EDUCATUM JSMT Vol. 6 No. 1 (2019)
ISSN 2289-7070 / eISSN 2462-2451 (15-28)
http://ojs.upsi.edu.my/index.php/EJSMT/index

Assessing the Attitudes of Japanese Junior High School Students towards Course Units of Mathematics: A Focus on Learners with 'No Problem'Feeling about Studying the Subject

Tomoko Nishikawa[1*] and Guido Izuta[1]

[1]Department of Social and Information Science,
Yamagata Prefectural Yonezawa Women's Junior College
6-15-1 Toori Machi, Yonezawa City, Yamagata Prefecture, 992-0025 Japan

**Corresponding author:* nishikawa@yone.ac.jp
DOI: https://doi.org/10.37134/ejsmt.vol6.1.3.2019

Received**:** 10 May 2019; Accepted: 22 June 2019; Published: 24 June 2019

Abstract

This article is concerned with the assessment of feelings that Japanese junior high school students have towards the course unit learning of mathematics curricula. To accomplish this purpose, 616 junior high school students of a typical public school were surveyed regarding their feelings towards these course units and a two-step analysis was carried out. The first part consisted of the tabulation of Likert scale type survey with 5 levels of evaluation from 1 ('not good at') through 5 ('good at') aimed to evaluate their feelings towards learning mathematics in general as part of their educational activity. Next, we looked only into the students who responded 'no problem'. As a matter of fact, these respondents accounted for 181 students in all with 44 of them in first year, 75 in second year, and 63 in third year. Now focusing strictly on these students, we performed a correspondence analysis of their feelings towards the course units. The results are discussed in terms of this correspondence analysis, which made it clear that despite the fact that the students do not feel resistance towards learning the subjects of mathematics, they have 'good at' and 'not good at' feelings towards particular unit learning independent of the gender. In the paper, we discussed these findings in detail.

Keywords Mathematics Education, Japanese Junior High School Students, Feelings, Correspondence Analysis

INTRODUCTION

Learning mathematics is part of the mandatory education that junior high school students have to undergo during their three years of academic life, whether they have a positive feeling toward it or not. As far as these feelings are concerned, it has been pointed out that the way how students behave in mathematics classes and the emotions towards the learning may often be a major factor influencing students' learning performance [1, 2]. In particular, students' attitudes towards mathematics were studied by Mata, Monteiro and Peixoto who found that, in general, students have positive attitudes [3]. Self-confidence in mathematics was investigated by Hannula et al. who showed that are remarkably higher in boys than girls [4]. Recently, Lubienski et al. showed that disparities in mathematical confidence between boys and girls were considerably larger than gaps in both achievement and interest [5].

On the other hand, the role of a teacher in students' learning has an impact on their students. Davadas and Lay's work using structural equation modeling predicted that students' attitudes towards mathematics were related to the factors as teachers' emotional support and instruction in the class [6]. Lazarides and Watt's study revealed, on the basis of multilevel structural equation modeling, links between teacher's beliefs, learning environments, students' motivations, and mathematical career intentions [7]. Furthermore, some of the investigations on students' attitude toward mathematics have highlighted teacher's actions and inactions in students' attitude [1, 8, 9]. Regarding communicating the purpose or goal of the learning to learners, several studies showed the importance of teachers in clarifying students about the final goal of their activities in the classroom [10, 11]. In addition, Samuelsson and Samuelsson showed a positive relationship between properly communicated objectives and achievement in mathematics [12]. Patrick, Ryan, and Kaplan found associations between teacher support such as providing academic support, providing emotional support and student motivation and achievement [13]. There are also studies suggesting not only that learner-centered teaching style leads to more adaptation of students in emotional, social and educational domains but also that the importance of teaching taking into consideration students' interests and individual differences while using new teaching patterns and methods [14].

As far as the mathematics education in junior high school in Japan and feelings of difficulty that students have to learn this subject are concerned, several studies have examined the feelings of junior high school students towards three main areas of mathematics learning, and showed a trend dependent on gender and grades [15, 16]. Nishikawa and Izuta hinted to the possibility of the existence of gender dependent feelings towards the course units learning in mathematics learning [17]. This study is motivated by the author's previous research. In this research, we focus on Japanese junior high school students who have 'no problem' feeling towards mathematics learning. Generally, teachers focus on the group of 'being not good at' or 'being good at', and the degree of interest in 'neutral' ('no problem') group tends to be lower. The aim of this work is to examine the students' feelings for the course unit learning of mathematics courses focusing only on students who feel 'no problem' toward mathematics learning.

MATERIALS AND METHODS

A total of 616 students of a typical public junior high school in Niigata prefecture in Japan participated in the survey: 182 first-year, 212 second-year, and 222 third-year students. Students' ages ranged from 12 to 15 years. The survey was conducted at the end of the term in the academic year 2016.

Participants were asked questions related to their feelings towards learning mathematics. The evaluation was based on a 5-point Likert-type scale ('not good at', 'somewhat not good at', 'neutral', 'somewhat good at', and 'good at'), and only 'neutral' answers were selected for this study, and these were 44 first-year, 75 second-year, and 63 third-year students.

Selected respondents were further probed for their feelings towards the course units composing the four areas of their mathematics learning curricula. The assessment here used the same 5-point Likert-type scale as above and the areas of mathematics learning were named 'Numbers and Algebraic Expressions', 'Geometrical Figures', 'Functions', and 'Making Use of Data' [18]. A total of 168 students (17 first-year males, 26 first-year females, 29 second-year males, 33 second-year females, 29 third-year males, and 34 third-year females) were included in the final data analysis.

