



Special Issue Article

Cultural differences in the understanding of modelling and feedback as sources of self-efficacy information

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Background. The potential role of culture in the development and operation of self-efficacy has been acknowledged by researchers. Clearer understanding of this cultural impact will benefit from research that shows how the same efficacy information is evaluated across cultures.

Aims. We tested whether two sources of self-efficacy information delivered by multiple social agents (i.e., vicarious experience and social persuasion) were weighed differently by adolescents in different cultures.

Sample. Of 2,893 middle school students in Korea ($n = 416$), the Philippines ($n = 522$), and the United States ($n = 1,955$) who completed the survey, 400 students were randomly pooled from each country.

Methods. Invariance of the measurement and of the latent means for self-efficacy and self-efficacy sources across the groups was tested by multigroup confirmatory factor analysis. Predictive utility of the self-efficacy sources was compared by multigroup structural equation modelling.

Results. Compared to the students in the two collectivistic countries, the US students reported significantly higher mathematics self-efficacy. Whereas the efficacy beliefs of the Korean and the US students were predicted equally well by the vicarious experience from their teachers and the social persuasion by their family and peers, those of the Filipino adolescents were best predicted by the social persuasion from their peers.

Conclusions. This study provided empirical evidence that socially conveyed sources of self-efficacy information are construed and evaluated differently across cultures, depending on who delivered the efficacy-relevant information.

A call for ‘culturally attentive’ research on self-efficacy formation

Self-efficacy is the subjective belief held by individuals that they can successfully carry out the actions required for achieving a desired outcome (Bandura, 1997). Individuals rely on four sources of information when estimating their self-efficacy: Mastery experience, vicarious experience, social persuasion, and physiological states (Bandura, 1997).

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Mastery experience, an individual's perception of having successfully performed the same or similar tasks, is the most reliable predictor of self-efficacy (Britner & Pajares, 2006; Joët, Usher, & Bressoux, 2011; Usher, 2009; Usher & Pajares, 2008). Individuals also modify their efficacy judgments after the *vicarious experience* of observing others perform similar tasks (Schunk, 1987). *Social persuasion* such as positive feedback and encouragement or negative feedback regarding one's capability from others (Chase, 1998; Zeldin & Pajares, 2000) and *physiological states* such as emotional and bodily arousal can also affect self-efficacy appraisals (Usher & Pajares, 2008).

Self-efficacy functions as a powerful predictor of individuals' motivation, emotion, and behaviour in all domains of functioning (Bandura, 1986). In the academic domain, efficacy beliefs influence the quality of student motivation, self-regulation, and performance (Pajares, 1996; Zimmerman, 2000; Zimmerman & Martinez-Pons, 1990). Bandura (2002) claimed that the potency of self-efficacy transcends not only domains but also cultures.

Nonetheless, Oettingen (1995) suspected culture-related differences in the formation of this important belief. According to her, 'culture may affect not only the type of information provided by the various sources, but also which information is selected and how it is weighted and integrated in people's self-efficacy judgments' (p. 151). She posited several reasons why culture may affect the formation of efficacy beliefs: (1) individuals in different cultures may experience different degrees of exposure to certain sources of efficacy information; (2) communication of efficacy-relevant information can take different forms across cultures; and (3) the extent to which each self-efficacy source is deemed valuable might vary across cultures.

Cross-cultural differences in self-efficacy and its sources

Cultural differences in self-efficacy information acquisition

Researchers focusing on the individualism–collectivism distinction have suggested that individuals in collectivistic cultures more actively seek, pay greater attention to, and are more heavily influenced by others' opinions, expectations, and behaviours than those in individualistic cultures (Markus & Kitayama, 1991; Triandis, 1989). The effect of socially conferred self-efficacy information, namely vicarious experience and social persuasion, may thus be greater for collectivistic than individualistic learners. Because self-appraisals of collectivists depend heavily on the evaluations of in-group members, especially of figures with power and authority (Markus & Kitayama, 1991), the self-efficacy of students in collectivistic cultures may be more strongly affected by information delivered by parents and teachers.

Comparison of the self-efficacy of children in East Berlin to that of children in West Berlin produced evidence in support of this hypothesis (Oettingen, 1995). The East German school system was judged to promote collectivism, a large power distance, strong uncertainty avoidance, and a masculinity-oriented achievement culture. As hypothesized, children in East Berlin reported significantly weaker self-efficacy than those in West Berlin. More interesting, the correlation between academic self-efficacy and achievement was stronger for students in East Berlin at all grade levels. Oettingen argued that the East Berlin children uncritically concurred with the achievement evaluations provided by their teachers and integrated this information in their efficacy judgments more readily than did the West Berlin children.

Klassen (2004a) also found that students differentially use efficacy sources according to the individualism–collectivism emphasized in their home culture. Indo-Canadian

seventh graders, whose home cultures emphasize collectivism, relied on both self-focused (mastery experience and physiological states) and other-focused (vicarious experience and social persuasion) sources when judging their mathematics self-efficacy. For Anglo-Canadian students whose home cultures were more individualistic, only the two self-focused sources significantly predicted self-efficacy.

In general, mastery experience and physiological states have consistently emerged as significant predictors of academic self-efficacy for students across cultures (Joët *et al.*, 2011; Klassen, 2004a; Matsui, Matsui, & Ohnishi, 1990). Some evidence suggests that the effects of vicarious experience and social persuasion are greater on the self-efficacy formation of collectivists than that of individualists (Klassen, 2004a). Less clear, however, is whether students attend differently to efficacy information relayed by different types of social agents (e.g., older or younger models or persuaders). Would students interpret the same efficacy-relevant information differently according to the social other involved in an interaction? Would these patterns in self-efficacy development be similar across cultural contexts? The present research was designed to provide some answers to these questions.

Cultural influences on self-efficacy strength

We also examined possible cultural differences in the strength of students' self-efficacy. Cross-cultural comparative research has invariably demonstrated that students in collectivistic countries tend to rate their academic self-efficacy lower compared to their counterparts in individualistic countries (Earley, Gibson, & Chen, 1999; Eaton & Dembo, 1997; Klassen, 2004b; Mahat, Scoloveno, & Ayres, 2014; Oettingen, 1995). This tendency is observed despite the fact that students in collectivistic countries often outperform students in individualistic countries (Lee, 2009).

The literature offers several explanations for the lower self-efficacy reported by students in collectivistic cultures. One explanation points to a lack of self-enhancement motive among collectivistic individuals. Preserving harmony and fitting in are virtuous in collectivistic society, where members are encouraged to restrain from promoting their own goals and aspirations (Markus & Kitayama, 1991). Another explanation points to the striving for self-improvement among collectivistic individuals, which makes them more vulnerable to failure experiences. In a study by Heine, Kitayama, and Lehman (2001), groups of Canadian and Japanese college students solved creativity problems and were provided with either success or failure feedback. They then rated themselves in comparison with others on a list of ten traits and abilities, including creativity. Canadian students did not show any signs of negative impact from the failure feedback. In contrast, Japanese students in the failure condition rated themselves to be worse than a majority of other students on creativity and on most other traits and abilities.

