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PSYCHOMETRIC PROPERTIES OF THE MONGOLIAN VERSION OF DELAWARE SCHOOL CLIMATE QUESTIONNAIRE (DSCQ)

Itgel Miyejav,
Bayasgalan Erdenebaatar,
Khajidmaa Otgonbaatar[i]
Mongolian National Institute for Educational Research,
Ulaanbaatar, Mongolia

Abstract:
The Delaware School Climate Questionnaire (DSCQ), initiated by Delaware and his associates, has been utilized as a common tool to explore and evaluate school climate in different countries. The purpose of the current study was to adapt the DSCQ into Mongolian and examine its psychometric properties with a sample of 1,174 secondary school students. The results of exploratory and confirmatory factor analysis verified the uni-dimensionality of the scale and confirmed the Mongolian version of DSCQ fit the three-factor model. The Cronbach alpha value of the total scale was 0.92, whereas correlation coefficients representing convergent validity varied from 0.30 to 0.72 ($p < .01$). The criterion validity of the scale was determined to be 0.3 when the Mongolian language and math achievement test score was used as a criterion in concurrent validity analysis. The results suggest that the Mongolian version of the DSCQ is a valid and reliable tool to evaluate school climate in Mongolian samples.

Keywords: school climate, measurement, validity, Mongolian version

1. Introduction

Various definitions of school climate are introduced by different authors. Yet, common agreement among the definitions is that school climate is described as a positive social attitude that is correlated with a broader range of academic achievement and social-emotional development (Bear *et al.*, 2011). For instance, researchers found that school climate is positively related to students' achievement (Scatler *et al.*, 2021; Jones & Shindler, 2016) and is linked to students' motivation (Marsh *et al.*, 2008). Furthermore, it was also found that socioeconomic status, including gender, place of residence, age, and salary, tends to affect school climate (Way *et al.*, 2007; Bayasgalan & Tuya, 2020).

[i] Correspondence: email otgonbaatar@mier.mn

To describe school climate, some researchers place greater emphasis on school safety aspects, including an individual's feelings toward his or her social, emotional, and physical safety around school (Cohen *et al.*, 2009; National School Climate Council, 2007).

Therefore, conducting school climate assessments is crucial to identifying stakeholders' opinions and attitudes towards school life, including school environment, safety, collaboration, and school atmosphere, and to utilizing the collected information to further improve school climate (National School Climate Council, 2007). Although a large body of studies has emphasized the impact of school climate on students' achievement, there has been relatively little research on school climate in Mongolia over the past decades. According to the findings of the school risk assessment, 31% were at medium risk, and 11.4%, or 64 schools, were at high risk out of 177 participating schools (Ministry of Education and Science, 2019). Moreover, the National University of Mongolia, in collaboration with researchers from the University of Washington, adapted a school climate instrument suitable for Grades 8–12 in Mongolian secondary schools (Scatler *et al.*, 2021). The result of the study shows that the 36-item WHITS (What's Happening in This School)-Mongolia questionnaire is a reliable and valid school climate instrument for middle schools. Besides, some studies examined school climate (Bayasgalan & Tuya, 2020), while others attempted to establish instruments to measure students' social and emotional aspects in a specific domain (Otgonbaatar, 2021).

As such, the current study aims to develop a brief and psychometrically solid instrument to assess school climate in a wider scope by adapting the Delaware School Climate Questionnaire-Student Version (DSCS-S) into a Mongolian context, as the instrument is a common tool to explore and evaluate school climate in different countries.

2. Material and Methods

2.1 Sample

It should be noted that the original sample consisted of 1,174 students enrolled in 6 schools in grades 3–12 from 5 regions of Mongolia. Among those students, 102 (8.7% of the sample) were removed because responses on demographic items (gender, grade, location) were incomplete. Hence, the participants for this study were 1,074 secondary school students, including 528 (49.2%) male and 546 (50.8%) female students who completed the school climate survey. There were 311 elementary students, 434 middle school students, and 329 high school students. Demographic information for each sample is shown in Table 1.

