Teachers' Gender Stereotypes in Japan: A Latent Class Analysis of Teachers' Gender Role Attitudes

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Teachers with gender stereotypes are particularly likely to engage in gender-biased teaching practices and to transmit biased gender norms to students. Examining teachers' gender stereotypes is important for understanding gender transmission in schools and gender inequality in educational attainments. Using data from a questionnaire survey of junior high school teachers in the Kansai area of Japan, this study empirically examines teachers' gender stereotypes, focusing on their gender role attitudes.

Using latent class analysis to examine teachers' gender role attitudes, the results identify three patterns (gender equality supporters, care-gender role supporters, and gender role supporters) in teachers' gender role attitudes. The distinctive pattern is the care-gender role supporters, a group that rejects some traditional gender roles but is more likely to hold the gender stereotype that women are better suited for housework and childcare; this group is considered "potential" gender stereotypes. Furthermore, using a latent class multinomial-logit model, we test three hypotheses regarding gender, age, and teachers' subject. The results show that the hypotheses are partially supported and that teachers' gender role attitudes are influenced by the basic factors mentioned above, including the interaction effect. Based on these findings, we discuss the structure of teachers' gender role attitudes and suggest the importance of focusing on teachers with potential gender stereotypes.

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Introduction

Japan is known as a developed country with high gender inequality (World Economic Forum Gender Gap Index 116th out of 146 countries in 2022). Women in Japan are often disadvantaged in many areas, including economic activity, political participation, and educational attainment. Although Japanese girls perform well on international achievement tests, they are more likely to experience a variety of constraints and disadvantages in their educational attainment, including access to highly selective universities and graduate schools and entry into STEM fields (Kimura 2022, etc.).

The role of school education in addressing gender inequality remains important (Buchmann et al. 2008, etc.). In Japan, this issue has been studied mainly by the sociology of education, with regard to the "hidden curriculum" in schools and its effects on male and female students (Kimura 1999). Although schools preach the importance of gender equality, students learn social expectations as women and men through the messages that teachers unconsciously convey (Miyazaki 1991, etc.). Teachers play an important role in the process of generating gender inequality through schools (Kimura 2014).

In particular, teachers' gender stereotypes are an important factor in shaping students' gender attitudes, academic performance, and career paths (Alan et al., 2018, Carlana 2019). Teachers also vary in their attitudes and opinions about gender (Teramachi 2021), and some teachers hold implicit gender stereotypes (Carlana 2019).

At the beginning of this paper, we mentioned that Japan is a country with a large gender gap, but a look at the social consciousness of the Japanese people shows that schools are perceived as a place where gender equality is more advanced than in the political arena or the workplace (Cabinet Office of Japan 2023). What kind of sexism remains in school education, where gender equality is often considered to have been achieved? Using statistical analysis, this study focuses on teachers' gender role attitudes and examines the current state of gender stereotypes among teachers and their determinants.

1. Literature review

1.1. Teachers' gender stereotypes

Gender stereotypes are expectations that ascribe certain attributes, characteristics, and roles to people based on their gender; more specifically, they involve ascribing traditional gender expectations associated with assigned sex at birth (Brussino & McBrien 2022)[1]. Research on teachers' gender stereotypes includes gender role attitudes, gender stereotypes about students, and opinions about gender equality (Alan et al. 2018, Gråstén et al. 2022)[2]. In Japan, regarding teachers' gender role attitudes, Iijima (2021) found that about 50% of teachers supported statements such as "women are better suited for housework and childcare," while about 26% supported "men are better suited for management positions than women," indicating that there are differences in which aspects of gender roles they support. Teachers also tend to be more in favor of gender essentialism (e.g., "abilities and aptitudes different between men and women") than of the gender role attitude statements (Horiuchi 2001, Naoi & Muramatsu eds. 2009).

Furthermore, these gender stereotypes lead to differences in teachers' classroom teaching

practices and evaluations, which in turn affect students' motivation to learn, academic achievement, and career paths (Alan et al. 2018, Carlana 2019). In Japan, teachers' gender stereotyping has also been found to decrease female students' motivation to learn (Morinaga et al. 2017).