Recent evidence challenges these assumptions, however. Kurman (2001) investigated the self-enhancement tendencies of high school students from three different cultures (Jewish Israeli, Israeli Druze, and Singaporean). Students were equally likely to self-enhance in reporting communal traits (honesty, cooperation), but interdependent Singaporean students engaged in significantly less self-enhancement of agentic traits (intelligence, sociability, health). The Singaporean students also scored the lowest on academic self-enhancement, which was predicted positively by independent self-construal and negatively by modesty. Kurman (2003) further demonstrated that although self-enhancement was a universal motive across cultures, cultural

differences in modesty best explained the degree of self-enhancement. Accordingly, the relatively lower self-efficacy reported by students in collectivistic cultures might be reflective of cultural demands for modesty.

Present research

The present research examined the role culture plays in self-efficacy formation by comparing how socially conferred efficacy information is evaluated by students in different cultures. Of particular interest was whether students from different cultural groups appraised efficacy-relevant information in vicarious experience and social persuasion differently, depending on the social agent involved. We also compared the strength of student self-efficacy beliefs across cultures. Because academic self-efficacy is known to help students exert greater effort, feel lower anxiety, display better self-regulation, and attain higher achievement (Pajares, 1996; Zimmerman, 2000), we assessed mathematics anxiety and achievement as well to verify the function of mathematics self-efficacy within each culture.

Selection of countries with collectivistic and individualistic cultures

To understand how culture influences the selection and integration of efficacy-relevant information and the strength of academic self-efficacy among students, we used the cultural value dimensions of Hofstede, Hofstede, and Minkov (2010) to select three countries to compare. The cultural value dimensions are closely related to how individuals might receive and interpret information from diverse social agents in the teaching–learning context (Hofstede, 1986). We chose Korea, the Philippines, and the United States as comparison targets because of the dissimilarity of the cultural value dimensions in these three countries.

Specifically, Korea and the Philippines share a large power distance (60 for Korea and 94 for the Philippines) and low individualism (18 for Korea and 32 for the Philippines). These values differ from those for the United States, which is characterized by a small power distance (40) and high individualism (91). The cultures of Korea and the Philippines are thus considered collectivistic and that of the US individualistic. The three countries also differ on other cultural value dimensions. The Filipino and American cultures are described to be masculine (64 for the Philippines and 62 for the United States) with weak uncertainty avoidance (44 for the Philippines and 46 for the United States), whereas the Korean culture is classified to be more feminine (39) with strong uncertainty avoidance (85). In sum, Korea and the United States appear most distinct from each other, with the Philippines in the middle, according to the cultural value dimensions (Hofstede *et al.*, 2010).

Present hypotheses

H1: The strength of mathematics self-efficacy will vary across cultures.

This hypothesis was based on the empirical evidence that students from collectivistic cultures (Korea and the Philippines in this research), compared to those from individualistic cultures (the United States), exhibit a modesty bias in judging their self-efficacy (Klassen, 2004b).

H2: The relationships between sources of mathematics self-efficacy and mathematics self-efficacy will vary across cultures.

On the basis of the literature reviewed earlier (e.g., Klassen, 2004a; Oettingen, 1995), we expected that students from collectivistic cultures, compared to those from individualistic cultures, would assign greater weight to vicarious experience and social persuasion as sources of self-efficacy information. We further anticipated that the effects of these sources would differ across cultures depending on the social agents involved. For example, the strong parental influence on the academic motivation and achievement of Korean children (Jiang, Song, Lee, & Bong, 2014; Kim & Park, 2006; Park & Kim, 2000) suggests that efficacy information from family members may function as a particularly important source of academic self-efficacy for Korean students. In comparison, the same efficacy information may be more strongly predictive of the self-efficacy of Filipino students when delivered by their peers, given the significance of the peer group in the psychology of Filipino adolescents (King & McInerney, 2014b, Study 2; Licuanan, 1971).

H3: Mathematics self-efficacy will be significantly related to mathematics anxiety and achievement within each culture.

Given the bulk of evidence pointing to the significant correlations between self-efficacy and these two variables (e.g., Pajares & Miller, 1994; Phan, 2012a,b), we anticipated the same pattern to emerge within each culture.

Method

Participants and procedure

Table 1 reports the demographic composition of each sample. A total of 2,893 students (416 from Korea, 522 from the Philippines, and 1,955 from the United States) attending grades 6–10 completed a survey about their academic motivation. Convenience sampling was used to recruit students from two public middle schools in Korea, two private secondary schools in the Philippines, and four public middle schools in the United States. The correlation coefficients of student self-efficacy (i.e., mathematics self-efficacy; see below) were statistically non-significant with grade level ($r = .03$, *ns*) and school type ($r = .03$, *ns*), indicating no systematic differences by these variables. Also, only the students who indicated that they were of Filipino nationality were included among the respondents in the Philippines because multiple nationalities represented in the Filipino sample could work as another source of cultural difference within this sample.

Students in the Philippines and the United States filled out an English version of the survey; those in Korea completed a Korean version. We translated the scales from one language to another by following the translation and back-translation process suggested by Brislin (1970). The questionnaires were either originally developed in or translated into Korean by the first and fourth authors and then independently back-translated into English by two individuals who were bilingual in English and Korean. The translations were generally accurate with minor differences in expressions, which were adjusted by the researchers before the survey.

Students were assured of the anonymity of their responses and their right not to answer any of the items on the survey. One of the authors was present during the survey administration in each country to answer student questions. The survey was administered during regular class hours with permission from the instructors. All remaining procedures

Table 1. Demographic composition of each sample

Demographic variable	Korea (N = 416)		Philippines (N = 522)		United States (N = 1,955)	
	n	%	n	%	n	%
Gender						
Boy	215	51.7	266	51.0	987	50.5
Girl	199	47.8	251	48.1	968	49.5
Unknown	2	.5	5	1.0		
Grade level						
6					739	37.8
7	117	28.1	36	6.9	775	39.6
8	184	44.2	35	6.7	441	22.6
9	115	27.6	41	7.9		
10			410	78.5		
Nationality/Race	Korean	100.0			1,062	54.3
			Filipino		White	
			Korean		African American	585
			Filipino Chinese		Hispanic	176
			Indian		Asian	49
			Filipino American		Other	83
			American			
			Japanese			
			Filipino Spanish			
			Australian			
			Indonesian			
			Filipino Canadian			
			Filipino Indian			
			Filipino Japanese			
			Filipino Swiss			
			Nigerian			
			Pakistan			

Continued

Table 1. (Continued)

Demographic variable	Korea (N = 416)		Philippines (N = 522)		United States (N = 1,955)		
	n	%	n	%	n	%	
Official language Language used in the survey							
			Singaporean	1	0.2		
			Taiwanese	1	0.2		
			Thai	1	0.2		
			Filipino Irish	1	0.2		
			Filipino Italian	1	0.2		
			Filipino Saudi Arabian	1	0.2		
			Korean American	1	0.2		
			Unknown	4	0.8		
		Korean		Filipino and English			English
		Korean		English			English

were performed in compliance with relevant laws and institutional guidelines in each country.

Because different sample sizes across countries could affect the overall model fit and statistical power associated with specific predictors, we randomly pooled a sample of 400 students from each country for analysis. The ratio of the number of respondents to the number of parameters estimated was approximately 10:1, which was deemed acceptable (Kline, 2005). The percentages of boys and girls in the pooled samples were roughly equivalent within each country, with 51.5%, 51.5%, and 53.5% boys in the Korean, the Filipino, and the US samples, respectively.

