Sense of Belonging Scale Development and Viability

A Thesis
SUBMITTED TO THE FACULTY OF THE UNIVERSITY OF MINNNESOTA
BY

Tai Do

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

Dr. Geoffrey Maruyama
Dr. Michael Rodriguez
Dr. Martin Van Boekel

2021

Acknowledgements:

I want to thank Dr. Michael Rodriguez and the Minnesota Youth Development Research (Carlos, Rik, and many more) for their instrumental support in my academic and professional growth. I am a stronger quantitative researcher because of their support, mentorship, and guidance, for which this thesis would not have been possible. I am also grateful to my advisor, Dr. Geoffrey Maruyama, and the Social and Developmental Processes Research Lab, including Dr. Isabel Lopez-Hurtado, for the unwavering support that helped me in my training toward becoming an applied social psychologist in educational settings. Dr. Martin Van Boekel as well has been a pivotal mentor with their feedback and student-centered support. Finally, my family and colleagues, many of whom are one in the same as chosen family, are the ones who kept the light on in my heart as I navigate(d) this unrelentless academy. Thank you.

Abstract

A sense of belonging measure was developed using items from a large survey administered to students in 5th, 8th, 9th, and 11th grade in Minnesota. Validity evidence, via regression analyses, was obtained that supported the interpretation and use of the measure in an adolescent-student sample. Regression results showed that Students of Color, compared to White students, experienced lower levels of sense of belonging. Sense of belonging also appears to be associated with academic engagement and disengagement variables, however, the effects were more prominent for White students than for Students of Color.

Table of Contents

List of Tables

List of Figures

Differences in educational aspiration and attainment among secondary-education students from racially and ethnically diverse backgrounds in the United States are well documented. For example, in the High School Longitudinal Study administered to a representative sample of first-year high school students in 2009, 19.7% of Black/African American students and 21.2% of Hispanic students reported aspiring to complete a four-year degree, compared to 25.7% of Asian students and 29.5% of White students. Regarding educational attainment, from the same High School Longitudinal Study, 76% of Black/African American students and 78.7% of Hispanic students successfully acquired a high school diploma compared to 89.2% of Asian students and 87.1% of White students (HSLS:09). These patterns of differences in students' educational aspirations and attainment are found in post-secondary education as well. According to the 2018 Current Population Survey data results, Black students (51.8%), Asian students (52.2), and Hispanic students (53.5%) enrolled at four-year college institutions at a lower rate than White students (58%) (Bauman & Cranney, 2020).

In examining the causes for these differences, researchers have documented multiple negative structural, cultural, and individual factors that may contribute to the differences in educational aspirations and attainment for students from racial-minority backgrounds compared to racial-majority backgrounds. Some of these factors include weaker cultural values toward education, increased experience with perceived discrimination and stereotypes, recent immigration status/history, lack of parental resources, insufficient parental involvement, and lack of opportunities and resources available in school (Berwise & Mena, 2020; Kao & Thompson, 2003; Qian & Blair, 1999; Steele & Aronson, 1995; Turcios-Cotto & Milan, 2013). Concurrently, researchers have also investigated different positive intrapsychic and interpersonal mechanisms that may mitigate the impact of these structural, cultural, and individual factors on

students' educational success. For example, Wentzel (1999) identified different social-influence and motivational mechanisms that may function as potential facilitators of students' educational success. Wentzel posited that positive interpersonal interactions (e.g., supportive relationships with peers, teachers, and/or family members), may affect students' motivations to pursue school-related goals important to their educational success, such as learning new things. In another example, Tran and Lee (2010) for instance, examined the association between ethnic-racial socialization, namely, the efforts that parents or close adults make to prepare adolescents for interactions with members of ethnically and racially diverse groups, and students' social competence, a correlate of academic success. The researchers found that the association between ethnic-racial socialization and social competence was mediated by ethnic identity, which is an individual's social identity that is derived from their ethnic-group membership (Phinney, 1992). Tran and Lee's (2010) findings depict how preparedness for interacting with others and having firm knowledge of one's own identity, may be important buffering mechanisms that contribute to student success.

Sense of Belonging as a Psychosocial Mechanism

Another social-psychological mechanism that educational researchers have widely explored is sense of belonging. Sense of belonging, in an educational context (also referred to as school belonging), broadly refers to a student's psychological sense of school membership, namely, the extent to which students feel valued, appreciated, and supported by others in an academic setting (Goodenow, 1993). Educational researchers have identified students' perceived sense of belonging to be associated with adolescent students' academic success and overall well-being (Allen et al., 2018), especially for students from racial-minority backgrounds (Sánchez et al., 2005). Although having and perceiving a sense of belonging benefit students from all

backgrounds, students from racial-minority backgrounds nevertheless do differentially perceive and experience a sense of belonging compared to racial-majority students. Bottiani et al. (2016), for example, found that compared to White students, Black students reported lower levels of sense of belonging due to a higher likelihood of experiencing disciplinary consequences in school.

Examining students' sense of belonging is not a new practice (Anderman, 2003; Goodenow 1993). In recent years, however, increased interest in fostering students' social- and emotional-competencies has renewed educational researchers' interest in sense of belonging as an important construct and mechanism at the primary- and secondary-education levels (CASEL, 2020; Romero, 2018). This renewed interest in sense of belonging within an educational context also resurfaced various psychometric concerns with extant sense of belonging measures. For example, Slaten et al. (2019) argued that the Psychological Sense of School Membership scale (PSSM, Goodenow, 1993), although widely used, has potential issues related to scale-factor structure and internal validity. Slaten et al. (2019) additionally suggested that the PSSM captures only one relational dimension of sense of belonging (e.g., school belonging), and therefore may not be adequately capturing adolescent students' lived experiences with precision. Tovar and Simon (2010), although referring mainly to sense of belonging measures administered at the higher-education level, also put forth the argument that sense of belonging as a construct may be better represented as a multidimensional construct, encompassing multiple relational domains, than a unidimensional one.

This ontological dilemma, or psychometric concerns with extant sense of belonging measures, however, may potentially be a result of an epistemological issue; not only is there not a consensus on the dimensionality and validity evidence for extant sense of belonging measures,

but conceptualizations of sense of belonging differ as well (Allen & Bowles, 2012). Whereas Goodenow (1993), for example, suggested that students who perceive a sense of belonging feel that they are valued, appreciated, and supported by others, researchers like Niehaus et al. (2012) argued that a sense of belonging mainly refers to students' perception that they have existing positive relationships with adults in their environment. Anderson-Butcher and Conroy (2002) additionally posit that a sense of belonging is captured by three distinct aspects of commitment, engagement, and connectedness, and that feeling like one has a sense of belonging means feeling committed, engaged, and connected.

Although these conceptualizations do not vastly differ, the varying nuances (e.g., extant relationships versus perceived value and support) can complicate measure development by eliciting inconsistencies between theory and item(s). When conceptualization and measurement are mismatched, interpretation and generalization of students' sense of belonging scores subsequently become limited as well. Therefore, based on established knowledge that sense of belonging is important for adolescent students yet differentially perceived and experienced by students from different racial/ethnic backgrounds, and that conceptualizations and measurement of the sense of belonging construct are inconsistent, this research study seeks to start addressing the shortcomings in conceptualizations and measurement for sense of belonging as a psychosocial construct by using a large midwestern survey of adolescent 5th – 11th graders. In this research study, I first identify a comprehensive conceptualization of sense of belonging that draws from prominent literature in the fields of social psychology and education. Second, using the Minnesota Student Survey (MSS, 2016), I develop an initial sense of belonging measure for adolescent students using my proposed conceptualization. Finally, I provide validity evidence,

using regression methods, to assess the viability and dimensionality of the initial sense of belonging measure, as well as its interpretation and use for an adolescent-student sample.

A Conceptual Framework for Sense of Belonging

In social psychology, researchers have largely used Baumeister and Leary's (1995) conceptualization of sense of belonging, or the belongingness hypothesis, to guide their understanding and research. According to Baumeister and Leary, humans have a pervasive drive to form and maintain long-lasting, positive, and significant interpersonal relationships. Furthermore, the researchers argued that humans also need frequent and affectively pleasant interactions with others to feel as if they have a sense of belonging. This involves seeking out and having stable and affective concern for each other's welfare. Within this framework, sense of belonging represents a fundamental human motivation given that the absence of a perceived sense of belonging can lead to negative effects on an individual's mental and physical health.

The belongingness hypothesis has been used as a framework, stemming from an interpersonal-relationships perspective, by social-psychological researchers to understand an individual's motivational need to belong (Leary et al., 2013). The application of the belongingness hypothesis in an educational context, compared to in a social-psychological context, however, has been infrequent. For example, Chhuon and Lebaron Wallace (2014), informed by the belongingness hypothesis, found that a sense of belonging for high-school students meant feeling known (e.g., cared for) by relevant supportive actors in the students' school environment. Slaten et al. (2019) also extended the belongingness hypothesis to an educational context, arguing that students seek a sense of belonging in a variety of relational domains (e.g., peers, teachers, and family), and that each domain contributes considerably to students' sense of belonging and well-being.