Table 1: Demographic information of the sample

	Elementary	Middle	High	Total
Gender				
Boys	153 (49.2%)	221 (50.9%)	154 (46.8%)	528 (49.2%)
Girls	158 (50.8%)	213 (49.1%)	175 (53.2%)	546 (50.8%)
Location				
City	105 (33.8%)	138 (31.8%)	104 (31.6%)	347 (32.3%)
Province	102 (32.8%)	145 (33.4%)	107 (32.5%)	354 (33.0%)
Soum	104 (33.4%)	151 (34.8%)	118 (35.9%)	373 (34.7%)

2.2 Measures

The questionnaire utilized in this study, known as DSCS-S, comprises 29 items that have been specifically designed to evaluate the various dimensions of school climate that were previously mentioned. These dimensions include Teacher-Student Relationship, which consists of 6 items, Student-Student Relationship, which consists of 12 items, and School Climate, which consists of 8 items. The perceived quality of student interactions with adults at school is known as teacher-student relationships. These relationships are determined by the adults' demonstration of warmth, respect, acceptance, and fairness. They also mirror students' perceptions of the quality of interactions with their peers, including friendliness and respect among them.

The assessment of rule fairness involves examining students' views on the fairness of school rules and the resulting consequences. Student behavior problems were tailored to gauge the extent to which students perceive issues such as fighting, hurting others, bullying, stealing, and cheating as problems within their school environment (e.g., "Stealing [drugs, fighting, etc.] is a problem at this school"). The School safety assessment offers insights into the overall sense of safety that students have in their school. The questionnaire intends to assess students' general feelings towards their school (Bear *et al.*, 2011).

The 26 items were assessed by students using a 4-item Likert scale, where 1 represents "Strongly Disagree," 2 represents "Disagree," 3 represents "Agree," and 4 represents "Strongly Agree." In order to calculate the overall school climate score, as well as scores for other factors and subscales, any items that indicated a negative school climate (such as "I wish I went to another school") were given a reverse score.

Researchers from the Mongolian National Institute for Educational Research conducted academic tests to assess students' academic performance in math and Mongolian. The data collected from the assessment were then utilized to examine criterion validity in this study.

2.3 Procedures

To translate the questionnaires from English to Mongolian, the Guidelines for Establishing Cultural Equivalence of Instruments (Ohrbach *et al.*, 2013) and International Guidelines for Test Use (International Test Commission, 2001) were followed. The questionnaires were independently translated by three translators from English into

Mongolian. After that, the translated three versions were reviewed by four experts who majored in 1) inclusive education, 2) psychosocial measurement, 3) Mongolian language, and 4) education studies to investigate content validity based on their professional experience.

The revised version was evaluated by eight experts from secondary schools: the National University of Mongolia, the Mongolian National University of Education, and the Mongolian National Institute for Educational Research. According to the Aiken scale, almost all the scores were above 0.9, indicating that the reliability of the translation was rated well (Aiken, 1985).

Students at six public schools in 1 city and 4 provinces in Mongolia completed the instruments, including Ulaanbaatar (two schools; city population of 1,539,810), Umnugovi (two schools; province population of 63,307), Selenge (two schools; province population of 108,768), Arkhangai (two schools; province population of 94,923), and Uvs (province population of 82,604). The study was conducted at the end of the first semester of the academic year. Written instructions were also given for the administration of the survey. To ensure confidentiality, students were told not to record their names or any identification numbers. However, items on the questionnaire asked students to identify their grade, location (city, province, soum), and gender. All surveys were completed in late November and early December, 2023.

2.4. Data Analyses

Descriptive statistics were calculated using the means, standard, deviations, minimums, and maximums of the school climate scale using SPSS 26.0. An independent-sample t-test was carried out to compare the means for gender, while an ANOVA test was carried out to compare the means across grade levels and the school's location.