Measures

Students rated each item on a 6-point Likert-type scale ranging from 1 (*strongly disagree/definitely false*) to 6 (*strongly agree/definitely true*). All items referred to a mathematics class or mathematics as a domain. The descriptive statistics and Cronbach's α coefficients are reported in Table 2.

Sources of self-efficacy

The vicarious experience and social persuasion scales validated in a previous study (Ahn, Bong, & Kim, 2015) were used. The vicarious experience scale consists of three subscales: Vicarious experience from family (three items; e.g., 'I have a family member who is really good at math'), vicarious experience from teacher (four items; e.g., 'My math teacher is really good at math'), and vicarious experience from peers (six items; e.g., 'I have a friend who is really good at math'). The social persuasion scale was also composed of three subscales: Social persuasion by family (four items; e.g., 'My family tells me that I can do well in math'), social persuasion by teacher (four items; e.g., 'My teacher tells me that I can do well in math'), and social persuasion by peers (four items; e.g., 'My friends tell me that I can do well in math'). The reliability coefficients for these scales ranged between .77 and .89 in the previous validation study (Ahn *et al.*, 2015). We excluded one item from the vicarious experience from family scale ('I have a family member who has a math-related career') due to a reliability concern. All vicarious experience and social persuasion items are provided in the Appendix.

Mathematics self-efficacy

We used an eight-item mathematics self-efficacy scale (e.g., 'I can understand even the complicated things in math class') from the Student Motivation in the Learning Environment Scales (SMILES; Bong *et al.*, 2012). The scale has been used successfully with Korean adolescents of varying ages, demonstrating significant positive correlations with task value and achievement, significant negative correlations with self-handicapping, academic procrastination, cheating, and defensive pessimism, and Cronbach's α coefficient of .93 (Lee, Bong, & Kim, 2014).

Anxiety

Three items were adopted from Miserandino (1996; e.g., 'When I'm in math class, I feel unhappy'). In Miserandino's study, these three anxiety items factored out clearly from other emotional engagement items and demonstrated Cronbach's α coefficient of .72.

Table 2. Descriptive statistics, reliabilities, and correlation coefficients among latent variables

Variable	M	SD	α	1	2	3	4	5	6	7	8
Korea											
1 Vicarious experience from family	3.82	1.53	.84	—							
2 Vicarious experience from teacher	4.27	1.16	.89	.27	—						
3 Vicarious experience from peer	4.38	0.96	.81	.30	.51	—					
4 Social persuasion by family	4.08	1.25	.87	.53	.48	.44	—				
5 Social persuasion by teacher	3.72	1.15	.83	.46	.73	.43	.72	—			
6 Social persuasion by peer	3.32	1.18	.85	.41	.39	.47	.70	.70	—		
7 Mathematics self-efficacy	3.83	1.24	.95	.32	.38	.33	.60	.46	.48	—	
8 Mathematics anxiety	2.73	1.42	.93	-.16	-.27	-.24	-.39	-.28	-.22	-.47	—
9 Mathematics achievement	66.85	25.36		.23	.14	.13	.37	.24	.25	.72	-.31
Philippines											
1 Vicarious experience from family	4.38	1.22	.71	—							
2 Vicarious experience from teacher	4.63	0.89	.82	.18	—						
3 Vicarious experience from peer	4.43	0.83	.74	.51	.25	—					
4 Social persuasion by family	4.29	1.07	.80	.73	.25	.46	—				
5 Social persuasion by teacher	4.33	0.90	.78	.36	.76	.32	.57	—			
6 Social persuasion by peer	3.99	1.03	.82	.53	.34	.62	.78	.61	—		
7 Mathematics self-efficacy	3.91	0.79	.89	.41	.30	.36	.56	.44	.63	—	
8 Mathematics anxiety	3.15	1.46	.94	-.29	-.34	-.19	-.27	-.37	-.32	-.52	—
9 Mathematics achievement	49.04	21.95		.17	.32	.05	.19	.35	.30	.20	-.28
United States											

Continued

Table 2. (Continued)

Variable	M	SD	α	1	2	3	4	5	6	7	8
1 Vicarious experience from family	4.62	1.46	.75	—							
2 Vicarious experience from teacher	4.88	1.20	.85	.33	—						
3 Vicarious experience from peer	4.47	1.06	.78	.47	.47	—					
4 Social persuasion by family	4.67	1.17	.77	.77	.56	.54	—				
5 Social persuasion by teacher	4.53	1.31	.84	.41	.92	.48	.72	—			
6 Social persuasion by peer	4.00	1.32	.80	.44	.53	.52	.78	.72	—		
7 Mathematics self-efficacy	4.56	1.12	.94	.39	.56	.36	.62	.64	.66	—	
8 Mathematics anxiety	2.74	1.69	.81	-.18	-.40	-.10	-.33	-.42	-.21	-.40	—
9 Mathematics achievement	229.60	14.94		.00	.12	.10	.10	.11	.18	.25	-.21

Note. Correlation coefficients for the Filipino and the US samples > .10 in absolute value are significant at the .05 level. All correlation coefficients for the Korean sample are significant at the .05 level. Response scales ranged between 1 and 6 for sources of self-efficacy, mathematics self-efficacy, and anxiety. Grading scales of 0–100, 0–100, and 166–278 were used for the mathematics achievement scores of the Korean, Filipino, and US samples, respectively.

However, one item ('When my math teacher first explains new material, I feel scared') had to be excluded from our study due to a reliability concern across all three countries. Although we retained only two items from the original anxiety scale, the scale functioned well across the countries with sufficient degree of reliability and discriminant validity (see Table 2).

Achievement index

Scores on the first-semester final examination in mathematics ranging between 0 and 100 were used as an achievement index for the Korean sample. For the Filipino sample, mathematics final grades during the first quarter ranging between 0 and 100 were used. For the US students, standardized test scores in mathematics ranging between 166 and 278 comprised the achievement index. To prevent estimation problems associated with discrepancy in measurement units and for better comparability of relevant results, we transformed all achievement scores into *Z* scores before analyses. However, we did not directly compare the achievement-related results across the three countries because standardizing the scores could not completely eliminate differences in the nature of these achievement indexes.

Results

Confirmatory factor analysis and correlations among the latent variables

Before testing the scales' measurement invariance across the three countries, we performed confirmatory factor analyses (CFAs) using Amos 21.0 to examine correlation coefficients among the latent variables within each country. Values of the Tucker-Lewis index (TLI) and comparative fit index (CFI) $>.95$ and of the root-mean-square error of approximation (RMSEA) $<.06$ represented an excellent model fit (Hu & Bentler, 1999). TLI and CFI values $>.90$ and of RMSEA $<.08$ were taken as evidence of a reasonable fit (Kline, 2005).

The percentages of missing responses were $<1.5\%$ for all items except for the achievement index (8.5% in the Korean data, 5.3% in the Filipino data, and 5.3% in the US data). All missing values were imputed with the expectation-maximization algorithm. The fit statistics for the CFA model were acceptable in all three data sets (see Table 3).

Table 2 presents correlation coefficients among the latent variables. Across the three samples, the three vicarious experience scales demonstrated weak-to-moderate correlations with each other, whereas the three social persuasion scales demonstrated strong correlations. The correlations among the social persuasion scales were generally consistent across the samples and the social agents. The correlations between vicarious experience and social persuasion became stronger when the two subscales reflected the same social agent. All six sources scales correlated significantly with mathematics self-efficacy in all three samples.