The statistical analysis was conducted with the use of R version 3.4.4 for Windows [19]. Independence between the course units which students learned and their feelings towards them was assessed using chi-square test. Correspondence analysis (CA) was performed to look over data as well as find out the major association of the response to the survey using the package 'FactoMineR' version 1.41 [20]. The results of CA data was visualized by using the package 'factoextra' [21].

RESULTS

First Year Students' Feelings towards Course Units

The contingency table of the first year student's feelings towards learning course units by gender based on the course units is presented in Table 1. 'Neutral' had the largest cumulative total number for both female and male students. A chi-square test for the contingency table of the first year students showed that course units and students' feelings are statistically significantly associated ($\chi^2(63) = 91.513$, $p < 0.05$).

Figure 1 shows the scree plot and the proportion of explained variances in the CA for the first year students. The first and second dimensions make up 67.4% and 11.5% of the variance, respectively, corresponding to total cumulative variance of 78.9%. As Bendixen has noted that any axis which contributes to more than the maximum percentages of either the average value of the eigenvalue for each axis in respect of rows or columns should be viewed as important and contained in the solution for interpreting data [22]. Nevertheless the proportion of the second dimension was slightly smaller than the maximum value (14.3%) among the averages regarding rows and columns, here we considered the number of dimensions to be 2.

Table 1 Contingency table of the first year student's feelings towards course units by gender in the course units for the first year of junior high school of mathematics learning.

	Female					Male					
Course Units of First Year Students	Not Good At	Somewhat Not Good At	Neutral	Somewhat Good At	Good At	Not Good At	Somewhat Not Good At	Neutral	Somewhat Good At	Good At	Total
Positive and negative numbers	0	3	9	11	3	0	3	8	4	2	43
Algebraic expressions using letters	0	4	12	6	4	0	3	8	6	0	43
Solving linear equation with one unknown	1	4	8	11	2	0	2	8	6	1	43
Constructing plane figures using compasses	0	2	3	15	6	2	2	4	6	3	43
Calculation of figure area and volume	1	11	7	6	1	0	2	11	4	0	43
Direct proportion, equation and graph	3	5	12	5	1	0	3	8	6	0	43
Inverse proportion, equation and graph	4	8	12	2	0	0	1	14	2	0	43
Histogram and representative values of data	1	3	12	8	2	1	2	9	3	2	43
Total	10	40	75	64	19	3	18	70	37	8	344

Table2 The result of the variable of correspondence analysis for the first year students.

		%	Dimension 1			Dimension 2			
Variables	Masses	Inertia	Coord	%Contrib	Cos^2	Coord	%Contrib	Cos^2	Quality
Course units									
Positive and negative numbers	0.125	1.491	0.246	4.216	0.507	-0.106	4.634	0.095	0.602
Algebraic expressions using letters	0.125	1.714	0.008	0.004	0.000	-0.306	38.265	0.682	0.682
Solving linear equation with one unknown	0.125	0.730	0.108	0.815	0.200	-0.050	1.007	0.042	0.242
Constructing plane figures using compasses	0.125	9.622	0.841	49.303	0.919	0.207	17.575	0.056	0.975
Calculation of figure area and volume	0.125	3.260	-0.328	7.477	0.412	0.207	17.594	0.165	0.577
Direct proportion	0.125	2.094	-0.300	6.275	0.538	-0.143	8.359	0.122	0.660
Inverse proportion	0.125	6.445	-0.670	31.282	0.871	0.175	12.466	0.059	0.930
Histogram and representative values of data	0.125	1.248	0.095	0.628	0.090	0.016	0.100	0.002	0.092
Feelings towards learning course units									
F.Not Good At	0.029	3.605	-0.875	12.399	0.617	0.253	6.108	0.052	0.669
F.Somewhat Not Good At	0.116	3.721	-0.431	12.023	0.580	0.241	22.065	0.181	0.761
F.Neutral	0.218	2.353	-0.224	6.077	0.463	-0.182	23.617	0.307	0.770
F.Somewhat Good At	0.186	4.360	0.462	22.094	0.909	0.050	1.532	0.011	0.920
F.Good At	0.055	3.167	0.695	14.874	0.843	-0.091	1.501	0.015	0.858
M.Not Good At	0.009	3.004	1.399	9.511	0.568	0.820	19.211	0.195	0.763
M.Somewhat Not Good At	0.052	0.452	0.082	0.195	0.077	-0.232	9.216	0.623	0.700
M.Neutral	0.203	1.910	-0.279	8.832	0.829	0.070	3.261	0.052	0.881
M.Somewhat Good At	0.108	1.124	0.163	1.598	0.255	-0.146	7.550	0.205	0.460
M.Good At	0.023	2.907	0.978	12.397	0.765	0.279	5.939	0.062	0.827