A variety of factors have been identified as influencing teachers' gender stereotypes, including teachers' gender and age (Horiuchi 2001, Iijima 2021), teaching career (Hofer 2015), partner's employment status (Naoi & Muramatsu eds. 2009), educational background and teaching style (Alan et al. 2018), and region of origin (Carlana 2019). In Japan, empirical studies are limited, especially those that control for multiple factors, and detailed verification of which factors have a single effect is needed. In other countries, empirical studies have accumulated in recent years, but the results vary by country, sample, and analytical model, making it difficult to find consistent trends. For example, regarding gender effects, some studies suggest that male teachers are more gender stereotypical than female teachers (Gråstén et al. 2022), while others show the opposite (Hofer 2015).

1.2. Research questions and hypotheses

This study empirically examines teachers' gender stereotypes by using teachers' gender role attitudes (hereinafter referred to as GRAs) as an outcome of analysis. GRAs are used because they are a basic indicator for understanding gender stereotypes and allows comparison with other occupations where research on GRA has accumulated. The following two research questions are set for the analysis.

RQ1 What is the pattern of GRAs among teachers?

In previous studies, GRAs have been measured by addressing individual items or combining them into a single scale, leaving it unclear what percentage of teachers are traditional gender role (hereinafter referred to as GR) supporters or non-supporters. However, regarding the association between GR items, although a certain degree of correlation is found (Naoi & Muramatsu eds. 2009), the percentage of support for each GR item is different (Iijima 2021). Therefore, patterns of attitudes such as "support for some GRs but not for others" have not been considered. In Japanese schools, while gender equality is proclaimed, it has been noted that gender equality practices in schools are weak (Kimura 2014). Thus, it is important to capture potential biases, such as opposition to traditional GRs but support for GRs latent in everyday life, such as care roles.

Thus, this paper uses latent class analysis to examine the state of teachers' GRAs by examining patterns of support and opposition across GR items. In particular, it focuses on identifying the group of teachers who have inconsistent opinions about GRs, the characteristics of their attitudes, and the percentage of teachers who belong to this group.

RQ2 What factors influence teachers' GRAs?

Japanese studies have not clarified which factors have a single effect on GRAs. Previous studies have identified some factors, including gender and age, but often did not control for multiple factors, so it is necessary to test whether they have a single effect. Based on previous research, we formulated three hypotheses.

Hypothesis 1: Male teachers are more likely to support GRs than female teachers.

Although Japanese studies on gender have reported that male teachers are more conservative (Naoi & Muramatsu eds. 2009), recent empirical studies in other countries have found no effect (Alan et al. 2018) or no consistent trend (Hofer 2015, Gråstén et al. 2022). We ex-

amine whether the effect of gender is confirmed after controlling for multiple factors.

Hypothesis 2. Both male and female teachers are more likely to become less supportive of GRs as they age.

Although it has been reported that veteran teachers tend to be more liberal with age (Iijima 2021), given that male and female teachers differ in their career development (Yamazaki 2012), it is possible that changes in GRAs with age also differ by gender. Indeed, it has been reported that changes in gender bias with years of teaching experience differ between male and female teachers (Hofer 2015). This paper will examine these effects by examining the interaction effects of gender and age.

Hypothesis 3: Teachers who teach health and physical education and STEM subjects are more likely to support GRs.

Considering the effects on children's learning and career choices, it is also necessary to focus on the effects of teachers' subject areas, but these effects have not been particularly well tested. In this paper, we focus on physical education subjects (Itani 2005, Gråstén et al. 2022) and STEM subjects (Hofer 2015, Carlana 2019). In Japan, a masculine culture has been observed in physical education subjects (Itani 2005), which may have more conservative attitudes compared to other subjects; for STEM subjects, the problem is that very few female students enter STEM fields in Japan, despite the high level of academic achievement in the country. Teachers of STEM subjects may have more conservative attitudes as a contributing factor. The analysis will also consider interaction effects with gender and teacher subject.

2. Method

2.1. Data

To answer the research questions empirically, this study utilizes the data from a questionnaire survey targeting junior high school teachers in Japan. This survey was administered to public junior high school teachers in seven Kansai-area municipalities (Osaka, Hyogo, and Kyoto Prefectures including designated cities), in December 2018 and January 2019. The survey was conducted using a self-administered questionnaire. Through two sampling procedures, target schools were randomly selected from a list of schools in each municipality, and questionnaires were distributed[3]. The total number of valid responses was 934, with a valid response rate of 25.9% and 870 cases with no missing values in any of the variables used in the analysis.

