Is There still a Gender Myth: Science Fields for Boys and Humanities for Girls?

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Abstract
MEXT, Japan (2006 and 2016) reported the numbers of university students' enrollments. In the area of Electric Communication Engineering, in particular, there are almost 16 times more men (132,404) than women (8152). In 2016, there are 10 times more men (103,476) than women (9546). The authors of this study, however, believe that gender preference of choosing a study area does not mean that either men or women are good at one particular study area. Thus, this study aims to examine, in particular, whether there are some gender trends about the electric communication engineering area. The authors of this study set out two research questions. The first question is whether there are any gender similarities and/or differences about using online course tools among university students. The second question is if there are any gender similarities and/or differences, what they are. This study firstly uses a questionnaire to see students' insights towards using online course tools for their English classes. Secondly, this study sees the actual use of online course tools by counting numbers of students who accessed the tools in our English classes. The questionnaire results reveal that women in this study did not tend to have negative attitudes towards using their Personal Computer (PC). The numbers of actual access to online course tools reveal that women accessed (M=1066) more than men (M=838.2). These results suggest that the traditional gender stereotype has been changing.

Keywords: gender stereotype, higher education, online course tools

Introduction

According to the encyclopedia of contemporary words (2015), the term "rikejyo" is an abbreviation of "rikei jyoshi". It means female science students in Japan. It is believed that "rikejyo" appears to encourage women to get involved in science fields more than ever. Japan Cabinet Office (2013) promotes the term "rikejyo" in order to increase population of female scientists who actively work in the science fields. Under the Science and Technology Policy in 2011 by Council for Science, Technology and Innovation, the Japanese government targets 30% of female scientists who will be working in human science areas by 2016. In universities in Japan, science fields are still popular for men while the humanities are popular for women (MEXT, 2016). The data by the Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT: 2006 and 2016) still suggests that a gender stereotype about choosing study areas exists. Men tend to study science fields while women tend to study humanities. However, the authors of this study do not particularly see the gender stereotype in their English classes. This study, thus, explores whether the gender stereotype still exists or not. In particular, this study examines whether there are any gender differences of using online course tools in English classes or not. The authors of this study use questionnaires to see the participants' insights towards using online course tools and count the actual use of online course tools accessed by the Japanese university students.

Literature review

Social psychological perspective

Studies in gender stereotypes about men's favor in science subjects and women's favor in arts subjects have been researched for some decades.

In psychology, gender stereotypes are examined by using "stereotype threat."

> It is conceived as a state of psychological discomfort that, if sufficiently acute, can impair performance. It is thought to arise when students are confronted with an evaluative situation, in which a stereotype regarding a particular ability is relevant. For example, stereotype threat may occur when a woman who is aware of that women are considered inferior to men at math is confronted with a mathematics test.
>
> (Appel, Kronberger and Aronson, 2011:904).

Beilock et al. (2010) find that school girls, who believed the traditional gender stereotype that girls are good at reading while boys are good at math, achieved lower math performance at the end of the school year. Also teachers' math anxiety influences students' math academic performance. Beilock et al. (2010) explain that there are more female teachers in general at schools and female teachers tend to have math anxiety. School children are exposed to these female teachers through their academic year and therefore, girls in particular are affected by their female school teachers' math anxiety. Because of this, girls perform lower achievements on math than boys do. Keifer and Sekaquapyewa (2007) also explain the influence of gender stereotype threat on the math test. They find that when the gender stereotype threat,

that women have a less mathematical ability than men, was reduced, the less women possessed the gender stereotype, the better they performed on the math test. Schmader (2002) finds that when gender identity was linked to test performance, female participants in his study scored lower on the math test than men did. However, when women in the study did not link gender identity to test performance, both women and men in his study equally performed on the math test. Johns, Schmader, and Martens (2005) also point out the effect of the stereotype threat. In their study, when women in their study strongly believed the gender stereotype, women's inferiority in math, the women performed worse on the mast test than men did.