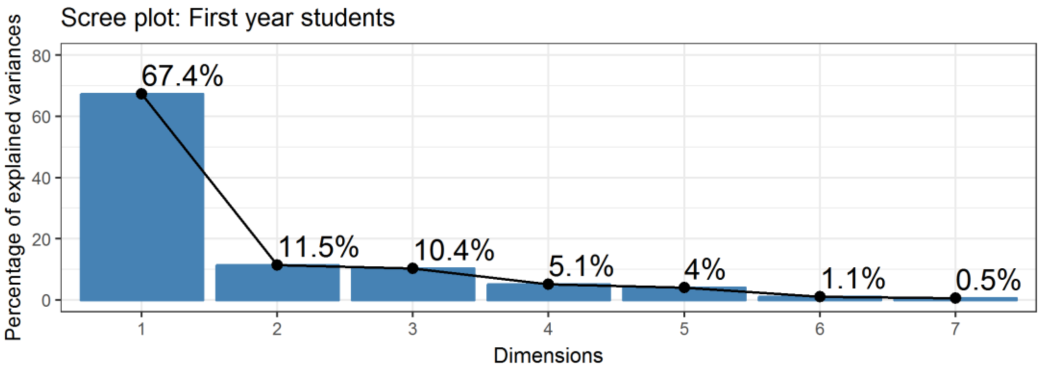

Figure 1 The scree plot of the correspondence analysis for the first year students, with the percentage of explained variance.

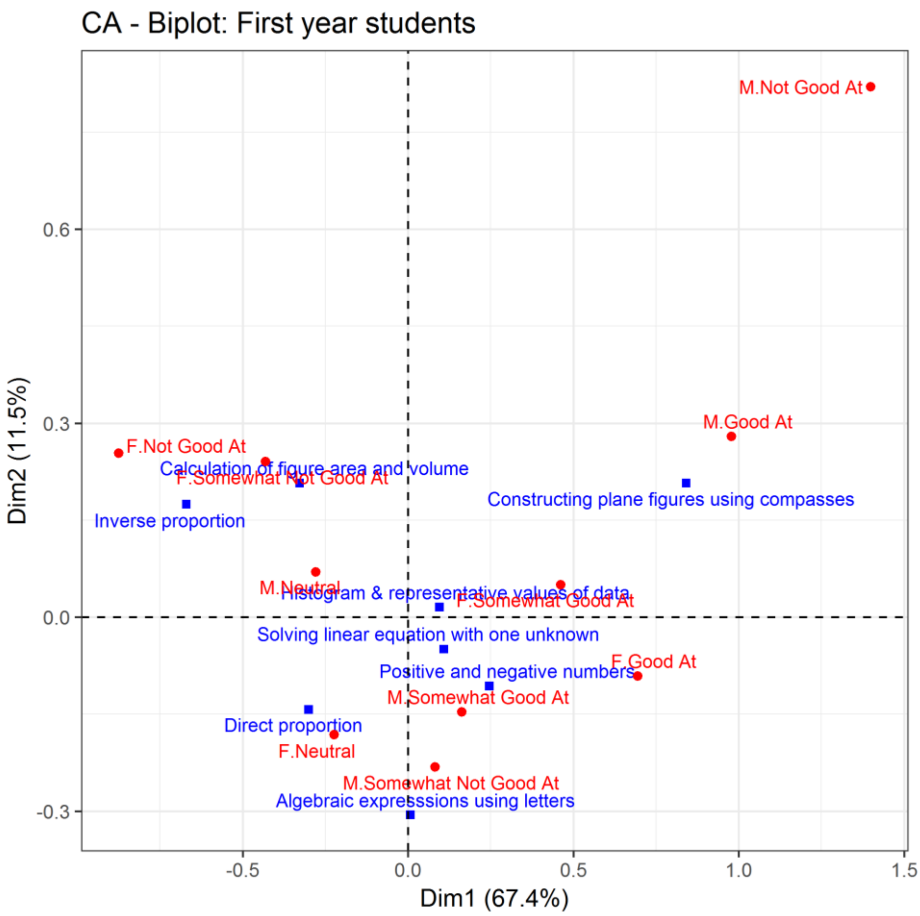

Figure 2 Biplot of the correspondence analysis of the course units and the feelings of the first year students toward the course units. The squares represent the course units for the first year of junior high school of mathematics learning. The circles represent the feelings of students toward the course units.

The results of the variables from CA for the first year students are presented in Table 2. The row items, which are ‘Constructing plane figures using compass’ and ‘Inverse proportion’, summed up to 80.5%; and they made the most important contribution to the definition of the first dimension. The column variables, which are 'F.Somewhat Good At', 'F.Good At', 'F.Not Good At', 'M.Good At', and 'F.Somewhat Not Good At', added up to 93.4%; and they were the most significant contributors to the Dimension 1. As to the second dimension, the row variables, which are 'Algebraic expressions using letters', 'Constructing plane figures using compass', and 'Calculation of figure area and volume' were the major contributors with a total of 73.5%. The columns variables, which are 'F.Neutral', 'F.Somewhat Not Good At', and 'M.Not Good At', were the most significant contributors totaling 64.9%. Regarding the quality of representation of the rows, all the course units for the first year students except one unit, which is 'Histogram and representative values of data', were well explained in two dimensions. In the same way, regarding the quality of representation of the columns, all of the items were well presented in two dimensions.

As for the biplot of the variables of course units and the variables of feelings of students toward the course unit shown in Figure 2, the first dimension explains 67.4% and the second dimension describes 11.5%. This graph shows that there are seems to have five relationships. Firstly, first-year male students felt that they were good at the unit 'Constructing plane figures using compasses'. Secondly, first-year male students recognized that they were somewhat good at the units 'Solving linear equation with one unknown' and 'Positive and negative numbers'. Thirdly, first-year female students felt that the unit 'Direct proportion' was neutral. Fourthly, first-year female students felt that they were not good at or somewhat not good at the units 'Inverse proportion' and 'Calculation of figure area and volume' whereas male students felt that these were neutral. Lastly, first-year male students felt that they were somewhat not good at the unit 'Algebraic expressions using letters'.