For Kindergarten to grade-12 (K-12) educational researchers (Allen, 2003; Anderman, 2003; Feinauer Whiting et al., 2018; Huges et al., 2015; Ma, 2003), compared to social-psychological researchers, Goodenow's (1993) conceptualization of sense of belonging in an educational context has been used most frequently. Goodenow defined sense of belonging as the extent to which students feel personally accepted, respected, included, and supported by others. Goodenow's framework for sense of belonging captures both intrapsychic concerns of being valued (e.g., accepted and respected) and interpersonal concerns of perceiving supportive relationships from peers and teachers. Although not a direct extension, more recent conceptualizations of sense of belonging in an educational context, for instance by Arslan and Duru (2017), have focused on similar intrapsychic concerns. Arslan and Duru conceptualized sense of belonging in an educational context as a construct important to the self, in which students' perception of sense of belonging means that they perceive themselves (and others perceive them) as meaningful and important actors in their academic settings.

Although sense of belonging conceptualization differs across social-psychological and educational literatures, there are important complementary elements that can be drawn from both disciplines to inform researchers on what a sense of belonging means for adolescent students. It is evident, consistently, across social-psychological and educational disciplines that interpersonal relationships are crucial to students' sense of belonging. In addition to having positive and important interpersonal interactions, students must also view themselves, from an intrapsychic perspective, as integral to their environment, and as such feel either valued, appreciated, accepted, and/or supported by others with whom they are connected with in their environment. Informed by the conceptual frameworks from both social-psychological and educational disciplines, and in particular the converging definitions of sense of belonging among the

different conceptual frameworks, I define sense of belonging as a student's perception that they are integral in an environment in which they are connected with supportive others who value, appreciate, accept, and respect them. This conceptual framework drives my scale construction and validation, and subsequently informs the following research questions:

Research Questions

1. Are there items in the Minnesota Student Survey that align with the sense of belonging conceptual framework?
2. Is the theorized sense of belonging factor structure of identified items supported by the data?
3. To what extent does students' sense of belonging differ by race/ethnicity?
4. To what extent is students' sense of belonging associated with skipping school, skipping class, participation in three or more activities a week, and self-reported positive experiences?
    a. Do the associations differ by students' race/ethnicity?

Methodology

Instrument

The data come from the 2013 and 2016 administration of the Minnesota Student Survey (MSS; MDE, 2016). The MSS Interagency team provided full access of the MSS database to the Minnesota Youth Development Research Group (MYDRG), from which I received access to perform secondary analyses. The MSS was designed by Minnesota 's Departments of Education, Health, Human Services, and Public Safety, and includes Search Institute's Developmental Asset Profile (DAP; Search Institute, 2013). It is triennially administered to 5th, 8th, 9th, and 11th grade public school students. The purpose of the MSS is to monitor important trends in students'

habits, experiences, and beliefs about positive and risky behaviors. Psychometrics of the MSS for the 2013 and 2016 data have been extensively documented, in which analyses examining factor structure, scaling, scoring, and item bias were conducted to ensure that students were comparable across grade and survey administrations (e.g., year) (Rodriguez, 2017).

Participants

The participants were 225,873 students in grades 8 (n = 79,501), 9 (n = 79,148), and 11 (n = 67,224) who participated in the 2013 and 2016 administration of the MSS. Students in grade 5 were not included in this sample because they did not receive the same survey questions as those in grades 8, 9, and 11. For scale-calibration purposes, and to examine differences in students' perceptions on various psychosocial constructs across administration years, 2013 and 2016 data were merged by the MYDRG. Students' self-identified racial/ethnic backgrounds were American Indian, Asian, Black, Hmong, Latino, Multiple Races, Somali, and White. Hmong and Somali are distinct groups that have been disaggregated from Asian and Black groups respectively, such that students who identified as Hmong are separated from the Asian sample and students who identified as Somali are separated from the Black sample. This decision was made by the MSS Interagency Team to better understand the educational experiences of specific communities within Minnesota. I report the demographic information from this sample of students in Table 1.

Table 1

Student Characteristics: Proportions by Grade and Race/Ethnicity

Characteristic	*n* (%)
Grades	
8th	79,501 (35%)
9th	79,148 (35%)
11	67,224 (30%)
Total	225,873
Race/Ethnicity	
American Indian	10,686 (4.7%)
Asian	7,333 (3.2%)
Black	8,974 (4.0%)
Hmong	5,891 (2.6%)
Latino	18,344 (8.1%)
Multiple Races	7,482 (3.3%)
Somali	2,726 (1.2%)
White	164,437 (73.0%)
Total	225,873

Overarching Procedure

In this study, I investigated the structure of a sense of belonging factor using students' responses to various items on the MSS. I selected MSS items that aligned with my conceptual framework. I then obtained validity evidence in support of the viability, interpretation, and use of the sense of belonging measure. This investigation used my proposed sense of belonging conceptualization, in which students perceive a sense of belonging when they perceive being connected with supportive others who value, appreciate, accept, and respect them.

First, I identified 7 items within the MSS that were consistent with my conceptual framework. Second, I conducted confirmatory factor analysis (CFA) in R (RStudio, 2020) to examine the commonalities between the 7 items to identify a latent factor of sense of belonging. Third, after confirming adequate fit statistics from the CFA results, I created Rasch scores for the

sense of belonging factor using the Partial Credit Rasch Model (PCRM) in Winsteps (Linacre, 2016). The PCRM specifies that each item has its own rating scale structure (e.g., person locations and item difficulties), which more effectively allows for the measurement of a construct over time. Additionally, the PCRM accounts for the polytomous nature of item response options among the chosen items, compared to traditional Rasch models that are limited to binary item-response options in scope (de Ayala, 2013). Fourth, I standardized the sense of belonging Rasch scores in order to make between-group comparisons (due to the scores being on the same metric) among students from different racial/ethnic backgrounds. Finally, I investigated the validity evidence for the sense of belonging measure by examining within students' race/ethnicity the association of the sense of belonging scores with relevant variables indicative of convergent or discriminant validity of the scale.

Item Selection

Of the 112 items in the MSS that inquired about family, schooling, health, and various behaviors and activities, I identified 7 items that aligned with my conceptualization of sense of belonging (i.e., being connected with supportive others who value, appreciate, accept, and respect them; RQ.1). The item stem and item-response options for the 7 items are in Table 2. Items 1, 2, and 3 reflect the extent to which parents, friends, and other adults in a students' community care about them. These first three items are consistent with my conceptual framework, exemplifying that to feel like they have a sense of belonging, students must perceive that they are cared for (e.g., valued, respected, and accepted) by supportive actors in their environment. Item 4 captures students' overall perception of how stable their life is, and thus, the extent to which their needs are met. Items 5 and 7 are consistent with my conceptual framework in that they reflect students' perception of existing relationships alongside items 1-3. Finally,

item 6 was included because it directly reflects students' perception of feeling integral, or valued and appreciated, in their environment.

Table 2

Item Stem and Item Response Options for Sense of Belonging Items

Factor	Label	Scaling
SOB1	How much do you feel your parents care about you?	1 = Not at all; 5 = Very much
SOB2	How much do you feel friends care about you?	1 = Not at all; 5 = Very much
SOB3	How much do you feel adults in your community care about you?	1 = Not at all; 5 = Very much
SOB4	I feel in control of my life and future.	1 = Not at all or rarely; 4 = Extremely or almost always
SOB5	I build friendships with other people.	1 = Not at all or rarely; 4 = Extremely or almost always
SOB6	I feel valued and appreciated by others.	1 = Not at all or rarely; 4 = Extremely or almost always
SOB7	I accept people who are different from me.	1 = Not at all or rarely; 4 = Extremely or almost always

Results

Scale Construction and Confirmatory Factor Analysis

223,852 students in grades 8, 9, and 11 who responded to the MSS were included in the total sample. To conduct the CFA, I used the Lavaan package (Rosseel, 2012) in R. I followed common guidelines for adequate fit indices, including RMSEA <.10, and CFI and TLI >.90 (Brown, 2015; Kline, 2011). Although Kline (2015) proposed that standardized factor loadings should be >.70, the guideline may be too rigid for an educational context. Therefore, I followed Brown's (2015) guidelines that suggested standardized factor loadings >.40 are appropriate to capture a factorial structure. Due to polytomous nature of the item response options across the 7 items, I used diagonally weighted least squares estimation (DWLS) in order to specify the 7

rating scale items as ordinal in the CFA (Li, 2016). I then used theta parameterization to estimate my CFA results, for theta parameterization, compared to delta parameterization, freely estimates the residual variance (Muthén & Asparouhov, 2002). Finally, as a default in the Lavaan package in R, the first congeneric variable for the factor (item 1) was fixed to a 1.0 loading as a reference indicator.

Scale Construction Results

Scale-construction results suggested that the hypothesized model fits well to the data (RQ.2). Of the original sample, my hypothesized model converged using a sample of 225,643 students. The fit indices and factor loadings are reported in Tables 3 and 4. Overall, the CFA fit indices and factor loadings supported the use of the 7 items as indicators of a latent sense of belonging factor, where $x^2(14, N = 225{,}643) = 12{,}128.789$, $p < 0.001$, CFI = 0.977, TLI = 0.966, and RMSEA = 0.085 (90% confidence interval [CI] = 0.084, 0.086). Although the chi-square goodness-of-fit test was significant, reflecting the large sample size (Kline, 2015), the fit indices supported the adequacy of the model. Most of the item loadings were above 0.65, which fit the criteria posited by Brown (2015), except for item 7: I accept people who are different from me. Item 7 had a factor loading of 0.41. Despite affecting the overall structure of the sense of belonging factor, item 7 was included because it is consistent with my conceptual framework, as the capacity to accept others, especially those who identify differently from oneself, is closely related to feeling that one is accepted by others (e.g., relational value; Leary, 2005). Further, item 7's inclusion did not appear to significantly impact my results. The results from my CFA provided empirical support for a sense of belonging factor based on the 7-item hypothesized simple structure model, indicating that Rasch scores can be generated using the 7 items.