Social role perspective

As opposed to psychology, sociologists tend to see gender stereotype as a result of social expectation by the society which both men and women belong to. For instance, Ecklund, Lincoln and Tansey (2012) explain that although the perception of occupational gender stereotypes has been changing over time, it still exists such as the notion that some jobs are more appropriate for men or women only. For instance, Ecklund et al (2012) explain that women leave physics because some do not want to sacrifice family duties and thus, they choose other fields which are more flexible for family duties than physics. Becker (2010) finds that young women in Germany tend to feel less convinced of succeeding in engineering field even though they have good grades in engineering subjects. In addition, although they are not afraid of being a minority as being engineers, they are afraid of discrimination because of being engineers. Preckel et al. (2008) point out the effect of gender social role in girls' math performance. In their study, girls performed lower on the math test than boys did. They concluded that gender social roles were influenced by their results that girls performed lower than boys did on the math test. Valenduc et al. (2004) point out the expectation by companies towards their employees. In the Information and Communication Technology (ICT) industries, for instance, employees are often expected to work for long hours such as 50 hours per week. Thus, women are often discriminated since they might need to look after their children or to do households. Instead of women, single men are often favored by these companies.

Gender features in Japanese Universities

Ministry of Education, Culture, Sports, Science and Technology, Japan (MEXT) releases the statistical data about numbers of university enrollments every year. Within a decade between 2006 and 2016 in Japan, the trend of preference of study areas at Japanese universities by gender has not dramatically changed. Both tables 1 and 2 show the data for the numbers of enrollment in Japanese universities by MEXT.

Table 1

2006		2016	
Major study fields Total numbers	Gender & numbers	Major study fields Total numbers	Gender & numbers
Humanities 400, 114	Men: 133,769 Women: 266,345	Humanities 366,220	Men: 126,715 Women: 239,505
Social Sciences 925,988	Men: 636,753 Women: 289,235	Social Sciences 829,399	Men: 541,507 Women: 287,892
Science 85,502	Men: 63,844 Women: 21,658	Science 79,290	Men: 57,850 Women: 21,440
Engineering 422,535	Men: 380,816 Women: 44,719	Engineering 384,762	Men: 330,720 Women: 54,042
Art 72,803	Men: 22,334 Women: 50,569	Art 69,691	Men: 20,488 Women: 49,203
Education 144,833	Men: 57,736 Women: 87,097	Education 190,903	Men: 78,201 Women: 112,702

(MEXT: 2006 & 2016)

Table 2

2006		2016	
Macro study fields Total numbers	Gender & numbers	Macro study fields Total numbers	Gender & numbers
Literature 157,825	Men: 43,224 Women: 114,581	Literature 137,749	Men: 40,208 Women: 97,541
Law & Politics 176,825	Men: 122,725 Women: 53,376	Law & Politics 157,851	Men: 107,847 Women: 50,004
Commerce & Economics 506,470	Men: 387,760 Women: 118,710	Commerce & Economics 452,924	Men: 321,554 Women: 131,370
Math 20,473	Men: 16,423 Women: 4050	Math 16,097	Men: 131,123 Women: 2974
Physics 13,797	Men: 12,088 Women: 1709	Physics 12,356	Men: 10,583 Women: 1,773
Chemistry 12,746	Men: 8917 Women: 3829	Chemistry 11,761	Men: 8255 Women: 3506
Electric Communication Engineering 140,556	Men: 132,404 Women: 8152	Electric Communication Engineering 113,022	Men: 103,476 Women: 9546
Home Economics 22,769	Men: 2512 Women: 20,257	Home Economics 20,554	Men: 2094 Women: 18,460

(MEXT: 2006 & 2016)

Both tables show the trend that men tend to study science fields while women tend to study arts fields. For instance, on table 1, there are nearly twice as many women (266,345) enrolled in the humanity area as men (133,769) did in 2006. This trend stays similar in 2016, 239,505 women enrolled in the humanity area while 126,715 men enrolled in it. As for engineering, it is nearly 8.5 times difference between men

and women. 380,816 men enrolled in the engineering field while 44,719 women did in 2006. Numbers decline to nearly 6 times difference between men and women in 2016, where 337,720 men enrolled in engineering while 54,042 women enrolled in the same area.