Second year students' feelings towards course units

The contingency table shown in Table 3 presents the second year student's feelings towards learning course units by gender. Similar to the first graders case, 'Neutral' had the largest cumulative total number for both female and male students. On comparing the course units and student's feelings towards learning course units with a chi-square test of independence, there are statistically significantly associated ($\chi^2(63) = 138.09$, $p < 0.05$).

Figure 3 describes the scree plot of the CA for the second year students. The percentage of explained variances in the CA were 58.3%, 15.9%, and 14.6% for the dimensions 1 through 3, respectively. This is the equivalent of a total cumulative variance of 88.8%, summing up total variance retained by the 3 dimensions. Even though Dimension 3 is slightly greater than the maximum value (14.3%) of average eigenvalue, only dimensions up to 2 were adopted in this data interpretation.

Table 4 shows the results of the variables from CA for the second year students. The column variables, which are 'F.Not Good At', 'F.Somewhat Not Good At' and 'F.Somewhat Good At', added up to 71.3% and they were the most significant contribution to the first dimension; the row variables, which are 'Linear functions' and 'Properties of parallel lines and angles', totalled 91.4%, and they were the most having great influence contributors to the definition of the Dimension 1. Regarding the second dimension, the row variables, which are 'Probability' and 'Properties of parallel lines and angles', were the most important contributors totaling 74.1%; the columns variables, which are 'M.Good At' and 'M.Neutral', contributed most (total was 52.5%). With regard to the quality of representation of the course units for second years, all the course units, except one unit, which is 'Properties of triangles and parallelograms' were well depicted in two dimensions. In a similar way, as to the quality of representation of the feelings variables, all variables were well described in the two dimensions.

Figure 4 pictured the projections of the rows and columns coordinates on the first dimension (58.3% of explained variance) and the second dimension (15.9% of explained variance), from which these can interpret the following associations: 1) Both female and male second-year students recognized that they were somewhat not good at the units 'Congruence of plane figures' and 'Linear functions', whereas the unit 'Algebraic expressions using letters' was neutral; 2) Second-year female students felt that they were somewhat good at the units 'Solving simultaneous linear equations' and 'Properties of triangles and parallelograms'; 3) Second-year male students perceived that they were somewhat good at the unit 'Polynomials' whereas female students were aware of neutral.

Table 3 Contingency table of the second year student's feelings towards course units by gender in the course units for the second year of junior high school of mathematics learning.

	Female					Male					
Course Units of Second Year Students	**Not Good At**	**Somewhat Not Good At**	**Neutral**	**Somewhat Good At**	**Good At**	**Not Good At**	**Somewhat Not Good At**	**Neutral**	**Somewhat Good At**	**Good At**	**Total**
Polynomials	0	5	10	16	2	0	3	18	6	2	62
Algebraic expresssions using letters	0	8	15	9	1	0	3	18	7	1	62
Solving simultaneous linear equations	0	5	12	14	2	0	5	11	9	4	62
Properties of parallel lines and angles	0	2	11	16	4	1	1	12	8	7	62
Congruence of plane figures	1	5	18	8	1	0	9	12	4	4	62
Properties of triangles and parallelograms	0	4	21	7	1	1	5	13	4	6	62
Linear functions	6	14	11	2	0	0	8	19	2	0	62
Probability	0	3	21	5	4	0	2	20	7	0	62
Total	7	46	119	77	15	2	36	123	47	24	496

Table 4 The result of the variable of correspondence analysis for the second year students.

Variables	Masses	% Inertia	Dimension 1 Coord	Dimension 1 %Contrib	Dimension 1 Cos^2	Dimension 2 Coord	Dimension 2 %Contrib	Dimension 2 Cos^2	Quality
Course units									
Polynomials	0.125	1.681	-0.173	2.303	0.223	-0.033	0.300	0.008	0.231
Algebraic expresssions using letters	0.125	0.998	0.030	0.068	0.011	-0.190	10.161	0.452	0.463
Solving simultaneous linear equations	0.125	1.426	-0.219	3.697	0.421	0.120	4.032	0.126	0.547
Properties of parallel lines and angles	0.125	4.592	-0.501	19.345	0.684	0.220	13.621	0.132	0.816
Congruence of plane figures	0.125	1.588	0.100	0.765	0.078	0.132	4.891	0.137	0.215
Properties of triangles and parallelograms	0.125	2.283	-0.128	1.254	0.089	0.109	3.370	0.066	0.155
Linear functions	0.125	12.130	0.968	72.123	0.966	0.105	3.124	0.011	0.977
Probability	0.125	3.143	-0.076	0.447	0.023	-0.463	60.501	0.854	0.877
Feelings towards learning course units									
F.Not Good At	0.014	7.114	2.094	38.117	0.870	0.518	8.529	0.053	0.923
F.Somewhat Not Good At	0.093	3.489	0.571	18.621	0.867	0.055	0.639	0.008	0.875
F.Neutral	0.240	1.991	-0.026	0.103	0.008	-0.129	8.952	0.200	0.208
F.Somewhat Good At	0.155	3.977	-0.391	14.612	0.597	0.165	9.515	0.106	0.703
F.Good At	0.030	1.599	-0.512	4.875	0.495	-0.237	3.829	0.106	0.601
M.Not Good At	0.004	1.210	-0.780	1.512	0.203	0.782	5.550	0.204	0.407
M.Somewhat Good At	0.095	1.334	-0.292	4.961	0.604	-0.077	1.252	0.042	0.646
M.Neutral	0.248	1.257	0.109	1.811	0.234	-0.167	15.506	0.547	0.781
M.Somewhat Not Good At	0.073	2.509	0.401	7.202	0.466	0.237	9.203	0.163	0.629
M.Good At	0.048	3.360	-0.524	8.186	0.396	0.583	37.025	0.489	0.885