Table 3

Item Factor Loadings for Latent Sense of Belonging Factor

Item	*Factor Loadings*
SOB1	0.703
SOB2	0.719
SOB3	0.706
SOB4	0.669
SOB5	0.712
SOB6	0.850
SOB7	0.411

Table 4

CFA Fit Statistics for Latent Sense of Belonging Factor

Fit Statistics	
RMSEA	0.085
CFI	0.977
TLI	0.966

Scale Interpretation and Use Validation

Initial Validation Analyses

Rasch Scores. To generate the sense of belonging Rasch scores, I used the Partial Credit Rasch Model (PCRM) in Winsteps (Linacre, 2016), and specifically the Joint Maximum Likelihood Estimation (JMLE) method. Using Rasch scaling and the JMLE method allowed me to estimate persons (i.e., person abilities) and items (i.e., item difficulties) concurrently. The PCRM allows each item to have its own structure (given the ordinal nature of the response scales) and places persons and items onto the same scale so that they are statistically equivalent regardless of persons or items analyzed from the same population. Thus, the generated Rasch

scores can be interpreted across persons, items, and constructs even when the item response options for each item that comprise the sense of belonging factor differ (e.g., 1 - 4 versus 1 - 5). Finally, I standardized the sense of belonging Rasch scores for use in subsequent validity evidence analyses.

Initial Validation Design. To obtain initial validity evidence, I computed descriptive statistics for my proposed sense of belonging factor model. I first inspected the intercorrelations of the items that comprise the sense of belonging measure. Second, I checked the distribution of sense of belonging scores across the entire 2013 and 2016 sample. Finally, I used regression methods to examine differences in students' reported sense of belonging scores as a function of their race/ethnicity (Model 1).

Initial Validation: Independent Variables. Student's race/ethnicity was used as a predictor, for differences in sense of belonging by students' race/ethnicity have been well documented (Bottiani et al., 2017; Sánchez et al., 2005). Race/ethnicity categories were dummy-coded and assigned a separate value for each category (e.g., American Indian, Yes = 1, no = 0).

Initial Validation: Dependent Variables. To measure students' sense of belonging, I generated Rasch scores for the sense of belonging factor based on theoretically consistent items. The sense of belonging Rasch scores were generated using the PCRM and, post-standardization, range from -4.0 to 4.0. Generating Rasch scores using the PCRM allows for more precise measurement of the construct as the model accounts for the ordinal nature of the item response options (Boone & Noltemeyer, 2017). On the Rasch logit metric, a more positive score indicates a person who perceives strong sense of belonging. Conversely, a less positive (and more negative) score indicates a person who perceives weak sense of belonging.

Initial Validation Results. For most of the sense of belonging items, the intercorrelations are moderate-to-strong and statistically significant ($p < 0.05$; see Table 5). However, the intercorrelations between item 7 and the other sense of belonging items are weak-to-moderate in strength, which is consistent with the factor loading results. The distribution of the standardized sense of belonging Rasch scores is reported in Figure 1 in continuous Rasch logit metric, ranging from -4.0 to 4.0. The standardized sense of belonging Rasch scores appear normally distributed. Students' endorsement of sense of belonging varied, with scores mostly clumped within 2 standard deviations.

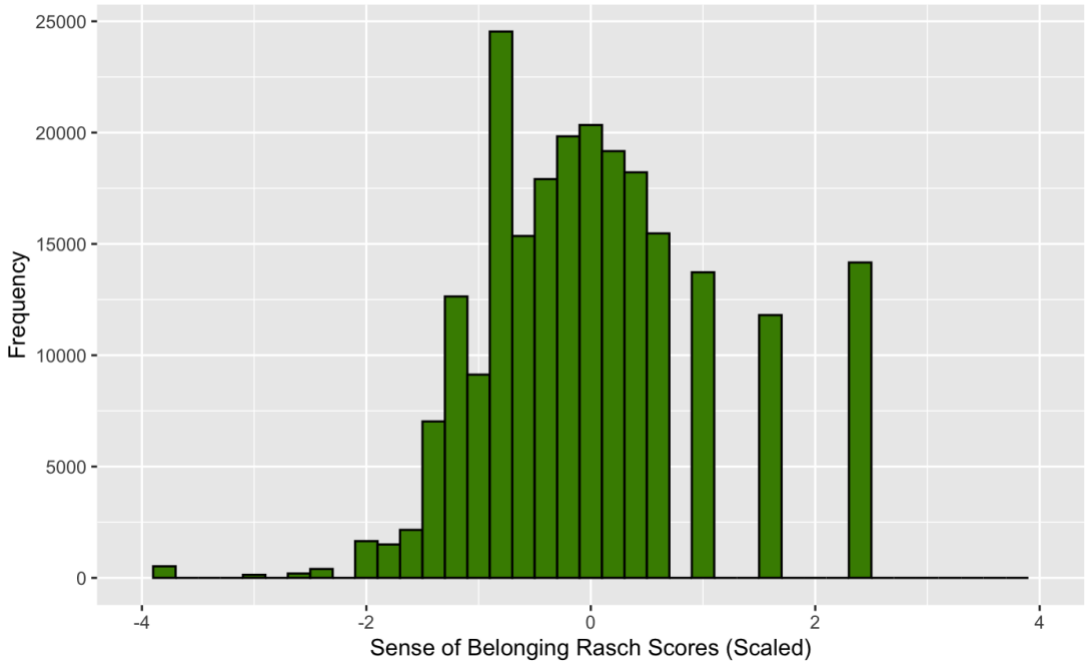
Table 5

Correlations among Sense of Belonging Items

	1.	2.	3.	4.	5.	6.
SOB1: Parents care	-					
SOB2: Friends care	.41**	-				
SOB3: Adults in community care	.40**	.49**	-			
SOB4: Control of life and future	.40**	.34**.	.38**	-		
SOB5: Build friendships	.30**	.44**	.41**	.43**	-	
SOB6: Feel valued and appreciated	.43**	.52*	.51**	.52**	.54**	-
SOB7: Accept people different	.17**	.22*	.19**	.20**	.30**	.30**

Figure 1

Distribution of Sense of Belonging Rasch Scores



Note. The distribution is in Rasch logic metric from -4.0 to 4.0. Sense of Belonging Rasch scores were standardized.

Standardized means and standard deviations are reported in Table 6. The linear regression results for Model 1 (Table 7) indicated that compared to White students, students from all other racial- or ethnic-minority groups reported lower levels of sense of belonging, except for Somali students (β = 0.09, p = <0.001). The R^2 for Model 1 is 0.02, which albeit small, provides necessary nuance into the complexity of students' sense of belonging, for there may be other group-based factors that impact students' perception of sense of belonging in addition to race/ethnicity. Overall, the descriptive results, as well as the results from Model 1, provide evidence that students' levels of sense of belonging significantly differed by race/ethnicity (RQ.3). However, differences in average sense of belonging Rasch scores by

race/ethnicity are insufficient to qualify the sense of belonging measure's viability and use, for standardized mean differences may be a facet of the group versus a facet of the actual measure itself. Therefore, I obtained additional validity evidence, using regression models that examined sense of belonging with variables associated with high or low sense of belonging, to validate measure interpretation and use.

Table 6

Mean and Standard Deviations of Sense of Belonging by Race/Ethnicity

	M	*SD*
Overall	0	1
Race/Ethnicity		
American Indian	-0.28	0.96
Asian	-0.08	0.99
Black	-0.08	1.04
Hmong	-0.37	0.83
Latino	-0.21	0.97
Multiple Races	-0.13	0.97
Somali	0.16	1.24
White	0.07	1.00

Note. All differences are statistically significant. Range of scores is from -4 to 4. Sense of belonging Rasch scores were standardized.

Table 7

Linear Regression Results of Sense of Belonging by Race/Ethnicity

	Estimate	SE	t	p	R2
Model 1					0.02
(Intercept)	0.07				
American Indian	-0.34	0.01	-34.41	***	
Asian	-0.14	0.01	-11.98	***	
Black	-0.14	0.01	-13.32	***	
Multiple Race	-0.19	0.01	-16.55	***	
Latino	-0.27	0.01	-35.54	***	
Somali	0.09	0.02	4.75	***	
Hmong	-0.43	0.01	-33.01	***	

Note. Reference group is White. Sense of belonging Rasch scores were standardized. t-values represent number of standard errors away from 0.

Main Statistical Analysis using Hierarchical Multiple Regression

I employed hierarchical logistic and linear regression methods to confirm expected associations with the sense of belonging measure. The MSS includes variables depicting outcomes, such as academic disengagement (e.g., skip school and skip class), academic engagement (e.g., participate in afterschool activities three or more times), and self-reported positive experiences. For each of the outcome variables, I included sense of belonging first as a primary predictor variable (first model), followed by race/ethnicity as a secondary predictor variable (second model), and then the sense of belonging and race/ethnicity interaction as a third predictor variable in the final model. I then used the Akaike Information Criterion (AIC; Vrieze, 2012) to select the best fitting model given the sample of models. I used logistic regression to compute odds ratios, or the likelihood of participating in each activity, using sense of belonging, for the outcome variables of skipping school, skipping class, and participation in afterschool activities three or more times. I used linear regression to examine students' self-reported positive

experiences as a function of their sense of belonging. The models for each outcome variable can be found in Table 8.