On table 2, there are some extreme trends between men's enrollment and women's enrollment. In home economics, there are about eight times difference between men (2512 in 2006 and 2094 in 2016) and women (20,257 in 2006 and 18,460 in 2016) in both 2006 and 2016. The authors of this study are particularly interested in the area of Electric Communication Engineering. There are almost 16 times differences in 2006 between men (132,404) and women (8152) and is almost 10 times difference between men (103,476) and women (9546) in 2016.
The authors of this study believe that gender preference of choosing a study area does not mean that either men or women are good at one particular study area. The authors of this study teach English to university students in Japan and they do not particularly realize a big gap of students' English proficiency by gender differences.

As the data of MEXT (2006 and 2016) showed, this study area showed a big gap between male and female students in Japan. The authors of this study encourage their university students to use online course tools for their English classes because they believe online course tools help students' study more efficiently when they are effectively used. Thus, this study aims to examine, in particular, whether there are some gender trends about the electric communication engineering area. The authors of this study set out two research questions below.

1. Are there still any gender similarities and/or differences about using online course tools among university students?
2. If there are any gender similarities and/or differences, what are they?

In order to find the answers to the research questions, this study firstly uses a questionnaire to see students' insights towards using online course tools for their English classes. Secondly, this study sees the actual use of online course tools by counting numbers of access by students who enrolled in our English classes. The authors of this study strongly encourage students to use online course tools for their English learning. Therefore, counting numbers of actual access by students supports the results of the questionnaire to see whether students' thoughts are reflected on their actual behavior towards using online course tools. The English classes which the authors of this study taught were conducted in the Project Based Learning (PBL) style and students conducted mini research throughout the semester. Both writing a final report and giving two presentations on their mini research were part of their assessments towards their final grade.

Methodology

Data collection

All data for this study was collected by the second author of this study. The total of seven English classes (three of the first year students' classes and four of the second year students' classes) were examined for the data collection. In order to collect the data of this study, the authors of this study used a questionnaire for participants and

also counted the numbers of actual access to the online course tool, Manaba+R (here after MR), by the participants. The questionnaire was carried out in July 2016 by the second author of this study to find how the participants used MR and if there were any gender similarities and/or differences in their usage of MR. Since the authors of this study taught students whose English proficiency was very low to very high, all questions were asked in Japanese to make sure that all participants understood each question clearly.

The authors used an online questionnaire instead of a paper-based one because they often encouraged their students to use PCs in their classes and believed that an online questionnaire attracted students to get involved in this study.

As for the coding the numbers of actual access to MR by the participants, the second author of this study checked actual access by her students and checked all of her English classes for this study. Coding the numbers of actual access to MR by students was carried out after the first semester finished in August, 2016. On the instructor's pages of MR, these pages allowed instructors to be able to see the total access by students, by gender and so forth. For this study, the second author in particular checked MR by gender features.

Participants

For the questionnaire, a total of 161 Japanese university students (both the first and second year) are involved. 101 male students and 60 female students participated. All participants majored in sport and health science in one of the private universities in Kansai region, Japan. All participants in this study were taking their English classes as one of the compulsory subjects for their undergraduate degrees.

Results

The results of the questionnaire

Table 3 below shows the results of Q3 (How often did you bring your PC into your class?), Q4 (How often did you use your PC in class?), Q5 (How often did you use Manaba+R through the semester?), and Q6 (Do you think that online course tools like Manaba+R is useful for your study?).