Exploratory factor analysis (EFA) is a statistical method that enhances the reliability of scales by identifying items that can be eliminated and determining the dimensionality of constructs by examining the relationships between items and factors when there is limited information about dimensionality (Netemeyer *et al.*, 2003). Specific criteria for EFA are employed to evaluate the suitability of data for factor analysis and factor extraction. These criteria include the Kaiser-Meyer-Olkin (KMO) sampling adequacy test and the Berlett's sphericity test. A KMO value above .70 is considered favorable, while a value below .50 is deemed unsuitable. Additionally, it is recommended that the values of Bartlett's test be less than 0.05 (Kline, 2010).

The reliability of a measure is determined by its ability to consistently produce stable and consistent outcomes. Reliability testing plays a significant role as it examines the consistency among various aspects of a measurement tool (Hamed, 2016). To evaluate the reliability of each competency, we employed SPSS 26.0 to calculate all relevant Cronbach's alpha coefficients. These coefficients should surpass 0.70 to be considered reliable (Hair *et al.*, 2010). A coefficient between 0.7 and 0.9 is considered good, while a value above 0.9 is considered very good (Taber, 2016).

Following the application of EFA, a confirmatory factor analysis (CFA) was conducted to validate the 26 items of the School climate instrument using AMOS, version 26. The primary objective of CFA is to investigate the relationships among the latent and observed variables, which are supported by logic or theory (Schreiber *et al.*, 2006). CFA is employed to confirm a conceptual structure of the scale (Maruyama, 1998). The $\chi 2$(CMIN), $\chi 2/df$ (CMIN/DF), root mean square error of approximation (RMSEA), Tucker-Lewis index (TLI), comparative fit index (CFI), incremental fit index (IFI), normed fit index (NFI), goodness of index (GFI), and adjusted goodness-of-fit index (AGFI) were utilized to determine the best fit for CFA. $\chi 2/df$ value within the range of 2.0 to 5.0 is considered satisfactory for model recommendation (Tabachnick & Fidell, 2007; Miyejav *et al.*, 2023). If the RMSEA is below 0.06, it is assumed that the analyzed data exhibit reasonable reliability, while a value above 0.08 indicates the presence of specific errors (National School Climate Council, 2007). The cut-off values for an acceptable model fit are TLI, CFI, NFI, GFI, and AGFI above 0.9, and RMSEA below 0.8 (Miyejav *et al.*, 2022).

3. Results and Discussion

The data were examined for univariate outliers, and all items were tested for univariate normality. No problems were detected, and no outliers were omitted. The data were randomly split to conduct EFA on half of the sample ("the initial sample"). Following a factor solution, CFA was conducted on the initial sample to test model fit. Then the second half of the data was utilized to conduct another CFA. The size of the initial sample was 534 cases, and the second half was 534 cases (using listwise deletion). Then the criterion validity of the DSCQ was tested with the second half of the sample.

3.1 Exploratory Factor Analysis

EFA was conducted on the 26 items with varimax rotation using SPSS 26.0. The KMO measure confirmed the sampling adequacy for the analysis (KMO=.956). Bartlett's test of sphericity, X2=6752.531, p<.000, indicated that correlations between items were sufficiently large for the EFA. Based on the results of the analysis, it was assumed that the data in this study were appropriate to conduct EFA. The 534-student sample size was large enough for the EFA since it was greater than the recommended sample size (Comrey & Lee, 1992). As presented in Table 2, results from the EFA identified three factors, which were the same three factors as originally proposed by the school climate instrument (Bear *et al.*, 2011). Therefore, CFA on the second randomly selected half of the sample also generated robust fit statistics for the three factors.