It should be noted that the data in this analysis are based on the group of classroom teachers employed as regular faculty members. In order to examine the attitudes of the entire group of teachers, it is necessary to include a wider range of subjects, such as principals and non-regular faculty members, but due to the limitations imposed by the postal survey. Therefore, when compared to the population, the data include a slightly larger number of males and chief teachers (the age and union membership rates are approximately the same as those of the population[4]).

2.2. Variables

Based on the teachers' responses to the survey, the following outcome and explanatory variables were created.

Outcome Variables

Gender Role Attitudes (GRAs). This variable consists of three items: "Men should work outside the home and women should look after the home," "Men play a central role and women assist them," and "Women are better suited for housework and childcare than men." The items refer to those used in general social surveys in Japan (e.g. Kikkawa 2014). Teachers were asked to indicate their responses (*disagree, somewhat disagree, somewhat agree, agree*). A response that supports these items implies having a conservative GRA.

The frequencies of the variables are shown in Table 1. For item c, there is a clear split between "agree" and "disagree." Elsewhere, most of the responses to items a and b are negative, but there is a clear split between "disagree" and "somewhat agree," indicating a strong or weak oppositional attitude. Given the small percentage of respondents who agree, for the purpose of examining the degree of attitude, it is used for analysis divided into three categories (agree + somewhat agree; somewhat disagree; disagree).

Table 1 Frequencies for outcome variables (%) (N=870)

Gender Role Attitude	Agree	Somewhat agree	Somewhat disagree	Disagree
a) "Men should work outside the home and women should look after the home."	0.5	7.1	29.9	62.5
b) "Men play a central role and women assist them."	0.2	3.3	26.9	69.5
c) "Women are better suited for housework and childcare than men."	7.4	30.5	24.4	37.8

Explanatory Variables

The details of the explanatory variables are as follows, and the frequencies and descriptive statistics are shown in Table 2. Note that all continuous variables were standardized (mean = 0, standard deviation = 1) to help in interpreting the results (except age for the following reasons).

Female. Female teachers are coded as 1 and their male counterparts as 0.

Age. This continuous variable indicates the ages of the teachers. A set of variables was created for the number of years of teaching experience, but this is very highly correlated with age. When interpreting the effect of age, it is necessary to consider the effect of era and cohort, but the results of the analysis are interpreted in light of previous studies. To interpret the interaction effects, the mean subtracted values are used in the analysis (age mean; -39.9).

Chief. This dummy variable indicates teachers who hold the position of chief in the workplace. Chief teachers are coded as 1 and others as 0.

Teachers' union. This dummy variable indicates members of the teachers' union. Teachers who are members of the teachers' union are coded as 1 and others as 0.

Health and physical education subject. This variable indicates that teacher's subject. Teachers who teach health and physical education were coded as 1 and others as 0.

Science and mathematics subjects. This variable also indicates that teacher's subject. Teachers who teach science or mathematics were coded as 1 and others as 0.

Authoritarian attitudes. This variable is the first principal component score generated by a principal component analysis of the four items asking about authoritarian attitudes (Kikkawa 2014). Teachers were asked for their opinions on items such as "One must always pay respect to those in authority" and "Those who question the way things are done according to

tradition and custom will eventually cause problems." Higher scores indicate more authoritarian attitudes.

Table 2. Frequencies and descriptive statistics for explanatory variables (N=870)

	%		Min	Max	Mean	SD	Skewness	Kutosis
Female (1)	32.8	Age (centered)	-17.88	17.12	0.00	10.56	0.26	-1.15
Chief (1)	49.9	Authoritarian attitudes	-2.40	3.92	0.00	1.00	-0.19	-0.05
Teachers' union member (1)	40.9							
Health and physical education subjects (1)	13.3							
Science and mathematics subjects (1)	32.5							

Each variable is treated as a binary dummy variable. The base category (others) is set to 0.

