

## Appendix A

### Example Mplus Codes for Data Generation

#### 1. Population Model with A Zero Covariate Effect on Latent Class

##### a) MI Conditions

Montecarlo:

```
Names are y1-y6 x;  
Genclasses = c(2);  
Nobs = 500;  
Seed = 1234;  
Nrep = 200;  
Repsave = all;  
Save = C:\PM1\data\rep*.dat;
```

Model population:

```
%overall%  
F by y1*.7 y2*.5 y3*.8 y4*.7 y5*.7 y6*.6;  
[f*0];  
f*1; !factor residual variance so the total factor variance is 1;  
[x*0];  
x*1;  
c#1 on x*0; !the zero covariate effect on latent class;  
y1*.52 y2*.75 y3*.36 y4*.51 y5*.51 y6*.64; !item residual variances so the total item variances  
were 1;  
[y1-y6*0];  
[c#1*0]; !balanced proportions (50%-50%); !change 0 to -.85 for unbalanced proportions (30%-  
70%);  
%c#2%
```

[f\*.5];

b) Intercept DIF Conditions

Most of the codes are the same as those for the MI conditions, and only the code that differs is presented below.

%c#2%

[f\*.5];

[y2\*.4]; *!only one DIF item; !add [y4\*.4] for two DIF items; !change .4 to .8 or 1.2 to manipulate DIF size;*

c) Loading DIF Conditions

Most of the codes are the same as those for the MI conditions, and only the code that differs is presented below.

%c#2%

[f\*.5];

f by y3\*.6; *!only one DIF item and small DIF size; !for two DIF items with large DIF size, change this line to y3\*.4 y4\*.3;*

y3\*.64; *!item residual variance so the total item variance is 1; !for two DIF items with large DIF size, change this line to y3\*.84 y4\*.91;*

2. Population Model with Covariate Effect on Latent Class

The codes for MI, intercept DIF, and loading DIF conditions are the same as those for the population model with a zero covariate effect on latent class, except this following line:

c#1 on x\*1; *!the covariate effect on latent class; !change 1 to 2 to manipulate the strength of the effect;*

3. Population Model with Covariate Effects on Latent Class and Factor

The codes for MI, intercept DIF, and loading DIF conditions are the same as those for the population model with a zero covariate effect on latent class, except the following lines:

f on x\*.4; *!the covariate effect on factor; !change .4 to .8 to manipulate the strength of the effect;*

*f\*.84; !factor residual variance so the total factor variance is 1; !change .84 to .32 for .8 covariate effect on factor;*

*c#1 on x\*1; !the covariate effect on latent class; !change 1 to 2 to manipulate the strength of the effect;*

## Appendix B

### Example Mplus Codes for Data Analysis

#### 1. Unconditional FMM

##### a) 1-Class Model

Data: file is rep1.dat;

Variable: names are y1-y6 x;

Usevariables are y1-y6;

Classes = c(1);

Analysis: type = mixture;

Model: %overall%

f by y1-y6;

[y1-y6];

Output: tech1 tech8 stdyx;

##### b) 2-Class Scalar

Data: file is rep1.dat;

Variable: names are y1-y6 x;

Usevariables are y1-y6;

Classes = c(2);

Analysis: type = mixture;

Model: %overall%

f by y1-y6;

[y1-y6] (1-6);

%c#1%

[y1-y6] (1-6); *!constrain intercepts to be equal across classes;*

y1-y6; *!freely estimate item residual variances across classes;*

[f]; f; *!the factor mean of the last class (c#2) was fixed at zero by default of Mplus, so the factor mean of (c#1) was freely estimated;*

Output: tech1 tech8 stdyx;

#### C) 2-Class Metric

Only Model statements are presented below. The rest of the codes are the same as 2-class scalar.

Model: %overall%

f by y1-y6;

[y2-y6];

[y1] (1);

%c#1%

[y2-y6]; *!freely estimate all item intercepts except the first item;*

[y1] (1);

y1-y6;

[f]; f;

#### d) 2-Class Configural

Only Model statements are presented below. The rest of the codes are the same as 2-class scalar.

Model: %overall%

f by y1-y6;

[y2-y6];

[y1] (1);

%c#1%

f by y2-y6; *!freely estimate all factor loadings except for the first item;*

[y2-y6];

[y1] (1);

y1-y6;

[f]; f;

## 2. FMM with Covariate Effect on Latent Class

The 1-class model is excluded from this analysis model, given that the covariate effect on latent class requires at least two latent classes. The syntax for other models is the same as that for the unconditional FMM detailed above, except that this following line is added to each model at the end of %overall% statements:

*c on x; !estimate the covariate effect on latent class;*

## 3. FMM with Covariate Effect on Latent Class and Factor

The 1-class model is excluded from this analysis model, given that the covariate effect on latent class requires at least two latent classes. The syntax for other models is the same as that for the unconditional FMM detailed above, except that the following lines are added to each model at the end of %overall% statements:

*c on x; !estimate the covariate effect on latent class;*

*f on x; !estimate the covariate effect on factor;*

## Appendix C

### Eta-Squared Values for Simulation Factors and Their First-Order Interaction Terms

BIC		saBIC	
Source	Eta-squared	Source	Eta-squared
Population Model with a Zero Covariate Effect			
DIF size	.19255	# of DIF items	.27336
DIF size*# of DIF items	.19255	DIF size	.13603
# of DIF items	.12387	DIF size*# of DIF items	.13525
Mixing proportions*DIF size	.06585	Sample size*DIF size	.10637
Population Model with a Covariate Effect on Latent Class			
DIF size	.34047	Sample size	.42960
Sample size	.17527	DIF size	.27749
# of DIF items	.14318	# of DIF items	.08483
Covariate Effect on Class	.09370	Covariate Effect on Class	.07502
Population Model with Covariate Effects on Latent Class and Factor			
DIF size	.39404	Sample size	.45565
Sample size	.24403	DIF size	.29730
# of DIF items	.10729		

*Note.* Eta-squared results are for intercept DIF conditions only. Only eta-squared values above .0588 (cutoff for a medium effect size) are presented. Complete eta-squared values for all factors and interaction terms are available upon request.

## Appendix D

### Items of the Curricular Leadership Scale

1. I use student performance results to develop the school's educational goals.
2. I make sure that the professional development activities of teachers are in accordance with the teaching goals of the school.
3. I ensure that teachers work according to the school's educational goals.
4. I discuss the school's academic goals with teachers at faculty meetings.

All items are measured on a 6-point Likert scale: 1 = did not occur; 2 = 1-2 times during the year; 3 = 3-4 times during the year; 4 = once a month; 5 = once a week; and 6 = more than once a week.