Table 2: Descriptive statistics of each item and three-factor of the school climate instrument after factor reduction procedures

	Descriptive statistics		Factor		
	M	**SD**	**Factor 1**	**Factor 2**	**Factor 3**
SSR1	2.88	0.732	0.381		
SSR2	3.06	0.757	0.408		
SSR3	3.14	0.716	0.452		
SSR4	2.94	0.787	0.466		
SSR5	3.15	0.741	0.480		
SSR6	3.22	0.615	0.519		
SSR7	3.18	0.691	0.580		
SSR8	3.05	0.728	0.620		
SSR9	3.06	0.748	0.624		
SSR10	3.07	0.708	0.634		
SSR11	3.12	0.747	0.665		
SSR12	3.05	0.727	0.700		
TSR1	3.24	0.778		0.539	
TSR2	3.09	0.800		0.569	
TSR3	3.35	0.683		0.598	
TSR4	3.23	0.742		0.615	
TSR5	3.40	0.673		0.629	
TSR6	3.28	0.745		0.747	
FR1	3.14	0.784			0.727
FR2	3.24	0.761			0.630
FR3	3.29	0.675			0.581
FR4	3.08	0.756			0.559
FR5	3.15	0.725			0.383
FR6	3.18	0.748			0.596
FR7	3.21	0.726			0.325
FR8	3.29	0.691			0.409

3.2 Confirmatory Factor Analysis

The CFA was conducted on the second sample (N = 534) using AMOS 26 to test the three-factor school climate instrument provided by EFA. A summary of CFA model of the school climate instrument is presented in Table 3, which indicates that the original model fit six criteria, which was an acceptable model. Therefore, an additional covariance path between the error terms of items SSR1, SSR4, SSR5, and SSR6 that had the potential to improve the model fit was suggested by the modification index, and a minor improvement was observed after the error terms of items had been correlated. The final model was run after these error terms of items were correlated. According to the final model, all models fit all criteria and had an acceptable model fit (Table 3).

Table 3: Summary of CFA model of the school climate instrument

	p	2 / df	RMSEA	TLI	CFI	IFI	NFI
Acceptable value	.00	2-5	< .08	> .9	> .9	> .9	> .9
Original model	.00	2.884	.059	.891	.900	.900	.855
Adjusted model	.00	2.409	.051	.918	.927	.928	.883
Final model	0.00	2.243	.048	.932	.941	.942	.900

The CFA was verified as an excellent fit for the data (χ2=625,889, df=279, p= .00, RMSEA=.048, TLI=.932, CFI=.941, IFI=.942, NFI=.900, GFI=, AGFI=). Finally, the results of the CFA confirmed that the model fits the proposed model and the observed data. A summary of the fit statistics for the three-factor model with a full sample and sub-samples is presented in Table 4.

Table 4: Fit statistics between groups for three factor model

Model	N	χ2	df	CFI	SRMR	RMSEA
Full sample	1074	950.153	279	.943	.0331	.047
Elementary	311	676.531	279	.830	.0603	.068
Middle	434	606.385	279	.921	.0439	.052
High	329	596.695	279	.896	.0541	.059
City	373	542.787	279	.927	.0450	.050
Province	354	610.802	279	.925	.0423	.058
Soum	347	664.722	279	.906	.0464	.063
Boys	528	750.594	279	.923	.0403	.057
Girls	546	671.651	279	.933	.0403	.051

3.3 Correlations between Factors and Internal Consistency

To examine the relative independence of scores for the three sub-scales supported by the results of CFA, correlations among sub-scale scores were computed. As shown in Table 5, for all students combined, correlation coefficients ranged from .74 to .76 with a median of 0.75. Those results indicate that 42% (1-.0.762=0.42) to 45% (1-.742=0.45) of the variances in each sub-scale score is independent of the scores on the other sub-scales. All correlation coefficients were statistically significant at the .001 level.

Item analysis was conducted to test the reliability of each sub-scale and the reliability of the overall School-climate instrument. Cronbach's alpha coefficient for student-student relations was .890, fairness of rules was .842 and teacher-student relations was .838 indicating that all three sub-scales in this instrument had good reliability. Cronbach's alpha for the instrument overall was .942 which showed excellent internal consistency.

Furthermore, academic achievement correlation coefficients between sub-scale scores ranged from .20 to .30 (Table 5). This indicates that the sub-scales of school climate affect academic performance, resulting in the criterion validity of the instrument being achieved.