Table 8

Sense of Belonging Models by Outcome Variable

Models	Description
Skipping School (Table 9)	
Model 2	**IV:** Sense of Belonging **DV:** Skip School
Model 3	**IV:** Sense of Belonging + Race/Ethnicity **DV:** Skip School
Model 4	**IV:** Sense of Belonging + Race/Ethnicity + Sense of Belonging x Race/Ethnicity **DV:** Skip School
Skipping Class (Table 10)	
Model 5	**IV:** Sense of Belonging **DV:** Skip Class
Model 6	**IV:** Sense of Belonging + Race/Ethnicity **DV:** Skip Class
Model 7	**IV:** Sense of Belonging + Race/Ethnicity + Sense of Belonging x Race/Ethnicity **DV:** Skip Class
Participate 3+ (Table 11)	
Model 8	**IV:** Sense of Belonging **DV:** Participate 3+
Model 9	**IV:** Sense of Belonging + Race/Ethnicity **DV:** Participate 3+
Model 10	**IV:** Sense of Belonging + Race/Ethnicity + Sense of Belonging x Race/Ethnicity **DV:** Participate 3+
Positive Experience (Table 12)	
Model 11	**IV:** Sense of Belonging **DV:** Positive Experience
Model 12	**IV:** Sense of Belonging + Race/Ethnicity **DV:** Positive Experience
Model 13	**IV:** Sense of Belonging + Race/Ethnicity + Sense of Belonging x Race/Ethnicity **DV:** Positive Experience

Main Analysis: Independent Variables. The independent variables were students' sense of belonging Rasch scores, race/ethnicity, and the interaction between students' sense of belonging Rasch scores and their race/ethnicity. Sense of belonging Rasch scores were continuous scores that range from -4.0 to 4.0. A higher score indicates a person who perceives a strong sense of belonging, whereas a lower score indicates a person who perceives a weak sense of belonging. As noted earlier, race/ethnicity categories were dummy coded as separate variables.

Main Analysis: Dependent Variables. I selected outcomes, available as variables in the MSS, that previous researchers have identified as associated with students' sense of belonging and/or with academic outcomes, including academic disengagement (negatively associated; Wang & Eccles, 2012) measured by skipping school and skipping class in the last 30 days and academic engagement (positively associated; Zaff et al., 2003) measured by participation in afterschool activities at least 3 times per week. Students' self-reported positive experiences were included as well, for high sense of belonging scores would be incongruent with low self-reported positive experiences scores. Whereas students' positive experiences were scored as a continuous Rasch score based on positive outcomes of participation in educational spaces (provided by the MSS agency team), skipping school (1 = yes, 0 = no), skipping class (1 = yes, 0 = no), and participating in three or more activities per week (1 = yes, 0 = no) were dichotomized.

Main Analysis: Results. According to the AIC values, the best fitting model of the sample of models available, for each of the outcome variables, was the model with the interaction effects (i.e., models 4, 7, 10, and 13 in table 8). The R^2 values across all the models were small. However, the models with the interaction effects explained more variance than the models without the interaction effects.

Skipping School. For the associations between skipping school as a function of sense of belonging and race/ethnicity, the interaction effects were all statistically significant at $p = <0.001$ except for the interaction between sense of belonging and identifying as a multi-racial student, which was significant at $p = <0.01$ (see Table 9, model 4). The interaction effects illustrate that the likelihood of skipping school as a function of sense of belonging varied for students from each different racial/ethnic minority backgrounds compared to White students (Figure 2). Further, sense of belonging appeared to be a mitigating mechanism. For example, the main effect odds ratio of skipping school for Hmong students is OR = 3.17, whereas the interaction effect odds ratio between having a sense of belonging and identifying as a Hmong student is OR = 1.43. Notably, the interaction effect odds ratio for skipping school was different when comparing Hmong students with Asian students and Somali students with Black students. Hmong students (OR = 1.43), for example, had a higher interaction effect (and in fact the highest) odds ratio than Asian students (OR = 1.28). Additionally, Somali students (OR = 1.24) had a lower interaction effect odds ratio than Black students (OR = 1.34). Overall, students of color were more likely to skip school than White students (i.e., scores had OR > 1.0), however, sense of belonging appeared to lessen the odds ratio discrepancies (i.e., the values moved closer to OR = 1.0) between students of color and White students.

Table 9

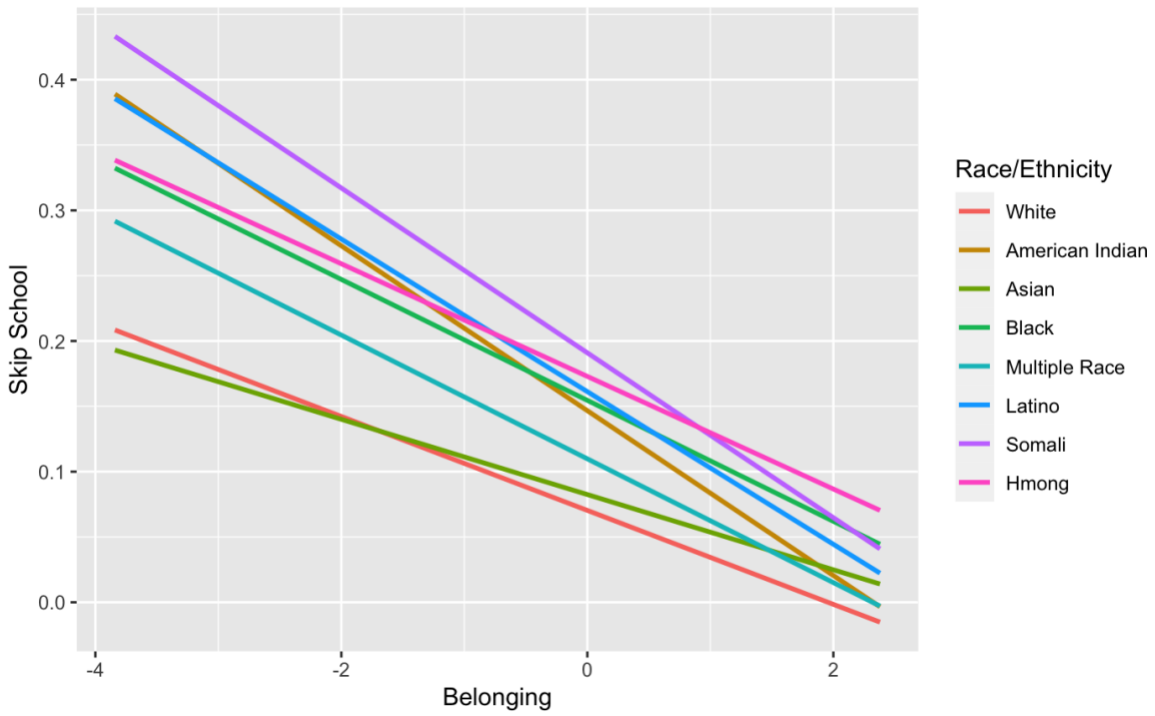
Logistic Regression Results of Skipping School on Sense of Belonging

	Estimate	SE	z	p	AIC	R2
Model 2					131,958.60	0.04
(Intercept)	0.09					
Belonging	0.54	1.01	-71.64	***		
Model 3					128,803.30	0.06
(Intercept)	0.07					
Belonging	0.57	1.01	-65.679	***		
American Indian	2.29	1.03	29.18	***		
Asian	1.18	1.04	3.799	***		
Black	2.41	1.03	28.241	***		
Multiple Race	1.64	1.04	13.087	***		
Latino	2.55	1.02	42.072	***		
Somali	3.14	1.05	21.701	***		
Hmong	2.65	1.04	27.651	***		
Model 4					128,627.70	0.07
(Intercept)	0.06					
Belonging	0.52	1.01	-57.208	***		
American Indian	2.44	1.03	26.583	***		
Asian	1.30	1.05	5.603			
Black	2.70	1.03	30.287	***		
Multiple Race	1.74	1.04	12.934	***		
Latino	2.79	1.03	41.206	***		
Somali	3.36	1.05	22.795	***		
Hmong	3.17	1.04	28.032	***		
Belonging x American Indian	1.15	1.03	4.281	***		
Belonging x Asian	1.28	1.05	4.948	***		
Belonging x Black	1.34	1.03	9.059	***		
Belonging x Multiple Race	1.15	1.05	3.17	**		
Belonging x Latino	1.23	1.03	8.14	***		
Belonging x Somali	1.24	1.05	4.82	***		
Belonging x Hmong	1.43	1.05	8.033	***		

Note* Odds-Ratios are reported. Pseudo R2 is McFadden's non-adjusted. Reference group is White. Sense of belonging Rasch scores were standardized. Z-scores are in log-odds.

