
EXTREMELY DISSATISFIED	3 (4.3)
Total	70 (100.0)

Table 50. Level of Satisfaction of English Reading Ability at End of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	12 (17.1)
VERY SATISFIED	17 (24.3)
SATISFIED	37 (52.9)
VERY DISSATISFIED	4 (5.7)
EXTREMELY DISSATISFIED	0 (00.0)
Total	70 (100.0)

Table 51. Level of Satisfaction of English Writing Ability at End of Overseas Research

Rating	Frequency (%)
COMPLETELY SATISFIED	5 (7.1)
VERY SATISFIED	19 (27.2)

SATISFIED	38 (54.3)
VERY DISSATISFIED	7 (10.0)
EXTREMELY DISSATISFIED	1 (1.4)
Total	70 (100.0)

Respondents were then asked if they went overseas regularly in a professional capacity, and 52 persons, or 70.3%, replied “no,” and 22 people, or 29.7%, said “yes.” Those answering in the affirmative were asked to state how often they went abroad, and 20 people, or 90.5%, replied they went overseas every one or two years. Those that had replied in the negative were asked if they planned to go abroad again, and 7 persons, or 16.3%, replied “no,” and 36 people, or 83.7%, said “yes.” There were nine non-responses.

Part Seven : Improvements in English Education

The first item in this section asked whether respondents were continuing their English studies, and 70 persons, or 60.9%, stated “no,” and 45 people, or 39.1%, said “yes.” Those replying in the affirmative were asked how they were continuing their English studies, and the results are shown in Table 52. This was a multiple answer item, however, no one marked more than one item. Twenty-four persons, or 41.3%, stated they were either taking private lessons or doing self-study, while 19 people, or 42.2%, said they were doing “other” (listening to the radio, TV, tapes, etc.), and 2, or 4.4%, were attending English language school.

Respondents were then asked if they had obtained some type of English certification, and 103 persons, or 93.6%, replied “no,” and 7, or 6.4%, said “yes.” Eight people did not respond. Those answering in the affirmative were asked what kind of certificate they had, and two people replied having STEP certification and 4 said they had TOEFL certification. One person did not respond.

Table 52. Type of Continuing English Study Methods (MA)

Type	Frequency (%)
Private Lesson	12 (26.7)
Self-Study	12 (26.7)
English Language School	2 (4.4)
Other	19 (42.2)
Total	45 (100.0)

DISCUSSION

A look at the personal information section of the questionnaire shows that the 118 respondents who participated in this survey were represented from all over Japan, and in a few cases, overseas as well. They are either working at universities, research institutes, or continuing their graduate studies. In a breakdown of the type of institution they are employed or studying at (Table 1), 67 % are employed at public institutions and 33% at private ones. Almost 80% were born after WW II (Tables 2 and 18), meaning most of them have studied English under the new revised Ministry of Education curriculum guidelines which were established following the War.

One of the major points of investigation in this survey was to look at the ratio of mathematicians who had done overseas research as opposed to those who did not and investigate their feelings and attitudes. More people went overseas than didn't (61% vs. 39%, Table 3), and 96% of those went to North America or England/Europe (Table 4) where English is the common language. Their choice of an English-speaking country was more than probably influenced by the fact they were forced to study English from their Junior high school days through university. There was a direct relationship between what they studied and where they did research. Therefore, if they had to study English, it was the responsibility of the education system to prepare them adequately to function in that environment from an early age. Of the 71 persons who had gone overseas, 63% of them went once, while the remaining went or continue to go overseas at least two times (Table 5). As professional mathematicians, research is an integral part of their career development, and the ability to adequately function in an overseas environment is vital. Twenty-two persons replied they went overseas on a regular basis, at least once every one or two years, and even among those who didn't go overseas regularly, a majority replied they were planning to go again at some point in the future.

English is important for the successful development of Japanese mathematicians as accomplished researchers. One method to estimate their feelings of satisfaction regarding their English education is to investigate the number of respondents who studied outside of the regular school curriculum and look at what and when they performed these studies. Fifty-nine respondents (50 %) stated they did some kind of outside English study which is a rather high incidence when considering the investment in time and money that is required. The time spent in doing these studies occurred most often after the respondents had finished their regular school curriculum, i. e., after finishing their Master's or Doctorate degrees (Table 38). This result suggested these respondents had decided to go overseas but felt their English abilities were not adequate enough to function successfully, and they felt a need to further strengthen those skills before departing. This could be construed as an indictment on the regular Japanese English education curriculum.

The second largest category was during graduate school, which could also be considered in the same manner as just described. Those studying during high school and university could have been pursuing further studies to help in passing entrance exams to gain entrance to prestigious institutions.