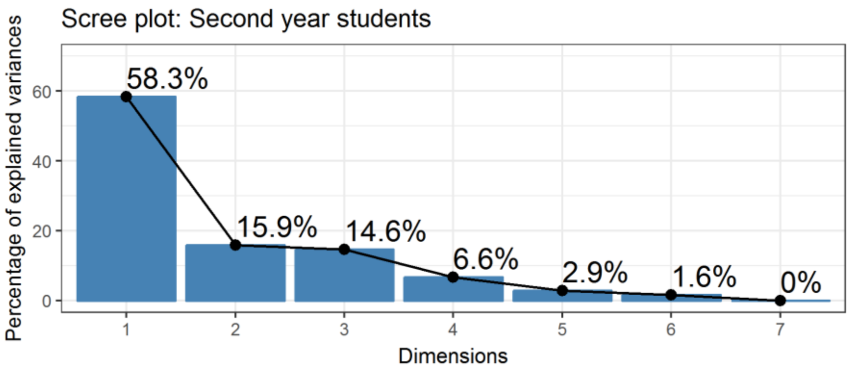

Figure 3 The scree plot of the correspondence analysis for the second year students, with the percentage of explained variance.

EDUCATUM JSMT Vol. 6 No. 1 (2019)
ISSN 2289-7070 / eISSN 2462-2451 (15-28)
http://ojs.upsi.edu.my/index.php/EJSMT/index

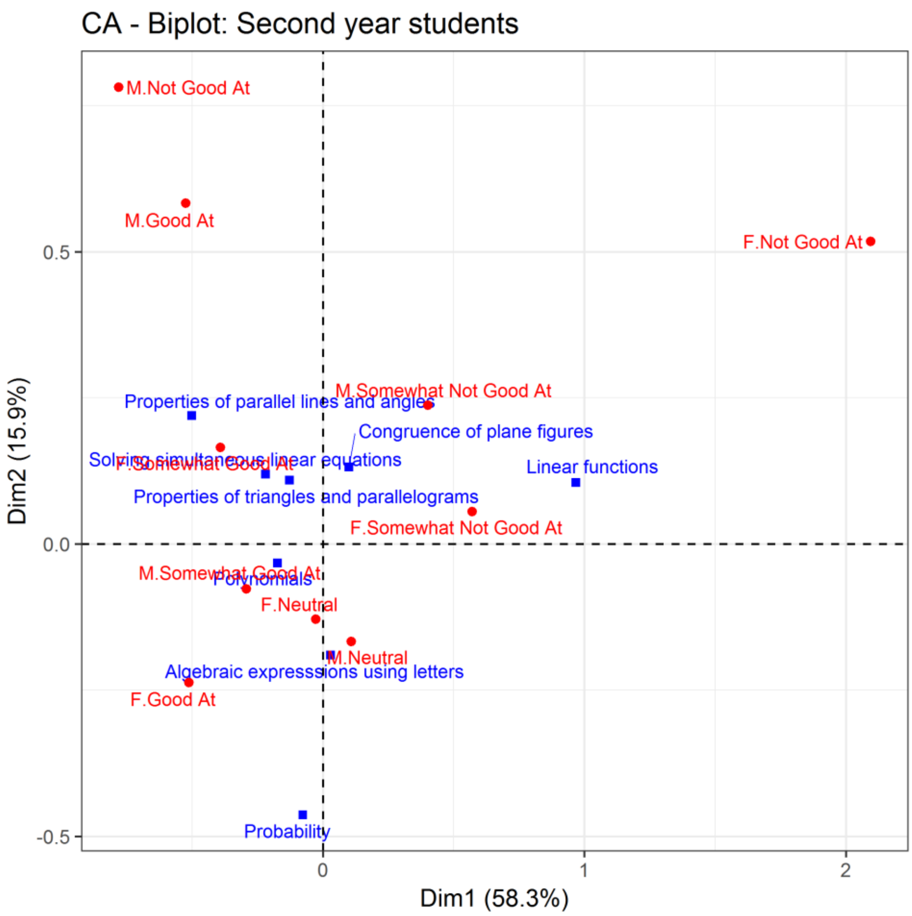

Figure 4 Biplot of the correspondence analysis of the course units and the feelings of the second year students toward the course units. The squares represent course units in second-grade mathematics. The circles represent the feelings of students toward the course units.

Third Year Students' Feelings towards Course Units

Table 5 shows the contingency table of the third year students. The largest cumulative total number of both female and male students' feelings was 'Neutral' (males: 123, females: 121). A statistically significant association between third-year student's feelings towards learning course units and the course units was observed ($\chi^2(72) = 132.12$, $p < 0.05$).

The scree plot of the CA for the third year students with the percentage of explained variances is displayed in Figure 5. The proportion of the second dimension slightly exceeded the maximum value (12.5%) of the average eigenvalue for each axis. Thus the number of dimensions was taken to be 2.

Table 5 Contingency table of the third year student's feelings towards course units by gender in the course units for the third year of junior high school of mathematics learning.