2.3. Analysis

After descriptive statics were generated, a latent class analysis (LCA) was conducted. LCA is a latent variable model in which both the latent variable and its indicators are categorical, as a person-oriented approach that estimates subtypes of individuals who exhibit similar patterns of individual characteristics (Collins & Lanza 2010). Latent class analysis assumes that a latent variable (class) explains the association between observed variables, and enables the extraction of response patterns that are highly applicable to multiple question items. Therefore, it is also used to examine the structure of attitudes and value consciousness (e.g., Yamaguchi 2000).

Using Mplus version 8.1 (Muthén & Muthén 1998-2017), this study first examines the status of GRAs among teachers, analyzing their response patterns. Then, using a latent class multinomial-logit model with the estimated latent class as the outcome variable, the study examines which factors among the explanatory variables influence the affiliation to each latent class[5].

3. Results
3.1. Latent class analysis: Examining the pattern of GRAs among teachers

In LCA, a fitted model is selected by first increasing the number of classes assumed. Table 3 shows the summary of information for selecting the number of latent classes. The model selection is judged comprehensively by referring to tests based on the likelihood-ratio statics (G^2) (called absolute model fit), the likelihood-ratio difference test, comparison of information criteria (called relative model fit), and the results of response probabilities for each model (Collins & Lanza 2010, Geiser 2012).

First, the result of the likelihood-ratio statics(G^2) test is not significant for the three-class of model. The results indicate that the three-class of model fits the observations. Next, to check the relative model fit, the likelihood-ratio difference test is conducted using the bootstrap likelihood-ratio difference test (Geiser 2012). This test increases the number of classes and examines whether the model can be improved. The results of the bootstrap tests show that the model improves significantly up to the three-class model. In addition, the comparison with the information criteria (AIC and BIC), shows that the three-class model is the best model with the lowest values. Based on the above results, the three-class model is adopted in the study.

Table 4 shows the details of the estimated three-latent-class model. The latent class

prevalences represent the estimated probability of membership to each class, and the conditional probability indicates the probability that an individual in that class responds to each item. The characteristics of each class can be interpreted as follows. Class 1 is the largest size class, with approximately 61.4% belonging to this class. Teachers who are assigned to Class 1 are fairly likely to respond "disagree" for each item. Responses to item c are also generally negative. Obviously, Class 1 represents the group of teachers who reject traditional gender roles, so it can be labeled "Gender equality supporters."

Teachers in Class 2 show a different pattern of conditional response probabilities. They disagree with items a and b, but have high probabilities for the "somewhat disagree" category, and do not reject gender roles as strongly as in Class 1. For item c, the probabilities for "agree + somewhat agree" are also high relative to the average. Teachers in Class 2 can therefore be labeled as the group that disagrees with some gender roles, but supports caring gender roles such as housework and childcare. Thus, this group is referred to as the "Care-GR supporters." It is important to note that this class has a negative but not strongly negative attitude toward traditional GRs such as items a and b, as well as a somewhat ambiguous attitude toward item c that does not swing toward support. It is also noteworthy that the composition of this class is quite large, estimated at 30.9%.

The smallest class is Class 3, approximately 7.7%, which is characterized by the support for traditional gender roles. This class shows high responses of "agree + somewhat agree" for items a and c. Although the tendency to support item b is slightly lower, overall they

Table 3. Summary of information for selecting number of latent classes (N= 870)

N. of classes	Model fit						BLRT		
	G^2	d.f.	p-value	Entropy	AIC	BIC	$\triangle G^2$	$\triangle$d.f.	p-value
1	836.5	20	.000	-	4630.6	4659.2	-	-	-
2	70.6	13	.000	.888	3878.7	3940.6	765.9	7	.000
3	8.1	6	.228	.856	3830.2	3925.6	62.5	7	.000

$\triangle$ represents the difference from the N-1 model.