Table 3

Q3: How often did you bring your PC into your class? 1: Never 2: Hardly 3: Sometimes 4: Almost every time 5: Every time	
Men: 4.69 (on average)	Women: 4.65 (on average)
Q4: How often did you use your PC in class? 1: Never 2: Hardly 3: Sometimes	

4: Almost every time 5: Every time	
Men: 4.62 (on average)	Women: 4.69 (on average)
Q5: How often did you use Manaba+R through the semester? 1: Never 2: Hardly 3: Sometimes 4: Almost every week 5: Every week	
Men: 4.76 (on average)	Women: 4.85 (on average)
Q6: Do you think that online course tools like Manaba+R are useful for your study? 1: Strongly disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Strongly agree	
Men: 4.4 (on average)	Women: 4.52 (on average)

As the table 3 shows, there is no significant gender difference on questions 3 to 6. Both men and women in this study used almost equally their PCs in their classes. Also both men and women in this study almost equally checked MR for their classes. Overall, on these questions, both men and women in this study showed positive and equal attitudes towards using PC and online course tools.

Table 4

Q7: Which pages on Manaba+R do you often check? 1: Project (homework) 2: Content 3: Board 4: Others	
1: Project (homework)	
Men: 95.30 (%)	Women: 92.60 (%)
2: Content	
Men: 34.12 (%)	Women: 59.26 (%)
3: Board	
Men: 17.65 (%)	Women: 16.67 (%)
4: Others	
Men: 1.18 (%)	Women: 1.85 (%)

Table 4 shows the results of Q7 (Which pages on Manaba+R do you often check?). There are no significant gender differences in the results except one answer. Women in this study seemed to be particularly interested in the Content pages on MR to look at. 59.26% of women in this study chose the answer of the Content pages while 34.12% of men in this study chose this answer.

The Content page was used to support both students' writing and presentations. The second author put mainly some tips of English expressions for making a final paper and oral presentation. For instance,

- ✓ Useful English expressions/phrases for an introduction, each body paragraph, and conclusion.
- ✓ How to prepare for giving presentations
- ✓ Useful English expressions for Question and Answer session for presentations
- ✓ Some examples of the final reports
- ✓ How to make references and citations for the final reports

As for the Board page, it was used for communications between teachers and all students in the same class. On this page, students could post questions about class activities or assignments to their teacher. The teacher tried to answer each question posted on this page so that useful class information could be shared with the entire class. For instance,

- ✓ A student asked for how many slide pages they should do for their presentations→ the teacher's answer and the question were shared with other classmates
- ✓ A student asked how to submit homework → the teacher's answer and the question were shared with other classmates
- ✓ A student asked some useful information for making reference lists → the teacher's answer and the question were shared with other classmates

Table 5

Q8: What information on Manaba+R did you find useful for yourself? 1: Guidelines for assignments 2: Tips for writing a paper 3: Useful English expressions 4: Model paper 5: Others	
1: Guidelines for assignments	
Men: 87.06 (%)	Women: 85.19 (%)
2: Tips for writing a paper	
Men: 74.12 (%)	Women: 72.22 (%)
3: Useful English expressions	
Men: 51.76 (%)	Women: 57.41 (%)
4: Model paper	
Men: 63.53 (%)	Women: 57.41 (%)
5: Others	
Men: 0	Women: 0

Table 5 shows the results of Q8 (What information on Manaba+R did you find useful for yourself?). There are no significant gender differences on this question. However, as for the answer 4 (model paper), there is a slight gender difference between men and women. 63.53% of men chose this answer while 57.41% of women chose this answer. However, the gap of this answer between men and women is small.