	Female					Male					
Course Units of Third Year Students	Not Good At	Somewhat Not Good At	Neutral	Somewhat Good At	Good At	Not Good At	Somewhat Not Good At	Neutral	Somewhat Good At	Good At	Total
Expansion of expressions	1	4	11	18	0	0	0	10	9	10	63
Factorization of expressions	0	1	11	18	4	0	1	9	8	11	63
Calculation of expression including square	1	1	16	15	1	0	1	11	9	8	63
Solving quadratic equations	1	9	16	7	1	0	1	11	7	10	63
Similarity of plane figures	8	10	12	2	2	4	2	17	4	2	63
Inscribed angle and central angle in a circle	5	5	13	9	2	1	1	14	7	6	63
Pythagorean theorem	2	9	11	11	1	0	1	13	11	4	63
Function $y=ax^2$	2	12	15	3	2	1	3	17	4	4	63
Sample survey	3	6	16	8	1	1	1	21	5	1	63
Total	23	57	121	91	14	7	11	123	64	56	567

Table 6 The result of the variable of correspondence analysis for the third year students.

Variables	Masses	% Inertia	Dimension 1 Coord	Dimension 1 %Contrib	Dimension 1 Cos^2	Dimension 2 Coord	Dimension 2 %Contrib	Dimension 2 Cos^2	Quality
Course units									
Expansion of expressions	0.111	2.776	-0.450	14.546	0.810	0.042	0.641	0.007	0.817
Factorization of expressions	0.111	4.176	-0.534	20.517	0.760	0.144	7.455	0.055	0.815
Calculation of expression including square root	0.111	1.911	-0.370	9.817	0.794	0.063	1.425	0.023	0.817
Solving quadratic equations	0.111	1.295	-0.071	0.360	0.043	-0.259	24.093	0.575	0.618
Similarity of plane figures	0.111	6.948	0.734	38.727	0.862	0.259	24.087	0.107	0.969
Inscribed angle and central angle in a circle	0.111	0.530	0.090	0.580	0.169	0.156	8.785	0.512	0.681
Pythagorean theorem	0.111	1.012	-0.038	0.105	0.016	-0.127	5.806	0.177	0.193
Function $y=ax^2$	0.111	2.842	0.388	10.842	0.590	-0.278	27.708	0.301	0.891
Sample survey	0.111	1.811	0.250	4.508	0.385	-0.001	0.000	0.000	0.385
Feelings towards learning course units									
F.Not Good At	0.041	3.466	0.761	15.200	0.678	0.467	28.585	0.255	0.933
F.Somewhat Not Good At	0.101	3.453	0.458	13.652	0.611	-0.306	30.407	0.272	0.883
F.Neutral	0.213	0.554	0.032	0.141	0.039	-0.072	3.537	0.197	0.236
F.Somewhat Good At	0.160	4.900	-0.523	28.446	0.898	0.136	9.571	0.060	0.958
F.Good At	0.025	1.159	0.011	0.002	0.000	0.214	3.668	0.098	0.098
M.Not Good At	0.012	3.074	1.332	14.159	0.712	0.742	22.003	0.221	0.933
M.Somewhat Not Good At	0.019	0.802	0.453	2.579	0.497	-0.175	1.925	0.074	0.571
M.Neutral	0.217	1.626	0.226	7.194	0.684	-0.011	0.083	0.002	0.686
M.Somewhat Good At	0.113	1.163	-0.246	4.424	0.588	-0.009	0.027	0.001	0.589
M.Good At	0.099	3.105	-0.472	14.203	0.707	-0.025	0.194	0.002	0.709

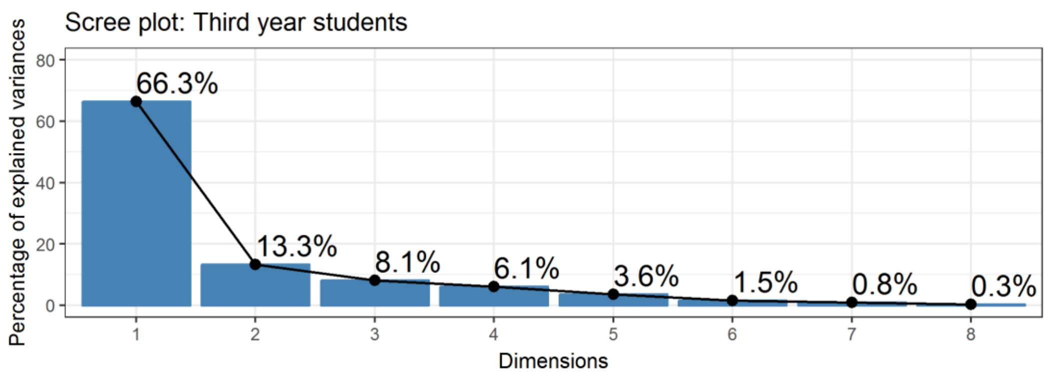

Figure 5 The scree plot of the correspondence analysis for the third year students, with the percentage of explained variance.