Where these studies were conducted can be an indicator of the kind of study that was undertaken which in turn can point to areas where these mathematicians felt their English skills were lacking. It transpires that the most common types of outside English study were English Language School and Private Lessons (Table 39). Both of these programs emphasize listening and speaking skills, through formal class study on developing everyday conversational skills for travel and enjoyment in the first case, and intensive one-to-one interactive English conversation with a native English speaker in the second. This would indicate that these particular respondents felt their aural/oral skills needed to be enhanced before going abroad. As we shall see later, almost all respondents felt the listening and speaking skills they were supposed to have developed in their educational curriculum were not adequate enough to prepare them for a smooth transition into an English-speaking environment.

Another measure of the importance of these outside studies for those who went overseas was to investigate their feelings of preparation for doing overseas research after completing their studies. In general, respondents felt these studies had a positive impact on preparing them to go abroad and function adequately (Table 40). This attitude probably reflected the increased listening and conversational skills they developed from their language school and private lessons.

The survey revealed that most respondents studied English as prescribed in Ministry of Education guidelines regarding the number of minutes per class and number of times classes were taught in high school and university (Tables 6, 7, 9, 19, 20, and 21, respectively).

Most of the respondents studied anywhere from three to six different types of English courses in high school (Table 10) with the top five classes in descending order being grammar, translation, writing, reading, and vocabulary (Table 11). All of these were textbook based courses requiring little interaction between teacher and student in an English conversational environment. All instruction could be provided in Japanese, and the students concentrated principally on reading and memorizing rules and practicing English-Japanese or Japanese-English translation. In addition, more than 97% of respondents did not participate in any kind of English Speaking Society (ESS) activities which could have bolstered their conversational and listening abilities. Only 5% stated they had studied with a native English speaker, and they felt, in general, that the native instructor was effective in teaching English.

At the university level, most respondents studied from one to three different English subjects with the top five in descending order being translation (an overwhelming majority), reading,

hearing, conversation, and writing (Table 23). Even though conversation and listening played a more prominent role in their English studies than in high school, most of these classes took part in the Faculty of Liberal Arts as general subject courses, so the effectiveness of these classes for preparing these math majors for successful integration into the math-related English speaking world could be questioned. Ninety-eight percent of respondents did not participate in any kind of ESS activities, and only 18% had a native English instructor, and 84% of those respondents replied studying with a native English instructor for one year or less (Table 25). And in general, the native instructor was rated as being effective in teaching English (Table 26).

At the graduate school level, 94% of the respondents did their graduate studies in Japan and 6% overseas. Seventy-one percent of the respondents who studied at Japanese universities replied studying English during that time, and there were two peaks regarding the number of years English was used in their studies, with one peak at two years, possibly corresponding to Master's degree study, and the other at 5 years, possibly corresponding to a Ph. D. degree (Table 32).

By looking at the data described above, it became apparent that most of the English studies undertaken by the respondents were primarily based on gathering information from a textbook rather than using conversational and listening skills to enhance information gathering and the development of oral/aural skills. In those few cases where respondents studied with a native English speaker, their ratings of effectiveness showed that he/she had a positive impact on their English studies, probably due to an increase in the utilization of oral/aural skills. The lack of participation in ESS activities was a surprise, as the authors were under the impression that this kind of activity is a popular one at the high school and university level.

Another purpose of this study was to identify the level of satisfaction the respondents had regarding their English studies during their educational careers. In high school, most respondents were satisfied with their English education (Table 12), which probably illustrates acceptance of the status quo of English education at that time. They were probably not thinking about the possibility of using English in the future, and they had nothing to compare their English abilities to. However in university, the level of satisfaction decreases considerably, with more than half of the respondents being less than satisfied with their English education (Table 24). By this time, most of them had selected their major area of study and were looking forward to garnering some English ability related to their major, however, because most English courses were taught in the Faculty of Liberal Arts, they were not exposed to any English that could be applied to their major. Instead, almost all of their studies were of the general English education type, i.e., reading, writing, and translating literature-based subject matter. This may have caused some frustration among the respondents. Again, the satisfaction pendulum swings back to the satisfied side in graduate school (Table 33), possibly because their studies were primarily based on translating and

comprehending articles in their major field of study, mathematics. Still, there appeared to be a feeling of dissatisfaction with increasing their oral/aural abilities, because soon after completing their formal studies, but before going overseas, many respondents undertook outside English studies to further prepare them for a smooth transition into an English speaking environment. As mentioned earlier, most outside studies consisted of English Language School and Private Lessons, indicating these respondents felt their oral/aural skills were lacking.

How respondents felt about their fluency of their listening, speaking, reading, and writing abilities throughout their formal education was another point of investigation in this survey. One way to evaluate the results was to look at each ability from high school through graduate school and see how the respondents judged their fluency level.