Table 6

Q9: Where do you usually check Manaba+R? 1: In class 2: At home 3: Outside of their English class on campus 4: On a bus or train 5: Others	
1: In class	
Men: 12.94 (%)	Women: 9.26 (%)
2: At home	
Men: 57.65 (%)	Women: 72.22 (%)
3: Outside of their English class on campus	
Men: 24.71 (%)	Women: 14.81 (%)
4: On a bus or train	
Men: 3.53 (%)	Women: 3.70 (%)
5: Others	
Men: 0	Women 0

Table 6 shows the results of Q9 (Where do you usually check Manaba+R?). The places where the participants checked MR were different by men and women. 57.65% of men answered that they usually checked MR at home while 72.22% of women chose this answer. Moreover, 24.71% of men answered that they normally checked MR outside of class on campus while 14.81% of women did.

Table 7

Q10: Do you think that online course tools like Manaba+R are useful to communicate with your teacher? 1: Strongly disagree 2: Disagree 3: Neither agree nor disagree 4: Agree 5: Strongly agree	
Men: 4.12 (on average)	Women: 4.19 (on average)

Table 7 shows the result of Q10 (Do you think that online course tools like Manaba+R is useful to communicate with your teacher?). There is no significant difference between men and women on this question.

Table 8

The numbers of actual access to Manaba+R		
The numbers of the participants	The numbers of total accesses	Mean
161 (men + women)	148594	922.94
Men: 101	84656	838.18
Women: 60	63938	1065.63

Table 8 shows the actual access to MR by both men and women in this study. It shows that women (M=1065.63) in this study tended to access more than men (M=838.18) did.

Discussions

The results of this study showed both similarities and differences between men and women in this study. Overall, there are mainly three findings which would help us answer our research questions. Firstly, based on the results of the questionnaire, overall, women in this study did not tend to have negative attitudes towards using both their PCs and the online course tool. In this study, both men and women were strongly encouraged to use both PCs and the online course tool within their English classes. In this environment, they rather tended to have positive attitudes towards using PCs and the online course tool as well as men. On the basis of this result, the data by MEXT (2006 and 2016) shown earlier, the data that men were more enrolled in the area of Electronic Communication Engineering than women, does not necessarily support the idea that women are inferior to men in using PCs or online course tools.

Secondly, there were two interesting results of the questionnaire in this study which were the results of both Q7 (Which pages on Manaba+R do you often check?) and Q9 (Where do you usually check Manaba+R?). As for the results of Q7, women in this study particularly were interested in checking the page of Content on MR. This result suggests that one of the traditional gender stereotypes which is "girls for language" still remains. The Content page includes many tips for improving students' writing drafts of their final reports and improving their presentation skills. If the students actively make use of this page and use teachers' tips for their both writing and presentations, the quality of their final reports and presentations will improve. Women in this study tended to show their higher motivation to get better grades than men in this study.

Thirdly, the results of Q9 (Where do you usually check Manaba+R?) are interesting to see. Women in this study preferred to check MR at home while men in this study preferred to do their homework on campus. The results of Q9 in this study are similar to the study by Vekiri and Chronaki (2008). They examined the use of the internet between boys and girls and they found the two important factors which involved the use of the internet for both boys and girls. They found that both parental and peer supports were important for both boys and girls to use the internet. In particular, for boys, friends' support played an important role. More boys tended to use the internet in public places such as internet cafes than girls did. Also they found that more boys tended to talk about computers with their peers than girls did.

Looking back to the results of Q9 in this study, as for men in this study, they showed the similar results to the study by Vekiri and Chronaki (2008). More men in this study checked MR on campus which was considered as one of the public places than women in this study did. Therefore men in this study were also likely to support each other when they checked MR on campus. On campus, it is the best place for students to study together with their peers.

Although it needs further research, as for women in this study, more women checked MR at home. The authors of this study hypothesize that women in this study could have got support from their parents at home. Vekiri and Chronaki (2008) explained that parental support for the use of the internet was the important factor for boys and girls. More women than men in this study showed that they tended to do their homework at home. They could have more family support by doing homework at home as Vekiri and Chronaki (2008) explained.