Table 4. Three-Latent-Class model of teachers' GRAs (N=870)

		Class 1	Class 2	Class 3	average
Latent class prevalences / Probability of membership		61.4%	30.9%	7.7%	
a) Men should work outside the home and women should look after the home.	agree + somewhat agree	.002	.071	**.683**	.076
	somewhat disagree	.029	**.850**	.239	.299
	disagree	**.969**	.079	.078	.626
b) Men play a central role and women assist them.	agree + somewhat agree	.000	.005	.439	.036
	somewhat disagree	.011	**.753**	.386	.268
	disagree	**.989**	.242	.175	.697
c) Women are better suited for housework and childcare than men.	agree + somewhat agree	.218	**.551**	**.958**	.377
	somewhat disagree	.193	.396	.042	.243
	disagree	**.589**	.053	.000	.380
Assigned label		Gender equality supporters	Care-GR supporters	GR supporters	

Values in the table represent conditional probability (except average). Item-response probabilities > .5 in bold to facilitate interpretation.

have a very supportive attitude towards GRs. Thus, Class 3 is labeled as "GR supporters."

3.2. Three-Class Latent-class Multinomial-Logit model: Explaining teachers' GRAs

Table 5 shows the results of the coefficients of the latent-class multinomial-logit model with the three-class model as the outcome variable [6]. Explanatory variables are added to the model to analyze factors that affect class affiliation in order to test the hypotheses.

The results on the left side of the table show the results of the factors influencing class assignment when Class 1 "Gender equality supporters" is used as the base category. First, the results for Class 2 "Care-GR supporters" show that male teachers and those with more authoritarian attitudes are more likely to be care-GR supporters than gender equality supporters. In addition, the interaction effect is also significant. In the case of female teachers, the effect of age is significant: as age increases, they are more likely to be gender equality supporters compared to care-GR supporters. For male teachers, however, there is no effect of age. Moreover, male STEM teachers are more likely to be gender equality supporters compared to other subjects. For female teachers, however, there is no significant effect of science and math subjects.

Next, the results for Class 3 "GR supporters" (vs gender equality supporters) show a similar trend to those for care-GR supporters. Male teachers and those with strong authoritarian attitudes are more likely to be GR supporters. The interaction between age and gender is also significant. On the other hand, there is no significant effect for science and mathematics subjects.

Finally, we examine the differences between care-GR supporters and GR supporters from the results on the right side of Table 5 (the base category is care-GR supporters). Compared to the result above, there are no significant effects, and the difference between the two is not

Table 5. Estimated coefficients of the multinomial logit model with three-latent classes (N=870)

| | Base = Gender equality supporters (Class 1) | | | | Base = Care-GR supporters (Class 2) | |
| | Care-GR supporters (Class 2) | | GR supporters (Class 3) | | GR supporters (Class 3) | |
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Intercept	-.305	.204	-1.643 ***	.390	-1.338 **	.427
Female	-.826 **	.249	-1.313 *	.652	-.486	.710
Age	.021	.011	.018	.024	-.002	.027
Chief	-.210	.201	-.329	.508	-.119	.562
Teachers' union	.032	.178	-.137	.342	-.169	.378
Health & physical subjects	.284	.311	.890	.475	.606	.517
Science & mathematics subjects	-.439	.225	-.357	.420	.082	.462
Authoritarian Attitudes	.651 **	.093	.759 **	.286	.108	.305
Female × Age	-.038 *	.017	-.087 *	.043	-.049	.046
Female × Health & physical subjects	.010	.593	-1.467	1.362	-1.477	1.473
Female × Science & mathematics subjects	.961 *	.461	.393	1.235	-.568	1.320
-2Log-likelihood = 3790.2						

* $p < .05$, ** $p < .01$, *** $p < .001$, S.E. = standard error.

clear. In other words, the difference between care-GR supporters and GR supporters cannot be explained by these explanatory variables. This result suggests that care-GR supporters and GR supporters are more closely related than gender equality supporters. Care-GR supporters appear to be more closely related to gender equality supporters because they do not support some GRs, but the underlying characteristics indicate that they are more closely related to GR supporters.

4. Summary and Discussion

The empirical results of this study reveal, first, that teachers' GRAs can be classified into three types: gender equality supporters (61.4%), care-GR supporters (30.9%), and GR supporters (7.7%). The three GR items show some degree of correlation. In particular, gender equality supporters and GR supporters have consistent attitudes toward each GR. Care-GR supporters, on the other hand, have inconsistent attitudes, opposing some traditional GRs but supporting the care GR. In this analysis, 30.9% of the respondents were care-GR supporters, indicating the persistence of latent sexism in teachers. Care-GR supporters may appear to be gender equality supporters because they do not support the obvious and traditional GRs. However, they are open to women taking on the care role. Teachers with these "invisible" GRAs may not be proactive in implementing gender equality practices in schools or may unconsciously base their educational practices on gender bias.