Figure 2

Visualization of Skipping School on Belonging by Race/Ethnicity



Skipping Class. For the associations between skipping class as a function of sense of belonging and race/ethnicity, the interaction effects were all statistically significant at p = <0.001 (see Table 10). The interaction effects demonstrate that the likelihood of skipping class as a function of sense of belonging varied for students from each different racial/ethnic minority backgrounds compared to White students (Figure 3). Further, for skipping class, like skipping school, sense of belonging appeared to also be a mitigating mechanism. For example, the main effect odds ratio of skipping class for Hmong students is OR = 2.18, whereas the interaction effect odds ratio between having a sense of belonging and identifying as a Hmong student is OR = 1.44. Additionally, the interaction effect odds ratio for skipping class was different when comparing Hmong students with Asian students and Somali students with Black students.

Hmong students, for example, had a higher interaction effect odds ratio (OR = 1.44) than Asian students (OR = 1.19). Somali students (OR = 1.28), compared to Black students (OR = 1.30), had a lower interaction effect odds ratio. Although students of color were more likely to skip class than White students, sense of belonging appeared to lessen the odds ratio discrepancies between students of color and White students within the context of skipping class as well.

Table 10

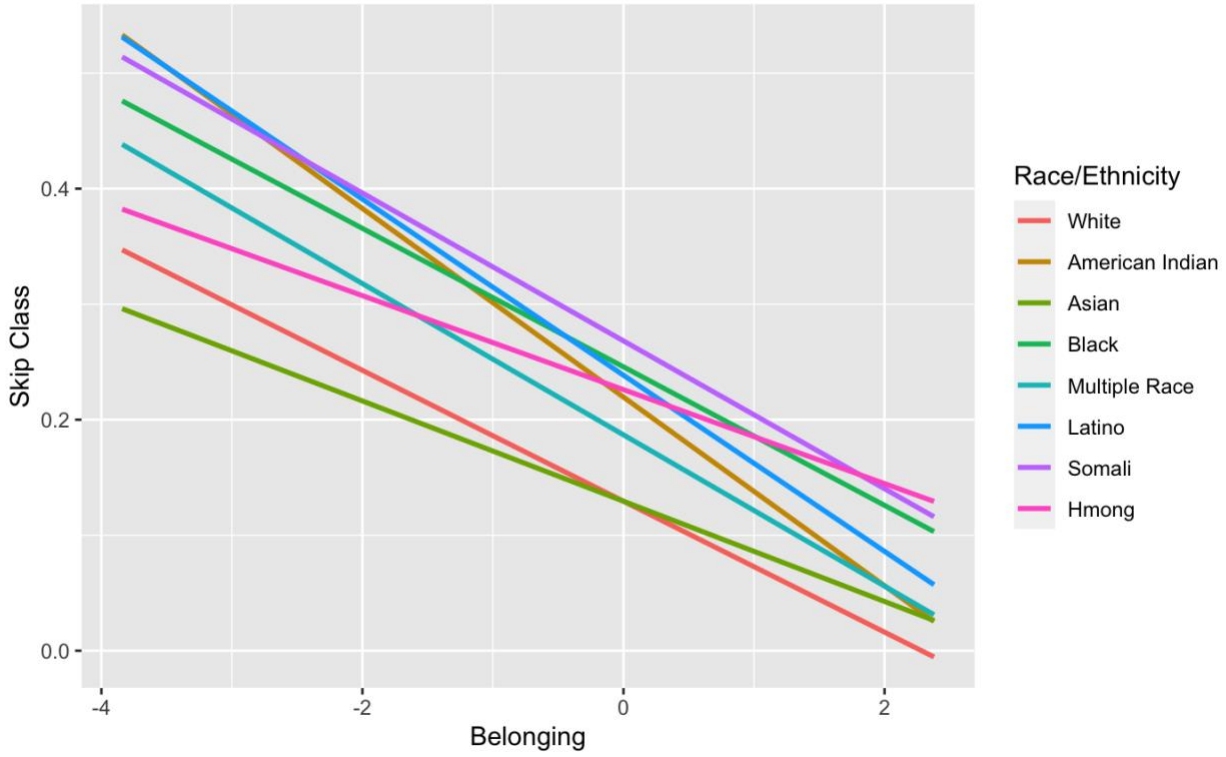
Logistic Regression Results of Skipping Class on Sense of Belonging

	Estimate	SE	z	p	AIC	R2
Model 5					185,639.50	0.04
(Intercept)	0.16					
Belonging	0.57	1.01	-81.71	***		
Model 6					182,648.00	0.05
(Intercept)	0.14					
Belonging	0.59	1.01	-76.5	***		
American Indian	1.92	1.02	26.75	***		
Asian	0.99	1.04	-0.23			
Black	2.21	1.03	30.3	***		
Multiple Race	1.56	1.03	14.45	***		
Latino	2.13	1.02	39.82	***		
Somali	2.54	1.05	20.19	***		
Hmong	1.85	1.03	19.17	***		
Model 7					182,440.80	0.06
(Intercept)	0.13					
Belonging	0.55	1.01	-67.581	***		
American Indian	1.98	1.03	24.66	***		
Asian	1.05	1.04	1.34	*		
Black	2.38	1.03	32.455	***		
Multiple Race	1.63	1.03	14.716	***		
Latino	2.25	1.02	39.241	***		
Somali	2.66	1.05	21.463	***		
Hmong	2.18	1.04	21.512	***		
Belonging x American Indian	1.10	1.03	3.438	***		
Belonging x Asian	1.19	1.04	4.265	***		
Belonging x Black	1.30	1.03	9.675	***		
Belonging x Multiple Race	1.14	1.04	3.782	***		
Belonging x Latino	1.17	1.02	7.051	***		
Belonging x Somali	1.28	1.04	6.5	***		
Belonging x Hmong	1.44	1.04	9.11	***		

Note* Odds-Ratios are reported. Pseudo R2 is McFadden's non-adjusted. Reference group is White. Sense of belonging Rasch scores were standardized. Z-scores are in log-odds.

Figure 3

Visualization of Skipping Class on Belonging by Race/Ethnicity



Participate 3. For the associations between participation in afterschool activities at least 3 times per week as function of sense of belonging and race/ethnicity, the interaction effects were all statistically significant at p = <0.001, except for the interaction between sense of belonging and identifying as an American Indian student, which was significant at p = <0.01 (see Table 11, model 10). The interaction effects showed that the likelihood of participating in afterschool activities at least 3 times per week as a function of sense of belonging varied for students from each different racial/ethnic minority backgrounds compared to White students (Figure 4). For the participation in afterschool activities at least 3 times per week variable, sense of belonging appeared to be a bolstering, versus a mitigating, mechanism. For example, the main effect odds ratio of participation in afterschool activities at least 3 times per week for Hmong

students is OR = 0.41, whereas the interaction effect odds ratio between having a sense of belonging and identifying as a Hmong student is OR = 0.79. The interaction effect odds ratio for participation in afterschool activities at least 3 times per week was different when comparing Hmong students with Asian students and Somali students with Black students. Hmong students (OR = 0.79), for example, had a lower interaction effect odds ratio than Asian students (OR = 0.90). Additionally, Somali students (OR = 0.71) had a lower interaction effect odds ratio (in fact the lowest) than Black students (OR = 0.77). Overall, within the context of participation in afterschool activities at least 3 times per week, students of color were less likely to participate in afterschool activities at least 3 times per week than White students, however, sense of belonging appeared to lessen the odds ratio discrepancies between students of color and White students as well.

Table 11

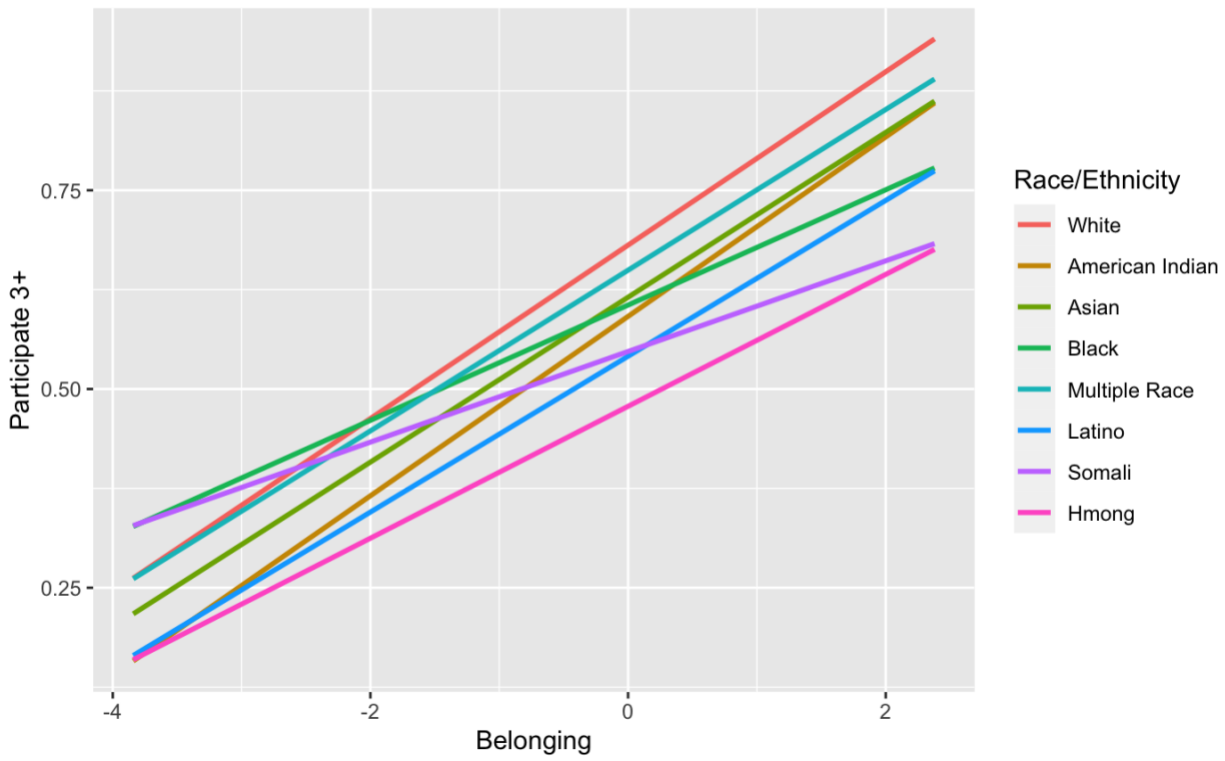
Logistic Regression Results of Participation in 3+ After School Activities on Sense of Belonging