Table 5: Correlations between school climate and academic achievement

	1	2	3	4	5	6
1. Student-student relations	(.890)					
2. Fairness of rule	.76	(.842)				
3. Teacher-student relations	.75	.74**	(.838)			
4. Total scale	.92	.89	.88	(.942)		
5. Mathematics	.22	.23	.30	.27	-	
6. Mongolian language	.20	.18	.29	.23	.33	-
Values in parentheses are coefficients of internal consistency (Cronbach's alpha) for each sub-scale. All correlations are significant at $p<0.001$.						

Means and standard deviations for scores of sub-scales and achievement tests are reported in Table 6.

Table 6: Aggregated means and standard deviations of school climate and achievement data by school level

	Elementary		Middle and high		Full sample	
	M	SD	M	SD	M	SD
School climate scores	3.62	0.36	3.13	0.50	3.27	0.52
Teacher-Student Relations	3.38	0.42	2.94	0.46	3.06	0.49
Student-Student Relations	3.46	0.41	3.07	0.50	3.19	0.50
Fairness of Rules	3.35	0.31	2.97	0.38	3.08	0.40
Total School Climate	66.84	23.09	45.10	27.91	51.40	28.36
Mongolian language achievement	77.64	25.19	52.45	24.50	59.74	27.21
Math achievement	3.62	0.36	3.13	0.50	3.27	0.52

4. Conclusion

According to statistics from the Ministry of Education and Science in Mongolia, one-third of 700 schools have a school psychologist. Considering this, there is a need for school psychologists, social workers, and educators to have valid and reliable tools to assess school climate. To fill this gap in the field, the main objective of this study was to develop a brief and psychometrically solid instrument for school psychologists, social workers, and educators to assess the school climate in Mongolia. To achieve this objective, the Delaware School Climate Questionnaire (DSCQ), initiated by Delaware and his associates, was adapted into a Mongolian context.

According to the factor analysis results, the Mongolian version of DSCQ is best represented by the three-factor model, namely, Teacher-Student Relations, Student-Student Relations, and Fairness of Rules. Moreover, the Mongolian version of the DSCQ is uni-dimensional and has the potential to measure school climate in different cultures. Furthermore, Cronbach's alpha for the total scale and sub-dimensions showed sufficient psychometric properties. The criterion validity of the scale was established by its correlation with academic achievement tests for math and Mongolian.

In sum, the Mongolian version of DSCS was a valid and reliable tool to assess the school climate for Mongolian students at general education schools. From the perspective

of the reliability and validity of the instrument in different cultural contexts, it is believed that the current study is significant for its contribution to existing international literature.

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Conflict of Interest Statement
The authors declare no conflicts of interest.

About the Authors
Itgel Miyejav is a director of the Mongolian National Institute for Educational Research. He earned a B.S. from the National University of Mongolia in 1997, and an M.S. from the National University of Mongolia in 2001. He received his Ph.D. in Mathematics Education from the Moscow Pedagogical State University, Russia in 2007. His research interests span mathematics education, teaching and learning strategy, and education assessment and measurement. He can be contacted at email: itgel@mier.mn.
Erdenebaatar Bayasgalan works as a researcher at the Mongolian National Institute for Educational Research, where he has been since 2019. He earned a B.Ed. from Tomsk State Pedagogical University, Russia, in 2017 and a M.Sc. from the Mongolian National University of Education in 2020. His research interests span school climate, inclusive education, and the development of children with different needs. He can be contacted at email: bayasgalan@mier.mn.
Khajidmaa Otgonbaatar works as a research officer at the Mongolian National Institute for Educational Research, where he has been since 2013. He earned a B.Ed. from the Mongolian National University of Education in 2009, and a M.Sc. from the National Taichung University of Education, Taiwan in 2013. He received his PhD from Hiroshima University, Japan in 2021. His research interests span 21st century skills, education assessment and measurement, and curriculum studies. He can be contacted at email: otgonbaatar@mier.mn.

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