The results suggest that GRs on care roles are important for the analysis of teachers' gender stereotypes. Similar to the reality of Japanese society, female teachers currently bear more of the burden of housework and childcare than male teachers (Iijima 2021). According to Takashima (2014), the tasks assigned to female teachers are likely to be associated with inferior positions compared to male teachers. This is a "consideration" for the fact that female teachers have a caretaking role at home, and there is also a culture that takes this status quo for granted. This point is consistent with the findings of this study, which show that there is a consistency between gender inequality in the care role responsibilities in the workplace and teachers' GRA.

In order to advance gender equality practices in schools, more attention should be paid to "potential" gender stereotypes, such as those of care-GR supporters. While some international studies have examined teachers' gender stereotypes by distinguishing between explicit and implicit aspects (Carlana 2019), future research should more closely examine the characteristics of teachers with potential gender stereotypes[7].

Second, this study highlights some factors that influence teachers' GRAs. The analysis reveals differences between gender equality supporters and care-GR supporters/GR supporters. Male teachers and teachers with strong authoritarian attitudes are more likely to be care-GR supporters or GR supporters compared to gender equality supporters. In addition, female teachers are more likely to become gender equality supporters as they age, while male teachers show no significant change in GRAs. Regarding the effect of teachers' subjects, female STEM teachers are more likely to be care-GR supporters compared to gender equality supporters. Based on these results, we discuss our hypotheses.

The results support Hypothesis 1. While recent empirical studies in other countries have found no consistent trend in gender effects (e.g., Hofer 2015, Gråstén et al. 2022), differences

in GRAs by gender are clear in Japan. Gender effects were found even when controlling for the more influential variable of authoritarian attitudes. Even in general surveys in Japan, men tend to be more gender conservative and women more liberal (Sasaki 2012). Even among professional teachers, we find that gender differences in attitudes toward GR are not small.

In addition, the effect of age on GRAs differs by gender. Thus, Hypothesis 2 is partially supported. Based on German data, Hofer (2015) reports that female teachers show gender bias at the beginning of their teaching career, which decreases with more years of teaching, while male teachers consistently show less gender bias. Hofer's study is not consistent with the findings of this study, but may reflect cultural and institutional differences between countries. Gender differences in the careers of Japanese teachers may explain this result. As female teachers get older, they are more likely to face conflicts about care roles and professions, and opportunities to become aware of the importance of gender equality increase. Male teachers, on the other hand, are often relegated to leadership roles in the workplace rather than care roles as they age (Yamazaki 2012). As they devote more time to their work, they are more likely to become fixed rather than to rethink GRs. It is possible that these career differences between male and female teachers in care roles are reflected in the differences in age effects.

Hypothesis 3 is partially supported by the significant results in STEM subjects. A gender interaction effect was found, with female STEM teachers more likely to be care-GR supporters compared to gender equality supporters; gender bias among STEM teachers varies by gender and the results are not consistent across countries (Hofer 2015). It is also questionable why there is no significant effect between GR supporters and gender equality supporters, despite their more differing attitudes. Possible explanations for the effect of subject on GRAs include the process influence of teacher training (Sakuma et al. 2004) and the subculture of the subject (Itani 2005). The impact of gender bias within a subject on children's educational outcomes and career choices is not small (Carlana 2019). More detailed research is needed in the future.

The above results represent differences between gender equality supporters and care-GR supporters/GR supporters. On the other hand, differences between care-GR supporters and GR supporters were not clearly found in this analysis. Although the model in this study uses basic variables, it does not explain the differences between care-GR supporters and GR supporters. In other words, the backgrounds of the two groups may be similar. Further studies using a different analytical model are needed in the future.