	Estimate	SE	z	p	AIC	R2
Model 8					278,719.10	0.04
(Intercept)	1.97					
Belonging	1.73	1.01	106.5	***		
Model 9					276,057.10	0.05
(Intercept)	2.24					
Belonging	1.69	1.01	101.543	***		
American Indian	0.67	1.02	-19.364	***		
Asian	0.74	1.03	-11.861	***		
Black	0.72	1.02	-14.469	***		
Multiple Race	0.87	1.03	-5.714	***		
Latino	0.55	1.02	-37.434	***		
Somali	0.53	1.04	-15.813	***		
Hmong	0.44	1.03	-30.334	***		
Model 10					275,759.00	0.05
(Intercept)	2.26					
Belonging	1.78	1.01	91.695	***		
American Indian	0.66	1.02	-18.818	***		
Asian	0.73	1.03	-12.289	***		
Black	0.69	1.02	-16.456	***		
Multiple Race	0.85	1.03	-6.236	*		
Latino	0.53	1.02	-38.664	***		
Somali	0.54	1.04	-15.749	***		
Hmong	0.41	1.03	-30.613	***		
Belonging x American Indian	0.93	1.02	-3.258	**		
Belonging x Asian	0.90	1.03	-3.583	***		
Belonging x Black	0.77	1.02	-11.449	***		
Belonging x Multiple Race	0.91	1.03	-3.42	***		
Belonging x Latino	0.85	1.02	-9.195	***		
Belonging x Somali	0.71	1.03	-10.407	***		
Belonging x Hmong	0.79	1.03	-7.043	***		

Note* Odds-Ratios are reported. Pseudo R2 is McFadden's non-adjusted. Reference group is White. Sense of belonging Rasch scores were standardized. Z-scores are in log-odds.

Figure 4

Visualization of Participate 3+ on Belonging by Race/Ethnicity



Positive Experience. For the associations between self-reported positive experiences as function of sense of belonging and race/ethnicity, only the interaction effects for sense of belonging with American Indian (p = <0.05), Black (p = <0.01), and Latino (p = < 0.001) students were statistically significant. The interaction effects illustrate that students' self-reported positive experiences as a function of sense of belonging varied for American Indian, Black, and Latino students compared to White students, but not for Asian, Multi-racial, Somali, or Hmong students. For example, the standardized main effect estimate for Black students is β = -0.29, whereas the standardized interaction effect estimate for the association between sense of belonging and identifying as a Black student is β = -0.10. Hmong and Somali students reported

the lowest levels of self-reported positive experiences ($\beta = -0.34$ and $\beta = -0.44$ respectively), from which their scores also differed from the self-reported positive experience scores for Asian and Black students ($\beta = -0.16$ and $\beta = -0.29$). Overall, students of color reported lower self-reported positive experience scores, on average, than White students (Table 12 and Figure 5). However, sense of belonging appeared to be a mitigating mechanism for American Indian, Black, and Latino students, in which it decreased the slope-estimate discrepancy for American Indian, Black, and Latino students compared to White students.

Table 12

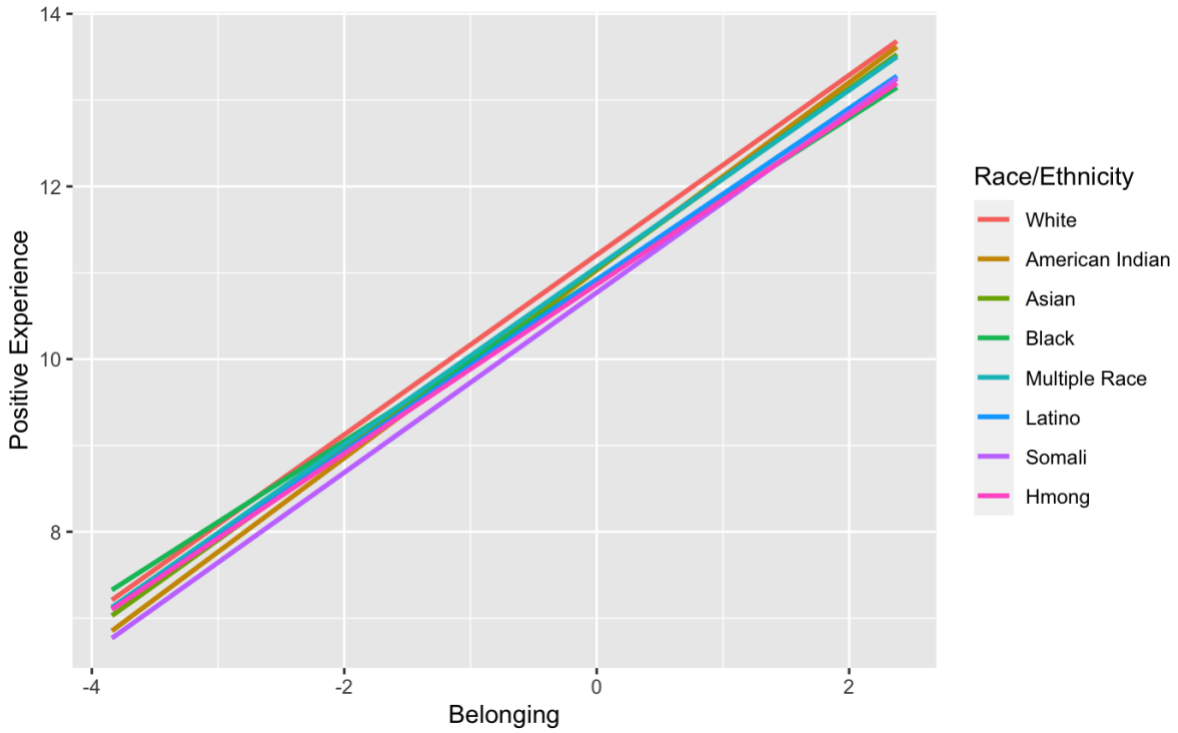
Linear Regression Results of Positive Experience on Sense of Belonging

	Estimate	SE	t	p	AIC	R2
Model 11					421,510.10	0.33
(Intercept)	11.13					
Belonging	1.04	0.00	239.20	***		
Model 12					420,808.70	0.34
(Intercept)	11.21					
Belonging	1.03	0.00	235.39	***		
American Indian	-0.19	0.02	-9.10	***		
Asian	-0.17	0.02	-6.76	***		
Black	-0.28	0.02	-12.57	***		
Multiple Race	-0.14	0.02	-5.94	***		
Latino	-0.28	0.02	-17.97	***		
Somali	-0.43	0.04	-11.66	***		
Hmong	-0.33	0.03	-11.74	***		
Model 13					420,780.90	0.34
(Intercept)	11.21					
Belonging	1.04	0.01	200.64	***		
American Indian	-0.18	0.02	-8.20	***		
Asian	-0.16	0.02	-6.71	***		
Black	-0.29	0.02	-12.71	***		
Multiple Race	-0.14	0.02	-5.91	***		
Latino	-0.29	0.02	-18.16	***		
Somali	-0.44	0.04	-11.51	***		
Hmong	-0.34	0.03	-11.57	***		
Belonging x American Indian	0.05	0.02	2.19	*		
Belonging x Asian	0.00	0.02	0.19			
Belonging x Black	-0.10	0.02	-4.91	***		
Belonging x Multiple Race	-0.02	0.02	-0.63			
Belonging x Latino	-0.05	0.02	-3.08	**		
Belonging x Somali	0.00	0.03	0.05			
Belonging x Hmong	-0.06	0.03	-1.86			

Note* Reference group is White. Positive Experience is a continuous Rasch score min = 5, max = 15. Sense of belonging Rasch scores were standardized. T-values are in log-odds.

Figure 5

Visualization of Positive Experience on Belonging by Race/Ethnicity



In summary, the results from the different regression models and analyses provide evidence that sense of belonging is positively associated with aspects of academic engagement and overall positive experiences and negatively associated with aspects of academic disengagement (RQ.4). Further these associations appear to vary by students' race/ethnicity (RQ.4a). Lastly, and equally importantly, the direction of the results, differentiated by race/ethnicity, is largely consistent with previous research and does lend support to the viability of the proposed sense of belonging measure at capturing adolescent students' perceived sense of belonging.