Tests of measurement invariance of the scales

To check for measurement invariance of the variables assessed in each country, we specified a series of nested models and tested configural invariance (i.e., equal form invariance) and construct-level metric invariance (i.e., equal factor loadings) suggested by Kline (2005), using multigroup CFA. For each test of model invariance, we applied the criterion of a $\leq.010$ change in the value of the CFI, as recommended by Cheung and

Table 3. Goodness-of-fit indexes for confirmatory factor analysis and structural equation modelling

Analysis	χ^2	df	CFI	TLI	RMSEA	$\Delta\chi^2$ (Δdf)	ΔCFI
Confirmatory factor analysis							
Korea ($n = 400$)	1118.140	465	.928	.913	.059		
Philippines ($n = 400$)	1126.976	465	.897	.876	.060		
United States ($n = 400$)	1120.243	465	.912	.893	.059		
Structural equation modelling							
Korea ($n = 400$)	993.228	386	.925	.909	.063		
Philippines ($n = 400$)	938.503	386	.901	.880	.060		
United States ($n = 400$)	980.786	386	.915	.898	.062		
Combined ($n = 1,200$)	1726.830	386	.935	.922	.054		
Multigroup structural equation modelling							
Baseline 3-country model, no constraints	2924.917	1,158	.914	.897	.036	n/a	n/a
Factor loadings constrained to be equal across countries	3088.880	1,206	.909	.894	.036	163.963 (48), $p < .001$.005
Factor variances constrained to be equal across countries	3153.380	1,218	.906	.893	.036	60.560 (12), $p < .001$.003
Factor covariances constrained to be equal across countries	3243.609	1,248	.903	.892	.037	90.229 (30), $p < .001$.003
Structural paths constrained to be equal across countries	3283.554	1,260	.902	.891	.037	39.945 (12), $p < .001$.001
Final model	3241.738	1,254	.904	.893	.036		

Note. χ^2 = chi-square; df = degree of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root-mean-square error of approximation; $\Delta\chi^2$ = chi-square difference; ΔCFI = difference in CFI; n/a = not applicable.

Rensvold (2002). The upper half of Table 4 shows the chi-square statistic and goodness-of-fit indexes associated with CFAs for the sources of self-efficacy variables, first performed separately for each country, followed by sequential tests of measurement invariance across the three countries. The lower half of Table 4 presents the same statistics associated with CFAs with the mathematics self-efficacy and anxiety variables.

Fit indexes in the initial sources of self-efficacy model were acceptable with the Korean and US samples but unsatisfactory with the Filipino sample. Three item-specific factors were added in the model to represent the effects of the three social agents (e.g., family, teacher, and peer), which were believed to create common variance among the items that shared the same social agent. Incorporating these item-specific factors improved the model fit to a satisfactory level in all three data sets. The model for mathematics self-efficacy and anxiety demonstrated adequate fit to the data with all three data sets.

The baseline model with no invariance constraint resulted in an acceptable overall fit for both the sources of self-efficacy, $\chi^2(630, N = 1,200) = 1603.393, p < .001$ (CFI = .930, TLI = .908, RMSEA = .036), and the mathematics self-efficacy and anxiety models, $\chi^2(102, N = 1,200) = 370.190, p < .001$ (CFI = .969, TLI = .958, RMSEA = .047). Constraining the factor loadings to be equal across the three countries yielded a loss in fit for the sources of self-efficacy model but not to the degree to reject invariance, with $\Delta\text{CFI} = .010$. The two subsequent models with progressively more restrictive invariance constraints also resulted in only slight loss in fit ($\Delta\text{CFI} \leq .006$), thereby supporting the measurement invariance of the sources of self-efficacy variables.

In contrast, constraining the factor loadings to be equal across the three countries in the mathematics self-efficacy and anxiety model brought about a reduction of .013 in the CFI value, which was greater than the $\Delta\text{CFI} \leq .010$ cut-off. Following the suggestion of Byrne, Shavelson, and Muthén (1989), we then proceeded with the analysis for locating partial measurement invariance by lifting the equality constraint(s) from the path(s) that differed significantly. Item-by-item comparative analyses were conducted to identify the specific path(s) that differed between the three countries (Supple, Ghazarian, Peterson, & Bush, 2009). The factor loading associated with the mathematics self-efficacy item, 'I can perform well on my math tests', was found to be statistically different across the countries, $\Delta\chi^2(2) = 46.333, p < .001$. We removed this item from the self-efficacy scale and re-estimated the model, which satisfied the condition for measurement invariance. Measurement invariance was held in all subsequent tests of more restrictive invariance assumptions. Therefore, we used only the seven remaining self-efficacy items in all subsequent analyses.

Latent mean differences between the countries

We compared the latent means by computing the critical ratio (CR) index, using AMOS (Arbuckle, 2012). To test for latent mean differences across multiple groups, one of the groups serves as a reference group with its mean fixed to zero, while the means of the comparison groups are freely estimated. Significant and positive CR values indicate significantly higher latent means of the comparison groups than that of the reference group; significant and negative CR values denote a significantly higher latent mean of the reference group. In this study, we designated the US sample to be a reference group for testing the overall difference among the three samples. When testing the difference between the two Asian samples, we designated the Korean sample as a reference group.

This analysis revealed that the mean scores of the sources of mathematics self-efficacy varied significantly between the countries (see Table 5). The mean vicarious experience

Table 4. Testing for invariance of the questionnaires measuring the sources of self-efficacy, mathematics self-efficacy, and anxiety

Model	χ^2	df	CFI	TLI	RMSEA	$\Delta\chi^2$ (Δ df)	Δ CFI
Sources of self-efficacy information							
Six-factor model of self-efficacy sources for each country							
Korea (<i>n</i> = 400)	572.570	210	.931	.910	.066		
Philippines (<i>n</i> = 400)	544.088	210	.917	.891	.063		
United States (<i>n</i> = 400)	486.639	210	.940	.921	.057		
Combined (<i>n</i> = 1,200)	947.154	210	.947	.930	.054		
Three group CFAs							
Baseline 3-country model, no constraints	1603.393	630	.930	.908	.036	n/a	n/a
Factor loadings constrained to be equal across countries	1775.136	666	.920	.901	.037	171.743 (36), <i>p</i> < .001	.010
Factor variances constrained to be equal across countries	1836.541	678	.917	.898	.038	61.405 (12), <i>p</i> < .001	.003
Factor covariances constrained to be equal across countries	1953.852	708	.911	.895	.038	117.311 (30), <i>p</i> < .001	.006
Mathematics self-efficacy and test anxiety							
Two-factor model of mathematics self-efficacy and test anxiety for each country							
Korea (<i>n</i> = 400)	140.394	34	.971	.961	.089		
Philippines (<i>n</i> = 400)	109.257	34	.967	.956	.074		
United States (<i>n</i> = 400)	120.540	34	.968	.957	.080		
Combined (<i>n</i> = 1,200)	295.850	34	.970	.960	.080		
Three group CFAs							
Baseline 3-country model, no constraints	370.190	102	.969	.958	.047	n/a	n/a
Factor loadings constrained to be equal across countries	496.190	118	.956	.949	.052	126.000 (16), <i>p</i> < .001	.013