The present study focused on teachers' GRAs and examined the structure of teachers' gender stereotypes; since the GRA patterns were limited by the number of GR items, reexamination by including more GR items is called for. More items may reveal more elaborate potential gender stereotyping characteristics. In addition, because this study focused on basic factors, examination with other factors is needed. For example, there is a gender-conservative "hidden curriculum" in teacher education in Japan that has been found to influence prospective teachers (Sakuma et al. 2004). Teachers' GRAs may be influenced not only by teacher education, but also by in-service training, their own school experiences, and their family environment (Teramachi 2021). Future analytical models will need to include multiple factors, not just the basic ones.

Notes

1 A concept closely related to gender stereotypes is gender bias. Since previous research often does not clearly distinguish between the two, we will also cover gender bias, which is analogous to the definition of stereotypes.

2 Due to space limitations, only notable studies are cited in this article.

3 Six copies of the questionnaire were distributed to each school. In order to allow for a wide age range of respondents and to eliminate distributor bias, the survey was assigned to class 1 home-room teacher of each grade and the head of each grade.

4 For basic population data, we referred to "Basic School Survey (2018) *Gakko Kihon Chosa*" for gender and head teachers, "Teachers' Statistical Survey (2016) *Kyoin Tokei Chosa*" for age, and "Monthly Report of the Board of Education (2018) Kyoiku Iinkai Geppo" for the union membership rate, as data that can be confirmed for each prefecture and were recorded close to the survey year.

5 Regarding indicator variables in LCA, according to Weller et al. (2020), there is currently no agreement on the number of indicator variables that should be included in the model. Many studies use 4 or more indicator variables (Weller et al. 2020), and under conditions where model estimation is prone to instability, such as small sample sizes, it is recommended to use more indicator variables as one way to improve the model (Wurpts & Geiser 2014). Since there were no problems in estimating the model in this study and the goodness of fit criteria was met, an analysis of the model with three indicator variables was conducted.

6 The latent class multinomial-logit model is estimated using the three-step method (Asparouhov & Muthén 2014). Therefore, the probability of class membership and the conditional probabilities in table 5 are consistent with the results in Table 4.

7 The percentage of female teachers in Japan's lower secondary education is 42.2% (OECD average 68.3%); among school principals, only 7.0% (OECD average 47.3%) are female teachers, with a predominantly male composition (OECD 2019). This gender composition may be reflected in the characteristics of the GRAs and the percentage of class composition. In the case of primary education, 61.4% of teachers are female and 23.1% of principals are female, reflecting variation by educational organization level in Japan, so it would be necessary to examine GRAs by educational organization level as well.

References

Alan, S., Ertac, S., & Mumcu, I. (2018). Gender stereotypes in the classroom and effects on achievement. *Review of Economics and Statistics*, 100(5), 876-890.

Asparouhov, T. & Muthén, B., (2014). Auxiliary variables in mixture modeling, *A Multidisciplinary Journal*, 21, pp.329-341.

Brussino, O. & J. McBrien (2022). "Gender stereotypes in education: Policies and practices to address gender stereotyping across OECD education systems", *OECD Education Working Papers*, No. 271, OECD Publishing, Paris, (Retrieved February 11, 2024, https://doi.org/10.1787/a46ae056-en).

Buchmann, C., DiPrete, T. A., & McDaniel, A. (2008). Gender inequalities in education. *Annual Review of Sociology*, 34, 319-337.

Cabinet Office of Japan. (2023). Danjyo kyōdō sankaku ni kansuru yoron chōsa hokoku sho (Reports of public opinion survey concerning gender equality in Japan) (Japanese) (Retrieved February 11, 2024, https://survey.gov-online.go.jp/r04/r04-danjo/gairyaku.pdf).

Collins, L. M., & Lanza, S. T. (2010). *Latent class and latent transition analysis*. John Wiley & Sons.

Carlana, M. (2019). Implicit stereotypes: Evidence from teachers' gender bias. *The Quarterly Journal of Economics*, 134(3), 1163-1224.

Geiser, C. (2012). *Data analysis with Mplus*. Guilford Press.

Gråstén, A., Kokkonen, J., & Kokkonen, M. (2022). Gender bias and gender equality beliefs in teaching efficacy profiles of Finnish physical education teachers. *Teachers and Teaching*, 28(2), 246-262.

Hofer, S. I. (2015). Studying gender bias in physics grading. *International Journal of Science Education*, 37(17), 2879-2905.