Discussion

With respect to measure construction, the 7 items that loaded onto my hypothesized model are theoretically consistent with my sense of belonging conceptual framework. These items highlight that for students in this 2013 and 2016 MSS sample, sense of belonging appears to constitute the perception that one is valued and appreciated (e.g., item 6), by close others (e.g., item 1 – 3). Furthermore, sense of belonging appears to also reflect students' motivations to connect and engage with others (e.g., Item 5 and 7), which can affect their positive outlook on life (e.g., Item 4). The empirical support provided by my CFA results indicate that different conceptualizations of sense of belonging, across social-psychological and educational disciplines, share complementary operational aspects (Allen et al., 2018), and that when taken together may adequately capture a latent sense of belonging construct for adolescent students.

In addition to measure construction, and to obtain validity evidence for the sense of belonging measure's viability, use, and interpretation, I examined differences in students' sense of belonging scores by race/ethnicity, and used students' sense of belonging scores to predict educational behaviors and outcomes hypothesized to be associated with sense of belonging, including skipping school, skipping class, participating in afterschool activities at least 3 times per week, and students' self-reported positive experiences. According to the APA Racial Disparities report (American Psychological Association, 2012), students from underrepresented backgrounds often experience lower levels of a sense of belonging than White students. Accordingly, my results are largely consistent with previous research, as I found that students from each racial- or ethnic-minority group reported lower levels of sense of belonging compared to White students, except for Somali students. Interestingly, in comparison of mean differences on sense of belonging scores by students' racial/ethnic backgrounds, Somali students reported

higher sense of belonging standardized mean scores than students from all other racial- or ethnic-minority groups. One hypothesis that may provide insight into this finding is that, because Somali students in Minnesota are part of a tight-knit community that continues to hold onto strong cultural traditions, students in this tight-knit community may feel valued and appreciated by supportive others due to their access to frequent opportunities to intermingle and build on rich cultural resources with members within their own community and enclave (Omar, 2016; Yosso, 2005).

Another notable result concerns the discrepancies in the associations between sense of belonging with the examined outcome variables for students from traditionally aggregated racial/ethnic groups, such as Hmong and Asian students. Hmong students, for example, in comparison to Asian students (with White students as the reference group) reported lower levels of sense of belonging, were more likely to skip school and class, were less likely to participate in three or more afterschool activities, and reported lower levels of positive experiences. These discrepancies in Hmong students' experiences may be due to higher rates of trauma within the Hmong community, due a tumultuous immigration history, which may negatively affect Hmong students' educational achievement, attainment, and overall well-being (Vang, 2005). The discrepancies in the association between sense of belonging and the examined outcome variables for students from traditionally aggregated racial/ethnic groups provides important nuance into the role of sense of belonging in educational settings and elucidates on the importance of data disaggregation to address extant support gaps for students from marginalized communities.

Lastly, regarding the overall associations between students' levels of sense of belonging with the examined outcome variables, including academic engagement, disengagement, and self-reported positive experiences, the results of this study were consistent with previous research

(Bottiani et al., 2017; Demanet & Van Houtte, 2012; Dukynaitė & Dudaitė, 2017; Wang & Eccles, 2012). Students who perceive a greater sense of belonging have a lower likelihood of skipping school and skipping class, and a higher likelihood of participating in afterschool activities at least 3 times per week. Furthermore, students high on sense of belonging were also high on self-reported positive experiences. These patterns were evident across different racial and ethnic groups as well. However, the discrepancies between students of color and White students were still observed; students of color, compared to White students, were more likely to skip school and class, less likely to participate in afterschool activities at least 3 times per week, and reported lower positive experiences even when accounting for sense of belonging. Yet, the role of sense of belonging on the outcome variables differed by students' race/ethnicity. For the associations between sense of belonging with the likelihood of skipping school, skipping class, and participate in afterschool activities at least 3 times per week, sense of belonging appeared to play a buffering role, such that the discrepancies (i.e., the slope estimates) between students of color and White students decreased in the direction towards OR = 1.0 (i.e., no difference in likelihood of participation). The same discrepancy-decrease was seen as well in the association with self-reported positive experiences. It appeared, however, only for American Indian, Black, and Latino students and not for Asian, Multiple Race, Somali, and Hmong students. This discrepancy-decrease exemplifies the importance of sense of belonging in an educational setting and provides validity evidence for the use of the proposed sense of belonging measure in adequately capturing that importance. Most importantly, the results from this study suggest that sense of belonging is important for White students and students of color, however, for students of color with respect to skipping school, skipping class, participating in afterschool activities 3 or more times, and overall positive experience, feeling like one has a sense of belonging is only part

of the picture, suggesting that a deeper investigation is required into the discrepancies in educational experiences among students from different racial/ethnic background.

Altogether, the results from this study provide initial validity evidence into the viability, interpretation, and use of the proposed sense of belonging measure, grounded in prominent sense of belonging frameworks (e.g., Baumeister & Leary, 1995; Goodenow, 1993). Several steps were taken to obtain validity evidence, including (1) item selection and measure construction, (2) confirmatory factor analysis to assess factor structure, and (3) testing associations with academic engagement and disengagement outcome variables. The validity evidence obtained, and in particular the direction of results and the buffering role that sense of belonging played in reducing the discrepancy between students of color and White students, provides ample support for the interpretation and use of the hypothesized 7-item sense of belonging measure to capture adolescent-students' perception of sense of belonging.

Limitations

This study had several limitations outside and within the scope of the study. Outside the scope of the study, this study is limited because item selection was based on a set of items available only in the MSS. In addition, although the MSS has a representative sample of Minnesota-based adolescent students, generalizations of these results beyond a Minnesota-based sample is limited. Within the scope of the study, whereas I conducted confirmatory factor analysis because theory informed the structure of my sense of belonging latent factor, I did not conduct an exploratory factor analysis to investigate whether other items may have loaded onto my 7-item hypothesized model as well, or if the items in my model also load onto different potential latent factors (i.e., test multidimensionality of the sense of belonging measure). Another limitation was that the bivariate correlations for item 7 with all other items were small.

Additionally, the R^2 values across all of the models were small. This suggests that there may be other variables not yet explored (e.g., a better fitting model) that may provide more insight into the sense of belonging construct and may better inform measure interpretation and use. Finally, in order to conduct the logistic regressions, the variables of skipping class and skipping school scores were dichotomized, which may have reduced the statistical power necessary in order to make interpretations with precision.

Conclusion

In conclusion, due to established differences in levels of perceived sense of belonging and academic outcomes among students from different racial- and ethnic-minority backgrounds, as well as inconsistencies in conceptualizations and measurement for a sense of belonging construct, I aimed to create a sense of belonging measure that was conceptually and psychometrically consistent for use in an adolescent-student sample. I identified items from the MSS that tapped into my conceptual definition of sense of belonging, derived from the social-psychological and educational literature. I obtained validity evidence, highlighting that the direction of the results for the associations between sense of belonging and the relevant educational behaviors and outcomes, differentiated by students' race/ethnicity, were consistent with previous research, which lends support to the viability, interpretation, and use of my proposed sense of belonging measure.

There are multiple practical implications for having a consistent conceptualization and measure for sense of belonging. A consistent conceptualization and measure may be useful for researchers, practitioners, and administrators, who work with adolescent students, to better address and accommodate different students' needs and experiences. A consistent conceptualization and measure for sense of belonging can also help educators better understand

the beliefs that underrepresented students hold about their academic and social success, as well as their experiences navigating educational institutions, which may differ from the beliefs and experiences of educators and students from non-marginalized backgrounds. In summary, examining students' sense of belonging using a consistent conceptualization and measure may elucidate on gaps in knowledge of students' needs, and may subsequently inform researchers, practitioners, and administrators of where those gaps are, how to address those gaps, and who can address those gaps. There are multiple future directions for this research. First, researchers might look at other variables that may moderate or mediate the sense of belonging association with academic engagement and disengagement variables, such as students' socioeconomic status. Researchers might also conduct additional psychometric analyses to examine dimensionality of sense of belonging across different factor analytic models, as well as to assess the potential multidimensionality of the sense of belonging construct.

References

American Psychological Association, Presidential Task Force on Educational Disparities. (2012). *Ethnic and racial disparities in education: Psychology's contributions to understanding and reducing disparities.* Washington DC: Author. Retrieved from http://www.apa.org/ed/resources/racial-disparities.aspx

Allen, J. B. (2003). Social motivation in youth sport. *Journal of Sport and Exercise Psychology, 25*, 551-567. https://doi.org/10.1123/jsep.25.4.551

Allen, K. A., & Bowles, T. (2012). Belonging as a guiding principle in the education of adolescents. *Australian Journal of Educational & Developmental Psychology, 12*, 108-119.