Continued

Table 4. (Continued)

Model	χ^2	df	CFI	TLI	RMSEA	$\Delta\chi^2$ (Δdf)	ΔCFI
Factor loadings constrained to be equal across countries after removing one self-efficacy item	333.546	92	.967	.961	.047	36.644 (10), $p < .001$.002
Factor variances constrained to be equal across countries	431.407	96	.957	.948	.054	97.861 (4), $p < .001$.010
Factor covariances constrained to be equal across countries	444.966	98	.952	.948	.054	13.559 (2), $p < .01$.005

Note: χ^2 = chi-square; df = degree of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root-mean-square error of approximation; $\Delta\chi^2$ = chi-square difference; ΔCFI = difference in CFI; n/a = not applicable.

from family rating of the US students was significantly higher than that of the Korean students ($CR = -8.45$), which was also significantly lower than that of the Filipino students ($CR = 5.98$). The mean vicarious experience from teacher rating of the Filipino students was also significantly higher than that of the Korean students ($CR = 7.07$) but both were significantly lower than that of the US students ($CRs = -7.84$ for the Korean and -2.19 for the Filipino samples, respectively). Regarding vicarious experience from peers, the Filipino students scored significantly higher than the US students ($CR = 2.58$) and the Korean students ($CR = 2.41$), on average.

The mean social persuasion by family score of the Filipino students was also significantly higher than that of the Korean students ($CR = 2.47$), both of which were significantly lower than that of the US students ($CRs = -7.03$ for the Korean and -3.64 for the Filipino samples, respectively). Regarding social persuasion by teacher, the average rating of the Filipino students was again significantly higher than that of the Korean

Table 5. Testing for latent mean differences across countries

Latent variable	Critical ratio	SE
United States versus Korea versus Philippines		
United States versus Korea		
Vicarious experience from family	-8.45***	0.11
Vicarious experience from teacher	-7.84***	0.10
Vicarious experience from peer	0.54	0.08
Social persuasion by family	-7.03***	0.09
Social persuasion by teacher	-9.45***	0.09
Social persuasion by peer	-7.72***	0.10
Mathematics self-efficacy	-7.72***	0.08
Mathematics anxiety	-0.14	0.11
United States versus Philippines		
Vicarious experience from family	-0.86	0.09
Vicarious experience from teacher	-2.19*	0.08
Vicarious experience from peer	2.58*	0.08
Social persuasion by family	-3.64***	0.08
Social persuasion by teacher	-0.93	0.08
Social persuasion by peer	1.80	0.09
Mathematics self-efficacy	-8.77***	0.06
Mathematics anxiety	3.69***	0.11
Korea versus Philippines		
Vicarious experience from family	5.98***	0.10
Vicarious experience from teacher	7.07***	0.06
Vicarious experience from peer	2.41*	0.04
Social persuasion by family	2.47*	0.07
Social persuasion by teacher	7.27***	0.07
Social persuasion by peer	8.38***	0.08
Mathematics self-efficacy	0.48	0.07
Mathematics anxiety	4.16***	0.10

Note. The latent mean parameter for the US sample was fixed to zero when testing for the overall difference among the three samples and that for the Korean sample was fixed to zero when testing for the difference between the two Asian samples.

* $p < .05$. *** $p < .001$.

students ($CR = 7.27$). The US students also provided a significantly higher mean social persuasion by teacher rating than the Korean students did ($CR = -9.45$). A similar pattern was observed for social persuasion by peers. The latent means of the US ($CR = -7.72$) and the Filipino samples ($CR = 8.38$) were significantly higher than that of the Korean sample.

When the latent mean scores of mathematics self-efficacy and anxiety were compared, the US students emerged with a significantly higher average self-efficacy score compared to that of the Filipino ($CR = -8.77$) or the Korean students ($CR = -7.72$). In comparison, the Filipino students were significantly more anxious on average than were the students in the United States ($CR = 3.69$) or Korea ($CR = 4.16$).

Tests of structural invariance of the prediction paths

Before testing the invariance of the structural paths across the three countries, we examined the fit of the structural equation model (SEM) with the sources and mathematics self-efficacy variables separately within each sample. When the separate and combined models demonstrated acceptable fit to the data, we proceeded to test multigroup SEMs (Kline, 2005). Table 3 reports the fit indexes of all SEMs.

To test whether any of the paths from the sources of self-efficacy variables to mathematics self-efficacy was significantly different across the samples, we performed multigroup SEM, starting with a baseline model with no equality constraint. This model demonstrated a reasonable fit to the data. We then imposed successively more restrictive invariance constraints, first on the factor loadings and finally on the structural parameters. All models with different sets of equality constraints yielded an adequate fit, with little decrement in fit from the preceding models (see Table 3). Nonetheless, the multigroup analysis revealed that three structural paths were significantly different between the samples. We thus sequentially lifted the equality constraint from these paths and re-estimated the model. This final model produced satisfactory goodness-of-fit indexes, $\chi^2(1,254, N = 1,200) = 3241.738, p < .001$ (CFI = .904, TLI = .893, RMSEA = .036). Figure 1 presents the path coefficients from this model.

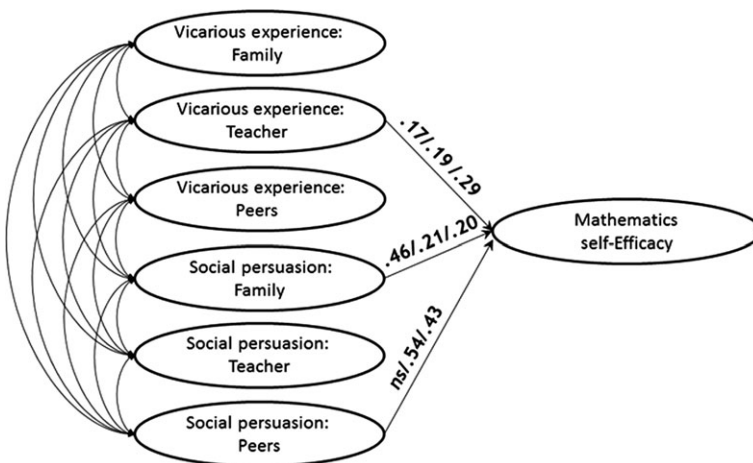


Figure 1. Standardized path coefficients for the hypothesized model. The first coefficients are from the Korean data; the second coefficients are from the Filipino data; and the third coefficients are from the US data. For clarity of presentation, only statistically significant paths ($p < .05$) are presented.

Of the six sources of self-efficacy information, three significantly predicted the mathematics self-efficacy of the students in at least two samples. The path from vicarious experience from teacher to student mathematics self-efficacy was stronger in the US sample ($\beta = .29$) than in the Korean ($\beta = .17$) or the Filipino sample ($\beta = .19$). However, these three paths were not significantly different from each other, as determined by the z score. In comparison, the path from social persuasion by family to student mathematics self-efficacy was significantly stronger in the Korean sample ($\beta = .46$) than in the Filipino ($\beta = .21$, $z = 2.90$, $p < .01$) or the US sample ($\beta = .20$, $z = 2.21$, $p < .05$). Social persuasion by peers demonstrated strong and significant predictive utility for the mathematics self-efficacy of the Filipino ($\beta = .54$) and the US students ($\beta = .43$) but not that of the Korean students ($\beta = .15$, *ns*). However, the differences between both the Filipino and Korean samples ($z = -1.91$, $p < .06$) and the US and Korean samples ($z = -1.95$, $p < .06$) were only marginally significant.