Horiuchi, K. (2001). *Kyōka to kyōshi no gender bunka (Gender Culture in Subjects and Teachers)*. (Tokyo, Domesu Shuppan) (Japanese).

Iijima, E. (2021). Gakko kyōin no danjo sabetsu to gender-kan (Gender gaps and the attitudes of school teachers). *Journal of JSEE,* 69(4), 14-19 (Japanese).

Itani K. (2005). Taiku kyoshi no danjo fukinko wo umidasu gender culture (Gender Culture Creates a Disproportionate Number of Men and Women Physical Education Teachers), *The Japanese Journal of Educational Research*, Vol. 72, (1), 27-40 (Japanese).

Kikkawa, T. (2014). Gendai Nihon no "shakai no kokoro" (*Sociological social psychology in contemporary Japan*), (Tokyo, Yuhikaku) (Japanese).

Kimura I. (2014). *Gakkō shakai no naka no gender (Gender within the school society)* (Tokyo: Gakugei University Press) (Japanese).

Kimura, R. (1999). *Gakkō bunka to Gender (Gender and School Culture)* (Tokyo, Keiso Shobo) (Japanese).

Kimura, R. (2022). Nihon kyōiku ni okeru gender byōdō no kako genzai mirai (The Past, Present, and Future of Gender Equality in Japanese Education). *Trends in the sciences*, 27(10), 68-75 (Japanese).

Miyazaki, A. (1991). Gakkō ni okeru 'sei yakuwari no shakai-ka' saikō (Reconsideration of "Gender Role Socialization"). *The Journal of educational sociology,* 48,105-123 (Japanese).

Morinaga, Y., Sakata, K., Furukawa, Y., & Fukudome, K., (2017). 'Joshi chu-kōsei no sugaku ni taisuru ishiki to stereotype' (Mathematics motivation and gender stereotypes of junior and senior high school girls). *The Japanese Journal of Educational Psychology*, 65(3), 375-387 (Japanese).

Muthén, L.K. & Muthén, B.O. (1998-2017). *Mplus User's Guide*. Muthén & Muthén.

Naoi, M., & Muramatsu, Y. eds. (2009). *Gakkō kyōiku no naka no gender (Gender within school culture)*, (Tokyo, Nihon Hyōronsha) (Japanese).

OECD (2019), *TALIS 2018 Results (Volume I)*, OECD Publishing, Paris (Retrieved February 11, 2024, https://doi.org/10.1787/1d0bc92a-en).

Sakuma, A., Kimura, I., Fukumoto, M. & Otake, M. (2004). Kyōin yosei no hidden curriculum kenkyū (The Hidden Curriculum in Teacher Traning), *Annual Bulletin of the Japanese Society for the Study on Teacher Education*, 13, 94-104. (Japanese).

Sasaki, T. (2012). JGSS ruiseki data 2000-2010 ni miru Nihon jin no seibetsu yakuwari bungyō ishiki no susei. (The Transformation of Japanese Gender Role Attitudes based on JGSS Cumulative Data 2000-2010), *JGSS Research Series*, (12), 69-80. (Japanese).

Takashima, H. (2014). Kyōin no shokuba ni okeru gender bias ("Gender Bias" at Teachers' Work Places), *Contemporary sociological studies*, 27, 37-54. (Japanese).

Teramachi, S. (2021). *"Kyōshi no jinsei" to mukiau gender kyōiku jissen (Gender Education Practice in Confronting Teachers' Lives)* (Kyoto, Koyo Shobo). (Japanese).

Weller, B. E., Bowen, N. K., & Faubert, S. J. (2020). Latent class analysis: a guide to best practice. *Journal of Black Psychology*, 46(4), 287-311.

Wurpts, I. C., & Geiser, C. (2014). Is adding more indicators to a latent class analysis beneficial or detrimental? Results of a Monte-Carlo study. *Frontiers in psychology*, 5, 920.

Yamaguchi, K. (2000). Multinomial logit latent-class regression models. *American Journal of Sociology*, 105(6), 1702-1740.

Yamazaki, J. (2012). *Kyōshi no hattatsu to rikiryō keisei (Teacher development and competency formation)* (Tokyo, Soufusha). (Japanese).