More than 60% of respondents felt their English listening ability was below average. In fact, 41% stated that their listening ability was "poor," the lowest category in the ranking (Table 13). At the end of their university education, more than 60% of respondents felt their listening ability was below average, and 36% stated their listening ability was "poor" (Table 27). And, after graduate school, more than 60% felt their listening ability was below average, and 35% stated their listening ability was "poor" (Table 34). Throughout their formal education, Japanese mathematicians felt their listening skills were not enhanced at all. About the only thing that could be said was that the percentage of respondents categorically feeling their listening ability was poor decreased slightly. Based on the above data, respondents felt their development of listening fluency was not adequately addressed.

Fluency regarding speaking ability among the respondents followed along the same pattern as for their listening ability. More than 60% felt their speaking ability was below average in high school. In addition, 39% stated their speaking ability was "poor" (Table 14). After completing university, more than 60% felt their ability was below average, and 34% stated their speaking was "poor" (Table 28). And, after graduate school, more than 55% felt their ability was below average, and 29% stated it was "poor" (Table 35). Again, respondents felt their education lacked adequate training in developing good communicative skills. However, there appeared to be a decrease in the total numbers of totally frustrated respondents, indicating that a small improvement in speaking ability could be noted.

Reading showed significantly better results than the previously described categories. In high school, more than 50% of respondents felt their reading ability was above average (Table 15), while a little under 50% felt their reading ability was above average after university (Table 29), and 55% felt their reading ability was above average after graduate school (Table 36). These results illustrate how predominant textbook-based instruction was utilized in their English studies. One reason for the significant reading improvement from after university to after

graduate school could have been due to the fact that the topics of the reading assignments were more content based, i.e., they were primarily exercises in reading mathematics related materials, providing respondents with a much needed boost in improving at least their ability to read and comprehend mathematics articles written in English.

Fluency regarding writing ability provided similar results as shown in reading ability, but the overall feeling of fluency was not as pronounced. The range of fluency levels were flatter in this category than in the others. This could have been a reflection of the difference in fluency feelings for writing in general and mathematics content based writing, with many respondents feeling their mathematics writing ability was stronger than their general writing ability as is shown in the decrease in feeling of below average writing ability from university to graduate school. In high school, 40% of respondents felt their writing ability was above average (Table 16), while 34% felt their writing ability was above average after university (Table 30), and 40% felt it was above average after graduate school (Table 37).

These results clearly demonstrated the inadequacy of training in the oral/aural skills. There was too much dependence on using textbooks to disseminate the English language, illustrating the lack of interaction on a person-to-person basis between teacher and student.

Another way to measure the adequacy of English education for Japanese mathematicians was to evaluate how well respondents felt their English studies prepared them for overseas research. As shown in the tables, most respondents were disillusioned of their studies, regardless of when and where they studied (Tables 17, 31, and 41). These results provided more insight as to how English education should evolve in Japan. The Ministry of Education addressed comprehensive reforms regarding general English education, but based on the results of this survey, it may also need to address the development of adequate skill training for professionals who want or need to work in a global environment. One possible approach is the further introduction of content based courses at the university level.

The survey attempted to gain some insight into what courses had a positive impact on helping prepare students to adequately function overseas in a research capacity, and as shown in Table 43, the classes regarded as helping the most were translation, conversation, hearing, and grammar, in that order. The results were surprising since conversation and hearing ranked so high, but the question to ask is where did they receive this training? This provided more proof that respondents who did outside studies before going overseas were seeking to improve these skills, and it appeared these studies were beneficial. Grammar was an important choice as it is the basis for learning any language, and translation would rank high because of the numbers of respondents who studied it and the foundation it provides for reading and comprehending specific, content based materials, in this case, mathematics studies.

Finally, did the time spent in doing research overseas have an impact on their English abilities? The results demonstrate a significant increase in levels of satisfaction for all four abilities, due primarily to a decrease in levels of dissatisfaction experienced by respondents after completing their research overseas (Tables 44, 45, 46, 47, 48, 49, 50, 51, respectively). The biggest increase in levels of satisfaction occurred in the listening and speaking skills, going from 57% less than satisfied before going overseas to 21% less than satisfied after completing research for listening, and from 51% less than satisfied before to 21% less than satisfied after for speaking. Many respondents feel a need to continue their language studies to keep their abilities at an optimal level by other means (TV, radio, listening to cassettes, etc.), private lessons, self-study, and English language school, in that order (Table 52).

Japanese mathematicians felt their English education did not adequately prepare them to do overseas research. They were particularly dissatisfied with listening and speaking training. However, they went on to state that such courses as translation, conversation, hearing, and grammar best helped to prepare them to go abroad. Since they were unhappy with their formal education, many respondents felt it necessary to pursue outside studies to gain the necessary foundation to be able to converse and hear the English language competently. Much of their language study was of a general nature, but when they had decided to venture overseas to further their careers, they could have been better served by studying more content based English courses, starting from university. The ability to use English in the global community is considered important for these professionals, and many of them still continue to improve or polish their English language skills.

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Notes

1. Shotoku Gakuen Women's College, Dept. of Business/Economics.
2. Chukyo University, Dept. of Liberal Arts.