Within each cultural group, the paths from vicarious experience from teacher, social persuasion by family, and social persuasion by peers to student mathematics self-efficacy differed significantly in the Korean and Filipino samples but not in the US samples. For the Korean students, the path from social persuasion by family to student mathematics self-efficacy was significantly stronger than the path from either vicarious experience from teacher ($z = -2.29$, $p < .05$) or social persuasion by peers ($z = 2.73$, $p < .01$). For the Filipino students, in contrast, the predictive path from social persuasion by peers to student mathematics self-efficacy was significantly stronger than the path from either vicarious experience from teacher ($z = -2.09$, $p < .05$) or social persuasion by family ($z = -2.12$, $p < .05$).

Discussion

Noting the inadequacies of Western theories for explaining motivational phenomena in other cultures, King and McInerney (2014a) recommended that researchers employ both etic and emic approaches to the study of achievement motivation. In a similar vein, Pajares (2007) called for 'culturally attentive' research to understand how different cultural practices cultivate students' academic self-efficacy. The present research was an attempt to answer these calls by examining potential cultural differences in how students utilize certain sources of self-efficacy information when forming their academic self-efficacy beliefs in the domain of mathematics. In particular, we compared how vicarious experience and social persuasion delivered by different social agents across cultures was differently related to student self-efficacy. By doing this, we hoped to catch a glimpse of the processes through which students in different cultures interpret and integrate efficacy-relevant information.

Weaker self-efficacy and stronger anxiety of collectivistic than individualistic students

Middle school students in the United States rated their mathematics self-efficacy significantly higher than did students in Korea and the Philippines. The latter two countries are considered more collectivistic according to the individualism index score of Hofstede *et al.* (2010). Cross-cultural studies have consistently shown that students in individualistic Western countries report stronger beliefs of personal efficacy compared to those in collectivistic East Asian countries (Eaton & Dembo, 1997; Oettingen, 1995; Schwarzer, Bäßler, Kwiatek, & Schröder, 1997), sometimes despite their superior

performance (Klassen, 2004b; Lee, 2009). Our results are consistent with this general trend.

However, we found that the US students provided higher ratings of not only mathematics self-efficacy but also other constructs than did the students in Korea or the Philippines. With the exceptions of anxiety and vicarious experience from peers, the US students had the highest ratings and the Korean students the lowest ratings, on all self-reported measures. Neither a lack of self-enhancement motive (Markus & Kitayama, 1991) nor a strong self-improvement motive among collectivistic individuals (White & Lehman, 2005) can explain these uniformly lower ratings of the Asian students. Rather, the results seem to support the argument that students in collectivistic cultures refrain from high ratings because of the cultural demands for humility (Kurman, 2001, 2003).

At the same time, the Filipino students reported higher anxiety than did students in Korea or the United States. Although both Korea and the Philippines are similarly characterized by the low scores on the individualism index (Hofstede *et al.*, 2010), the Philippines is characterized by a much higher power distance index than Korea and the United States. Individuals in hierarchical societies with a large power distance emphasize status, referent power, authority, and legitimacy. They learn to comply with ascribed social status and are expected to preserve this order, which can create strong social pressure to meet social standards. This may in turn explain a heightened sense of anxiety. Another plausible explanation is the lower mathematics proficiency of Filipino students compared to that of Korean or US students (Mullis, Martin, Gonzalez, & Chrostowski, 2004), which could also explain the high anxiety level of the Filipino students. We were not able to test the plausibility of these suppositions, but future research should.

Modelling by teachers and persuasion by family and peers as predictors of self-efficacy

All six sources of efficacy information demonstrated significant positive correlations with student mathematics self-efficacy ($.30 \leq r \leq .66$). When all six source variables simultaneously entered the same model, however, only the vicarious experience from teachers and social persuasion by family members and peers emerged as significant positive predictors of mathematics self-efficacy. That the unique variances in the vicarious experience from family members and peers, and social persuasion by teachers, did not predict mathematics self-efficacy may not be too surprising. Unless there is a family member or a peer who consistently demonstrates strong performance on mathematics-related tasks, vicarious experience from family members and peers may not function as a reliable source of information for students (Zeldin & Pajares, 2000). The limited number of students who receive compliments from their teachers to augment their efficacy beliefs in mathematics may explain why social persuasion by teachers was not a stronger source of efficacy information than social persuasion by family or peers.

What the present results most unambiguously demonstrate, however, is the relative effectiveness of multiple social agents in providing different types of efficacy information. Self-efficacy information conveyed in the form of modelling was most effective when delivered by teachers. Verbal persuasion as a source of efficacy information, in comparison, was more powerful when communicated by family members or friends. Moreover, various social agents and the efficacy information they deliver differed in their impact depending on the culture.

Importance of family for Korean and of peers for Filipino adolescents

Social persuasion by family members was a significantly stronger predictor of mathematics self-efficacy for Korean adolescents than for Filipino or US students. The strong influence of Korean parents on their children's academic motivation and achievement has been documented repeatedly (Bong, 2008; Bong, Hwang, Noh, & Kim, 2014). Kim and Park (2006) also found that social support from parents consistently played a central role in raising the self-efficacy of Korean students from elementary to high school years. Among different social models in the family, mothers typically exert a stronger influence on their children's self-efficacy than fathers do (Kim & Park, 2005).

Whereas Korean students turned to their family members, Filipino students seemed to turn to their friends for efficacy-relevant verbal feedback. The importance of peers for the psychology of Filipino adolescents has been discussed by several researchers (King & McInerney, 2014b; Study 2). Licuanan (1971) observed that although Filipino adolescents relied on multiple reference groups to meet the demands of specific situations, they chose friends as the most important reference group for their immediate concerns. Church (1987) suggested that *pakikisama* (going along with others) is a valued personality trait for Filipinos. Fernandez (2012) also pointed out the importance of *pakikisama* in the Filipino adolescents' conceptualization of support. Our results are consistent with these observations.

Self-efficacy as a universal predictor of achievement outcomes

Mathematics self-efficacy of the participating students demonstrated a significant positive correlation with students' mathematics achievement and a significant negative correlation with their mathematics anxiety in Korea, the Philippines, and the United States. The strong predictive utility of self-efficacy has been established clearly in contemporary literature across a variety of settings and cultures (Bandura, 2002). Within the academic domain, many studies have demonstrated that self-efficacy is a significant predictor of achievement for students from all cultural groups, despite fluctuations in the level and strength of the relationship across cultures (Eaton & Dembo, 1997; Salili, Chiu, & Lai, 2001). Our research replicates these well-known findings.

Conclusion and future directions

The present research has several limitations that also suggest directions for future research in this area. We consulted indexes of diverse cultural dimensions to select countries in the current study. However, future research should assess cultures or cultural identities directly and re-examine the differences addressed in this study, especially because the model fit indexes were not completely satisfactory for the Filipino data set.