EDUCATUM JSMT Vol. 6 No. 1 (2019)
ISSN 2289-7070 / eISSN 2462-2451 (15-28)
http://ojs.upsi.edu.my/index.php/EJSMT/index

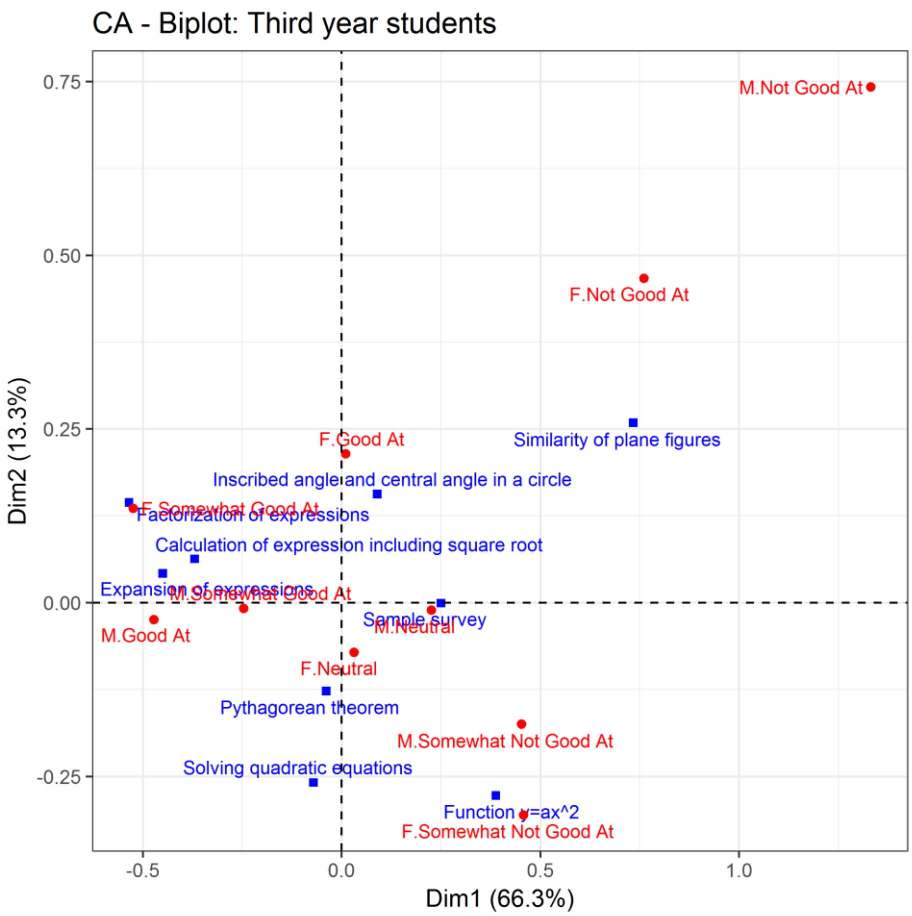

Figure 6 Biplot of the correspondence analysis of the course units and the feelings of the third year students toward the course units. The squares represent course units in third-grade mathematics. The circles represent the feelings of students toward the course units.

The CA outcome variables for third year students are listed in Table 6. The variables of course units, which are ‘Similarity of plane figures’, ‘Factorization of expressions’ and ‘Expansion of expressions’, added up to 73.7%; they had given the most important contribution to the definition of Dimension 1. The variables of feelings, which are ‘F.Somewhat Good At’, ‘F.Somewhat Not Good At’, ‘M.Good At’, ‘M.Not Good At’, and ‘F.Somewhat Not Good At’, amounted to 85.7%, and they were the highly valued contributor to the first dimension. With respect to the second dimension, the row items, which are ‘Function $y=ax^2$’, ‘Solving quadratic equations’ and ‘Similarity of plane figures’, contributed most (total of 75.9%); and the column items, which are ‘F.Somewhat Not Good At’, ‘F.Not Good At’, and ‘M.Not Good At’, summed up to 81.0%, and they were the most significant contributor. As regards the quality of representation of the columns, all items except one item, which was ‘F.Good At’, were well described in the two dimensions. Similarly, in regard to the quality of representation of the rows, all the course units for third years except the item ‘Pythagorean theorem’ were well represented in the Dimension 1 and 2.

The biplot which had the rows and columns variables had coordinates expressing Dimension 1 (66.3% of explained variance) and Dimension 2 (13.3% of explained variance) as illustrated in Fig. 6, thereby interpreting that the following associations are drawn: 1) Third-year female students felt that they were not good at the unit 'Similarity of plane figures'; 2) Third-year male students felt that the unit 'Sample survey' was neutral; 3) Both female and male third-year students felt that they were good at or somewhat good at the following units: 'Factorization of expression', 'Calculation of expression including square root', and 'Expansion of expressions'; 4) Both female and male third-year students felt that they were somewhat not good at the unit 'Function $y=ax^2$'.

DISCUSSION

Considering the results of first year students, male students showed a positive reaction to some units included in the fields of numbers and calculations and geometry. On the other hand, female students showed a sort of negative reaction to the units included in the fields of function and geometry. These results indicate that mathematics teachers should teach female students each unit in the field of function and geometry with certain care and in a way that they understand them as possible as without putting psychological and emotional stresses on them.

Both second year females and males showed mild attitudes to some units included in the fields of numbers and calculations. In contrast, they showed a slight negative reaction to some units involved in the fields of function and geometry. This tendency is similar to the one found in third year students. In fact, third graders had a favorable attitudes towards some units contained in the field of numbers and calculations, and negative for some units involved in the fields of function and geometry. These results suggest that teachers should teach each unit in the field of function and geometry in such a way that students can learn these topics more smoothly, perhaps just as done for first graders.