As for the results of the actual access to MR, it is also an interesting result to discuss. Women in this study accessed MR more than men in this study. Weiser (2000) found that women tended to use the internet for course information and seeking for help with education while men tended to use it for shopping and listening to audio broadcasts. The results of this study showed similar results to Weiser's study (2000). The online course tool, MR, was used within English classes in this study and women in this study accessed MR more than men did. It suggests that women in this study tended to show their higher motivation to get better scores for the English subject.

Implications

The authors of this study believe the importance of teachers' effort to break the traditional gender stereotype and to encourage women to be involved in science field programs at university level. For instance, Gilbert (1996) found the influence of teachers on students' selections of what subjects they tended to take. The participants of Gilbert's study mentioned that because they liked their teachers who taught the subjects, they took the subject taught by their favorite teacher. Gilbert (1996) suggests that teachers can increase the number of students who choose not only science or math subjects but also language or social study subjects. Teachers' influence seems an important factor for students to choose what subjects they take. One thing which the authors of this study concern is that Gilbert's study was carried among school boys and girls. Thus, the authors of this study wonder to what extent Gilbert's point could apply to university students. University students are of course more mature than school boys and girls and to what extent Gilbert's point is applied to university students remains unsure. It will be the future study. However, the authors of this study agree to the point given by Gilbert. They believe that teachers' effort can contribute to breaking the gender myth: men for science fields while women for humanities.

Conclusion

The results of this study showed both similarities and differences between men and women. Looking back to the research questions of this study, this study raised two research questions earlier. The first research question was if there were any gender similarities and differences about using online course tools among university students. The second research question was if there were any gender similarities and/or differences, what they were.

As for the first research question, the results of this study showed both similarities and/or differences between men and women in this study. Overall, the questionnaire results showed that both men and women showed no significant gender difference about using their PC and the online course tool, MR, except the results of Q7 and Q9.

The results of the actual access of MR showed the gender difference that women in this study accessed more than men in this study did.

As for the second research question, the results of both Q7 and Q9 on the questionnaires provide the answers. On the results of both Q7 and Q9, some gender differences were observed. On the results of Q7, women in this study checked the Content page on MR, in particular. As for the results of Q9, women in this study tended to access MR at home while men in this study tended to access MR on campus.

Overall, this study showed that one of the traditional gender stereotypes, boys for science field and girls for humanities, seemed to be changing. This study was limited to examining participants who were majoring in sport and health science and thus, it needs to examine the other participants who are majoring in the other studies as a future study.

4613 words (excludes tables: 407 words)

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Appendix

All questions for the questionnaire

Q1: What is your gender?

Q2: What grade are you in?

Q3: How often did you bring your PC into your class?
1: Never, 2: Hardly, 3: Sometimes, 4: Almost every time, 5: Every time

Q4: How often did you use your PC in class?
1: Never, 2: Hardly, 3: Sometimes, 4: Almost every time, 5: Every time

Q5: How often did you use Manaba+R through the semester?
1: Never, 2: Hardly, 3: Sometimes, 4: Almost every week, 5: Every week

Q6: Do you think that online course tools like Manaba+R are useful for your study?
1: Strongly disagree, 2: Disagree, 3: Neither agree nor disagree, 4: Agree, 5: Strongly agree

Q7: Which pages on Manaba+R do you often check?
1: Project (homework), 2: Content, 3: Board, 4: Others

Q8: What information on Manaba+R did you find useful for yourself?
1: Guidelines for assignments, 2: Tips for writing a paper, 3: Useful English expressions, 4: Model paper, 5: Others

Q9: Where do you usually check Manaba+R?
1: In class, 2: At home, 3: Outside of their English class on campus, 4: On a bus or train, 5: Others

Q10: Do you think that online course tools like Manaba+R are useful to communicate with your teacher?
1: Strongly disagree, 2: Disagree, 3: Neither agree nor disagree, 4: Agree, 5: Strongly agree