We only measured vicarious experience and social persuasion because the robust nature of mastery experience and physiological states as antecedents of self-efficacy beliefs has been clearly demonstrated in past research. Nevertheless, it may be a worthwhile endeavour for researchers to compare how sources of efficacy information derived from the self (i.e., mastery experience and physiological states) and other social agents (i.e., vicarious experience and social persuasion) are selected, interpreted, and weighed as a result of different cultural practices. Also, our selection of multiple social others was primarily based on the social roles they played during adolescence (Wentzel, 1998). However, it may be others' attributes rather than their social roles that are more consequential in the appraisal of efficacy information. For example, the strength by which

modelling influences observers' self-efficacy depends on the perceived similarity of the model to the observers and the proficiency of the model in executing the target skills. The strength by which verbal persuasion influences listeners' self-efficacy depends on the perceived competence, credibility, and knowledgeable-ness of the persuader (Bandura, 1997). We strongly encourage interested researchers to test differences in the attributes of effective models and persuaders across cultures.

Despite these limitations, we are confident that the present results contribute to the existing literature in several important ways. Compared to the number of studies on the motivation of students in East Asian countries such as Korea, only few studies have examined the academic motivation of students in South-East Asian countries. The current results provide a rare glimpse into the processes through which adolescents in the Philippines, one of the South-East Asian countries, form their mathematics self-efficacy beliefs. Furthermore, many cross-cultural studies on self-efficacy have stopped at demonstrating that students from collectivistic cultures estimate their self-efficacy more conservatively than those from individualistic cultures. In addition to replicating the cultural differences in self-efficacy ratings, our study documents differences in the relationship between socially acquired efficacy information and mathematics self-efficacy across cultures. Most important, the study presents empirical evidence that the same type of efficacy information could be construed and evaluated differently across cultures, depending on the social agent who delivered it. We believe the present results provide an important clue into understanding at least part of the mechanism that creates cultural differences in students' efficacy beliefs.

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References

- Ahn, H. S., Bong, M., & Kim, S. (2015). *Social models, implicit theories, and classroom goal structures in the cognitive appraisal of self-efficacy information*. Manuscript submitted for publication.
- Arbuckle, J. L. (2012). *IBM® SPSS® Amos™ 21 user's guide*. Retrieved from ftp://public.dhe.ibm.com/software/analytics/spss/documentation/amos/21.0/en/Manuals/IBM_SPSS_Amos_Users_Guide.pdf
- Bandura, A. (1986). *Social foundations of thoughts and action: A social-cognitive view*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.
- Bandura, A. (2002). Social cognitive theory in cultural context. *Applied Psychology: An International Review*, 51, 269–290. doi:10.1111/1464-0597.00092.
- Bong, M. (2008). Effects of parent-child relationships and classroom goal structures on motivation, help-seeking avoidance, and cheating. *Journal of Experimental Education*, 76, 191–217. doi:10.3200/JEXE.76.2.191-217
- Bong, M., Hwang, A., Noh, A., & Kim, S. (2014). Perfectionism and motivation of adolescents in academic contexts. *Journal of Educational Psychology*, 106, 711–729. doi:10.1037/a0035836
- Bong, M., Kim, S., Reeve, J., Lim, H. J., Lee, W., Ahn, H. S., ... Woo, Y. (2012). *The Student Motivation in the Learning Environment Scales (SMILES)*. Unpublished instrument. Retrieved

- from Korea University, Brain and Motivation Research Institute website: http://bmri.korea.ac.kr/english/research/assessment_scales/list.html?id=assessment
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology, 1*, 185–216. doi:10.1177/135910457000100301
- Britner, S. L., & Pajares, F. (2006). Sources of science self-efficacy beliefs of middle school students. *Journal of Research in Science Teaching, 43*, 485–499. doi:10.1002/tea.20131
- Byrne, B. M., Shavelson, R. J., & Muthén, B. (1989). Testing for the equivalence of factor covariance and mean structures: The issue of partial measurement invariance. *Psychological Bulletin, 105*, 456–466. doi:10.1037/0033-2909.105.3.456
- Chase, M. A. (1998). Sources of self-efficacy in physical education and sport. *Journal of Teaching in Physical Education, 18*, 76–89.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255. doi:10.1207/S15328007SEM0902_5
- Church, A. T. (1987). Personality research in a non-Western culture: The Philippines. *Psychological Bulletin, 102*, 272–292. doi:10.1037/0033-2909.102.2.272
- Earley, P. C., Gibson, C. B., & Chen, C. C. (1999). “How did I do?” versus “How did we do?”: Cultural contrasts of performance feedback use and self-efficacy. *Journal of Cross-Cultural Psychology, 30*, 594–619. doi:10.1177/0022022199030005003
- Eaton, M. J., & Dembo, M. H. (1997). Differences in the motivation beliefs of Asian American and non-Asian students. *Journal of Educational Psychology, 89*, 433–440. doi:10.1037/0022-0663.89.3.433
- Fernandez, K. G. (2012). Support means direct help: Filipino adolescents’ multidimensional conceptualization of social support. *Psychological Studies, 57*, 251–259. doi:10.1007/s12646-011-0129-3
- Heine, S. J., Kitayama, S., & Lehman, D. R. (2001). Cultural differences in self-evaluation: Japanese readily accept negative self-relevant information. *Journal of Cross-Cultural Psychology, 32*, 434–443. doi:10.1177/0022022101032004004
- Hofstede, G. (1986). Cultural differences in teaching and learning. *International Journal of Intercultural Relations, 10*, 301–320. doi:10.1016/0147-1767(86)90015-5
- Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations: Software of the mind* (3rd ed.). New York, NY: McGraw-Hill.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55. doi:10.1080/10705519909540118
- Jiang, Y., Song, J., Lee, M., & Bong, M. (2014). Self-efficacy and achievement goals as motivational links between perceived contexts and achievement. *Educational Psychology: An International Journal of Experimental Educational Psychology, 34*, 92–117. doi:10.1080/01443410.2013.863831
- Joët, G., Usher, E. L., & Bressoux, P. (2011). Sources of self-efficacy: An investigation of elementary school students in France. *Journal of Educational Psychology, 103*, 649–663. doi:10.1037/a0024048
- Kim, U., & Park, Y. S. (2005). Integrated analysis of indigenous psychologies: Comments and extensions of ideas presented by Shams, Jackson, Hwang and Kashima. *Asian Journal of Social Psychology, 8*, 75–95. doi:10.1111/j.1467-839X.2005.00162.x
- Kim, U., & Park, Y. S. (2006). Factors influencing academic achievement in relational cultures: The role of self, relational, and collective efficacy. In F. Pajares & T. Urduan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 267–285). Greenwich, CT: Information Age.
- King, R. B., & McInerney, D. M. (2014a). Culture’s consequences on student motivation: Capturing cross-cultural universality and variability through personal investment theory. *Educational Psychologist, 49*, 175–198. doi:10.1080/00461520.2014.926813
- King, R. B., & McInerney, D. M. (2014b). The work avoidance goal construct: Examining its structure, antecedents, and consequences. *Contemporary Educational Psychology, 39*, 42–58. doi:10.1016/j.cedpsych.2013.12.002