Our findings suggest that Japanese junior high school students who have 'No Problem' feelings towards mathematics learning tend to have positive attitudes towards the units included in the fields of numbers and calculations, and negative feelings for the units included in the fields of both function and geometry. This indicates that it may be possible to create a sort of pleasant feeling in learning mathematics when students do not feel difficulties in learning it. This also implies that mathematics teachers have to further improve or think of new teaching method when teaching function and geometry.

CONCLUSION

Our findings indicate that the assessment of feelings that Japanese junior high school students have towards course unit learning of mathematics courses. These results suggest that teachers need to give suitable support for students who have 'No Problem' feelings for each unit of mathematics. Finally, the findings of this study may help teachers think out better instruction methods of teaching mathematics.

REFERENCES

[1] Marchis, I. (2011). Factors that influence secondary school students' attitude to mathematics. *Procedia-Social and Behavioral Sciences*, 29, 786-793.

[2] Mohamed, L., & Waheed, H. (2011). Secondary students' attitude towards mathematics in a selected school of Maldives. *International Journal of humanities and social science*, 1(15), 277-281.

[3] Mata, M. D. L., Monteiro, V., & Peixoto, F. (2012). Attitudes towards Mathematics: Effects of Individual, Motivational, and Social Support Factors. *Child development research*, vol. 2012, Article ID 876028, 10 pages, 2012. doi: 10.1155/2012/876028.

[4] Hannula, M. S., Maijala, H., Pehkonen, E., & Nurmi, A. (2005). Gender comparisons of pupils' self-confidence in mathematics learning. *Nordic Studies in Mathematics Education*, 10(3-4), 29-42.

[5] Lubienski, S. T., Robinson, J. P., Crane, C. C., & Ganley, C. M. (2013). Girls' and boys' mathematics achievement, affect, and experiences: Findings from ECLS-K. *Journal for Research in Mathematics Education*, 44(4), 634-645.

[6] Davadas, S. D., & Lay, Y. F. (2017). Factors Affecting Students' Attitude toward Mathematics: A Structural Equation Modeling Approach. Eurasia Journal of Mathematics, *Science and Technology Education*, 14(1), 517-529.

[7] Lazarides, R., & Watt, H. M. (2015). Girls' and boys' perceived mathematics teacher beliefs, classroom learning environments and mathematical career intentions. *Contemporary educational psychology*, 41, 51-61.

[8] Ampadu, E. (2012). Students' Perceptions of their Teachers' Teaching of Mathematics: The Case of Ghana. *International Online Journal of Educational Sciences*, 4(2).

[9] Anyagh, P. I., Honmane, O., & Abah, J. (2018). Secondary School Students' Perception of Teachers' Attitude towards Learning in Mathematics in Wukari Metropolis, Taraba State, Nigeria. *International Journal of Research and Review*, 5(5), 69-75.

[10] Gherasim, L. R., Butnaru, S., & Mairean, C. (2013). Classroom environment, achievement goals and maths performance: Gender differences. *Educational Studies*, 39(1), 1-12.

[11] Koutrouba, K. (2016). Defining Teacher Effectiveness in Secondary Education: The Perceptions of Greek Students. *International Journal of Learning, Teaching and Educational Research*, 15(10).

[12] Samuelsson, M., & Samuelsson, J. (2016). Gender differences in boys' and girls' perception of teaching and learning mathematics. *Open Review of Educational Research*, 3(1), 18-34.

[13] Patrick, H., Ryan, A. M., & Kaplan, A. (2007). Early adolescents' perceptions of the classroom social environment, motivational beliefs, and engagement. *Journal of educational psychology*, 99(1), 83.

[14] Khandaghi, M. A., & Farasat, M. (2011). The effect of teacher's teaching style on students' adjustment. *Procedia Social and Behavioral Sciences*, 15, 1391-1394.

[15] Izuta, G., & Nishikawa, T. (2017). Assessing the Sense of 'Good at' and 'Not Good At' towards Learning Topics of Mathematics with Conjoint Analysis, *AIP Conference Proceedings*, 1847, 030014-1–030014-7, doi: 10.1063/1.4983892.

[16] Nishikawa, T., & Izuta, G. (2017). A Characterization of Junior High Students with Anxieties towards Learning Mathematics. In *Proceedings of 2017 International Conference on Education, Psychology, and Social Sciences*, CD-ROM Format, Bangkok, Thailand, August 2-4, 404-413.

[17] Nishikawa, T., & Izuta, G. (2017). An Assessment of Learning Difficulty Level of Math Class Topics- A Case Study of a Japanese Public Junior High School. *International Journal of Educational Science and Research*, 17(1), 105-118.

[18] MEXT: Ministry of Education, Culture, Sports, Science and Technology. (2008). Junior High School Teaching Guide for the Japanese Course of Study: Mathematics No.2.
Retrieved from http://www.mext.go.jp/component/a_menu/education/micro_detail/__ics (accessed Sep 2018).

[19] R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Retrieved from https://www.R-project.org/. (accessed Sep 2018).

[20] Sebastien, L., Julie, J. & Francois, H. (2008). FactoMineR: An R Package for Multivariate Analysis. *Journal of Statistical Software*, 25(1), 1-18. doi: 10.18637/jss.v025.i01.

[21] Kassambara, A., & Mundt, F. (2017). factoextra: Extract and Visualize the Results of Multivariate Data Analyses. R package version 1.0.5. Retrieved from https://CRAN.R-project.org/package=factoextra. (accessed Sep 2018).

[22] Bendixen, M. (1996). A practical guide to the use of correspondence analysis in marketing research. *Marketing Research On-Line*, 1(1), 16-36.