- Klassen, R. M. (2004a). A cross-cultural investigation of the efficacy beliefs of South Asian immigrant and Anglo Canadian nonimmigrant early adolescents. *Journal of Educational Psychology, 96*, 731–742. doi:10.1037/0022-0663.96.4.731
- Klassen, R. M. (2004b). Optimism and realism: A review of self-efficacy from a cross-cultural perspective. *International Journal of Psychology, 39*, 205–230. doi:10.1080/00207590344000330
- Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York, NY: Guilford Press.
- Kurman, J. (2001). Self-enhancement: Is it restricted to individualistic cultures? *Personality and Social Psychology Bulletin, 27*, 1705–1716. doi:10.1177/01461672012712013
- Kurman, J. (2003). Why is self-enhancement low in certain collectivist cultures? An investigation of two competing explanations. *Journal of Cross-Cultural Psychology, 34*, 496–510. doi:10.1177/0022022103256474
- Lee, J. (2009). Universals and specifics of math self-concept, math self-efficacy, and math anxiety across 41 PISA 2003 participating countries. *Learning and Individual Differences, 19*, 355–365. doi:10.1016/j.lindif.2008.10.009
- Lee, J., Bong, M., & Kim, S. (2014). Interaction between task values and self-efficacy on maladaptive achievement strategy use. *Educational Psychology: An International Journal of Experimental Educational Psychology, 34*, 538–560. doi:10.1080/01443410.2014.895296
- Licuanan, P. B. (1971). The impact of modernization on Filipino adolescents. In F. Lynch & A. de Guzman II (Eds.), *Modernization: Its impact in the Philippines V (IPC Papers No. 10)*. Quezon City, Philippines: Ateneo de Manila University Press.
- Mahat, G., Scoloveno, M. A., & Ayres, C. (2014). Comparison of adolescents' HIV/AIDS knowledge and self-efficacy across two cultures. *Journal of Cultural Diversity, 21*, 152–158.
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*, 224–253. doi:10.1037/0033-295X.98.2.224
- Matsui, T., Matsui, K., & Ohnishi, R. (1990). Mechanisms underlying math self-efficacy learning of college students. *Journal of Vocational Behavior, 37*, 225–238. doi:10.1016/0001-8791(90)90042-Z
- Miserandino, M. (1996). Children who do well in school: Individual differences in perceived competence and autonomy in above-average children. *Journal of Educational Psychology, 88*, 203–214.
- Mullis, I. V. S., Martin, M. O., Gonzalez, E. J., & Chrostowski, S. J. (2004). *TIMSS 2003 international mathematics report: Findings from IEA's trends in international mathematics and science study at the fourth and eighth grades*. Chestnut Hill, MA: Boston College. Retrieved from http://timssandpirls.bc.edu/PDF/t03_download/T03INTLMATRPT.pdf
- Oettingen, G. (1995). Cross-cultural perspectives on self-efficacy. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 149–176). New York, NY: Cambridge University Press.
- Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*, 543–578.
- Pajares, F. (2007). Culturalizing educational psychology. In F. Salili & R. Hoosain (Eds.), *Culture, motivation, and learning: A multicultural perspective* (pp. 19–42). Charlotte, NC: Information Age.
- Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*, 193–203. doi:10.1037/0022-0663.86.2.193
- Park, Y., & Kim, U. (2000). The impact of the changing parent-child relationship on adolescents' functioning: Comparison of primary, junior high, senior high and university students. *Korean Journal of Educational Research, 38*, 109–146.
- Phan, H. P. (2012a). Relations between informational sources, self-efficacy and academic achievement: A developmental approach. *Educational Psychology, 32*, 81–105. doi:10.1080/01443410.2011.625612

- Phan, H. P. (2012b). Informational sources, self-efficacy and achievement: A temporally displaced approach. *Educational Psychology, 32*, 699–726. doi:10.1080/01443410.2012.708320
- Salili, F., Chiu, C. Y., & Lai, S. (2001). The influence of culture and context on students' motivational orientation and performance. In F. Salili, C. Y. Chie & Y. Y. Hong (Eds.), *Student motivation: The culture and context of learning* (pp. 221–247). New York, NY: Kluwer.
- Schunk, D. H. (1987). Peer models and children's behavior change. *Review of Educational Research, 57*, 149–174.
- Schwarzer, R., Bäßler, J., Kwiatek, P., & Schröder, K. (1997). The assessment of optimistic self-beliefs: Comparison of the German, Spanish, and Chinese versions of the general self-efficacy scale. *Applied Psychology: An International Review, 46*, 69–88. doi:10.1111/j.1464-0597.1997.tb01096.x
- Supple, A. J., Ghazarian, S. R., Peterson, G. W., & Bush, K. R. (2009). Assessing the cross-cultural validity of a parental autonomy granting measure: Comparing adolescents in the United States, China, Mexico, and India. *Journal of Cross-Cultural Psychology, 40*, 816–833. doi:10.1177/0022022109339390
- Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review, 96*, 506–520. doi:10.1037/0033-295X.96.3.506
- Usher, E. L. (2009). Sources of middle school students' self-efficacy in mathematics: A qualitative investigation. *American Educational Research Journal, 46*, 275–314. doi:10.3102/0002831208324517
- Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research, 78*, 751–796. doi:10.3102/0034654308321456
- Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology, 90*, 202–209. doi:10.1037/0022-0663.90.2.202
- White, K., & Lehman, D. R. (2005). Culture and social comparison seeking: The role of self-motives. *Society for Personality and Social Psychology, 31*, 232–242. doi:10.1177/0146167204271326
- Zeldin, A. L., & Pajares, F. (2000). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal, 37*, 215–246. doi:10.3102/00028312037001215
- Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*, 82–91. doi:10.1006/ceps.1999.1016
- Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology, 82*, 51–59. doi:10.1037/0022-0663.82.1.51

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Appendix : Vicarious experience and social persuasion items

Vicarious experience scales	Social persuasion scales
<p>Vicarious experience from family</p>	<p>Social persuasion by family</p>
<ol style="list-style-type: none"> 1. I have a family member who is really good at math 2. I have a family member who explains math problems very well 3. I have a family member who has a math-related career^a 	<ol style="list-style-type: none"> 1. My family tells me that I can do well in math 2. My family tells me that everyone can do well in math if he or she tries hard 3. My family has given me advice on how to do better in math 4. My family compliments me on my effort in math
<p>Vicarious experience from teacher</p>	<p>Social persuasion by teacher</p>
<ol style="list-style-type: none"> 1. My math teacher is really good at math 2. My math teacher explains math problems very well 3. My math teacher can solve even the most difficult math problems 4. My math teacher clearly explains even the most difficult math ideas 	<ol style="list-style-type: none"> 1. My teacher tells me that I can do well in math 2. My teacher tells me that everyone can do well in math if he or she tries hard 3. My teacher has given me advice on how to do better in math 4. My teacher compliments me on my effort in math
<p>Vicarious experience from peer</p>	<p>Social persuasion by peer</p>
<ol style="list-style-type: none"> 1. I have a friend who is really good at math 2. I have a friend who explains math problems very well 3. I have a friend who wants to have a math-related career 4. I have a friend who can solve even the most difficult math problems 5. I have a friend who receives compliments on his or her work in math 6. Most of my friends get good grades in math 	<ol style="list-style-type: none"> 1. My friends tell me that I can do well in math 2. My friends tell me that everyone can do well in math if he or she tries hard 3. My friends have given me advice on how to do better in math 4. My friends compliment me on my effort in math

^aDeleted to improve reliability of the scale.