Allen, K., Kern, M. L., Vella-Brodrick, D., Hattie, J., & Waters, L. (2018). What schools need to know about fostering school belonging: A meta-analysis. *Educational Psychology Review, 30*, 1-34. https://doi.org/10.1007/s10648-016-9389-8

Anderman, L. H. (2003). Academic and social perceptions as predictors of change in middle school students' sense of school belonging. *The Journal of Experimental Education*, *72*(1), 5-22. https://doi.org/10.1080/00220970309600877

Anderson-Butcher, D., & Conroy, D. E. (2002). Factorial and criterion validity of scores of a measure of belonging in youth development programs. *Educational and Psychological Measurement, 62*, 857-876. https://doi.org/10.1177/001316402236882

Arslan, G., & Duru, E. (2017). Initial development and validation of the school belongingness scale. *Child Indicators Research, 10*, 1043-1058. https://doi.org/10.1007/s12187-016-9414-y

Bauman, K., & Cranney, S. (2020). *School enrollment in the United States: 2018* (P20-584). United States Census Bureau: U.S. Department of Commerce. https://www.census.gov/content/dam/Census/library/publications/2020/demo/p20-584.pdf

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*, 497-529. https://doi.org/10.1037/0033-2909.117.3.497

Berwise, C.A., & Mena, J.A. (2020). Perceived discrimination and educational attainment for U.S. Black adults: The influence of Black racial identity. *Social Psychology of Education*, 1-22. https://doi.org/10.1007/s11218-020-09587-7

Boone, W. J., & Noltemeyer, A. (2017). Rasch analysis: A primer for school psychology researchers and practitioners. *Cogent Education, 4*, 1-13. https://doi.org/10.1080/2331186x.2017.1416898

Bottiani, J. H., Bradshaw, C. P., & Mendelson, T. (2016). A multilevel examination of racial disparities in high school discipline: Black and White adolescents' perceived equity, school belonging, and adjustment problems. *Journal of Educational Psychology, 109*, 532-545. https://doi.org/10.1037/edu0000155

Brown, T. (2015). *Confirmatory factor analysis for applied research* (2nd ed.). New York, NY: Guilford Press.

CASEL. (2020). The CASEL guide to schoolwide SEL essentials: A printable compilation of key activities and tools for school teams. https://casel.org/in-the-classroom/

Chhuon, V., & LeBaron Wallace, T. (2014). Creating connectedness through being known: Fulfilling the need to belong in U.S. high schools. *Youth & Society, 46,* 379-401. https://doi.org/10.1177/0044118X11436188

De Ayala, R. J. (2013). *The theory and practice of item response theory.* Guilford Publications, 2013.

Demanet, J., & Van Houtte, M. (2012). School belonging and school misconduct: The differing role of teacher and peer attachment. *Journal of Youth and Adolescence, 41,* 599-514. https://doi.org/10.1007/s10964-011-9674-2

Dukynaitė, R., & Dudaitė, J. (2017). Influence of school factors on students' sense of school belonging. *The New Education Review*, *47*(1), 39-52

Feinauer Whiting, E., Everson, K.C., & Feinauer, E. (2018). The simple school belonging scale: Working toward a unidimensional measure of student belonging. *Measurement and Evaluation in Counseling and Development, 51*, 163-178. https://doi.org/10.1080/07481756.2017.1358057

Goodenow, C. (1993). Classroom belonging among early adolescent students: Relationships to motivation and achievement. *Journal of Early Adolescence, 13*(1), 21-43. https://doi.org/10.1177/0272431693013001002

Hughes, J.N., Im, M.H., & Allee, P.J. (2015). Effect of school belonging trajectories in grades 6-8 on achievement: Gender and ethnic differences. *Journal of School Psychology, 53*, 493-507. https://doi.org/10.1016/j.jsp.2015.08.001

Kao, G., & Thompson, J. S. (2003). Racial and ethnic stratification in educational achievement and attainment. *Annual Review of Sociology, 29,* 417-442. https://doi.org/10.1146/annurev.soc.29.010202.100019

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York, NY: Guilford Press.

Kline, R. B. (2015). *Principles and practice of structural equation modeling* (4th ed.). New York, NY: Guilford Press.

Leary, M. R. (2005). Sociometer theory and the pursuit of relational value: Getting to the root of self-esteem. *European Review of Social Psychology, 16,* 75-111. https://doi.org/10.1080/10463280540000007

Leary, M. R., Kelly, K. M., Cottrell, C. A., & Schreindorfer, L. S. (2013). Construct validity of the need to belong scale: Mapping the nomological network. *Journal of Personality Assessment, 95,* 610-624. https://doi.org/10.1080/00223891.2013.819511

Li, C. (2016). Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares. *Behavior Research Methods, 48,* 936-949. https://doi.org/10.3758/s13428-015-0619-7

Linacre, J. M. (2016). Winsteps® (Version 3.92.0) [Computer Software]. Beaverton, Oregon: Winsteps.com. Retrieved from http://www.winsteps.com/

Ma, X. (2003). Sense of belonging to school: Can schools make a difference? *The Journal of Educational Research, 96,* 340-349. https://doi.org/10.1080/00220670309596617

McFarland, J., Cui, J., Holmes, J., and Wang, X. (2019). *Trends in High School Dropout and Completion Rates in the United States: 2019* (NCES 2020-117). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved [date] from https://nces.ed.gov/pubsearch.

Minnesota Department of Education. (2016). *Minnesota Student Survey*. Roseville, MN. Retrieved from http://education.state.mn.us/MDE/dse/health/mss

Muthén, B., & Asparouhov, T. (2002). Latent variable analysis with categorical outcomes: Multiple-group and growth modeling in Mplus. *Mplus Web Notes, 4,* 1-22.

Niehaus, K., Moritz Rudasill, K., & Rakes, C. R. (2012). A longitudinal study of school connectedness and academic outcomes across sixth grade. *Journal of School Psychology, 50,* 443-460. https://doi.org/10.1016/j.jsp.2012.03.002

Omar, Y. (2016). Identity and sense of belonging of young Somali men in a western context: Case studies from Melbourne and Minneapolis. *Bildhaan: An International Journal of Somali Studies, 16,* 65-79.

Phinney, J. S. (1992). The multigroup ethnic identity measure: A new scale for use with diverse groups. *Journal of Adolescent Research, 7,* 156-176. https://doi.org/10.1177/074355489272003

Qian, Z., & Blair, S. L. (1999). Racial/ethnic differences in educational aspirations of high school seniors. *Sociological Perspectives, 42,* 605-625. https://doi.org/10.2307/1389576

RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL http://www.rstudio.com/.

Rodriguez, M. C. (2017). *Technical report on developmental skills, supports, & challenges from the 2013-2016 Minnesota Student Survey.* Minnesota Youth Development Group. https://sites.google.com/view/mnydrg.

Romero, C. (2018). *What we know about belonging from scientific research* (Research Brief). Mindset Scholars Network. https://mindsetscholarsnetwork.org/research_library/what-we-know-about-belonging-from-scientific-research/

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software, 48*(2), 1-36. Retrieved from http://www.jstatsoft.org/v48/i02/

Sánchez, B., Colón, Y., & Esparza, P. (2005). The role of sense of school belonging and gender in the academic adjustment of Latino adolescents. *Journal of Youth and Adolescence, 34,* 619-628. https://doi.org/10.1007/s10964-005-8950-4

Search Institute. (2013). *Developmental Assets Profile: Technical summary*. Minneapolis, MN: Author. Retrieved at http://www.search-institute.org/surveys/dap

Slaten, C. D., Rose, C. A., Bonifay, W., & Ferguson, J. K. (2019). The Milwaukee Youth Belongingness Scale (MYBS): Development and validation of the scale utilizing item response theory. *School Psychology, 34,* 296-306. https://doi.org/10.1037/spq0000299

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69,* 797-811. https://doi.org/10.1037/0022-3514.69.5.797

Tovar, E., & Simon, M. A. (2010). Factorial structure and invariance analysis of the sense of belonging scales. *Measurement and Evaluation in Counseling and Development, 43*(3), 199-217. https://doi.org/10.1177/0748175610384811

Tran, A. G. T. T., & Lee, R. M. (2010). Perceived ethnic-racial socialization, ethnic identity, and social competence among Asian American late adolescents. *Cultural Diversity and Ethnic Minority Psychology, 16,* 169-178. https://doi.org/10.1037/a0016400

Turcios-Cotto, V. Y., & Milan, S. (2013). Racial/ethnic differences in the educational expectations of adolescents: Does pursuing higher education mean something different to Latino students compared to White and Black students? *Journal of Youth and Adolescence, 42,* 1399 – 1412. https://doi.org/10.1007/s10964-012-9845-9

U.S. Department of Education, National Center for Educational Statistics (2009). *High School*

Longitudinal Study of 2009 (HSLS:09). Retrieved June 13, 2020, from https://nces.ed.gov/datalab/index.aspx.

Vang, C.T. (2005). Hmong-American students still face multiple challenges in public schools. *Multicultural Education, 13,* 27-35.

Vrieze, S. I. (2012). Model selection and psychological theory: A discussion of the differences between the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). *Psychological Methods, 17,* 228-243. https://doi.org/10.1037/a0027127

Wang, M. T., & Eccles, J. S. (2012). Adolescent behavioral, emotional, and cognitive engagement trajectories in school and their different relations to educational success. *Journal of Research on Adolescence, 22,* 31-39. https://doi.org/10.1111/j.1532-7795.2011.00753.x

Wentzel, K.R. (1999). Social-motivational processes and interpersonal relationships: Implications for understanding motivation at school. *Journal of Educational Psychology, 91,* 76-97. https://doi.org/10.1037/0022-0663.91.1.76

Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of community cultural wealth. *Race Ethnicity and Education, 8,* 69-91. https://doi.org/10.1080/1361332052000341006

Zaff, J. F., Moore, K. A., Papillo, A. R., & Williams, S. (2003). Implications of extracurricular activity participation during adolescences on positive outcomes. *Journal of Adolescent Research, 18,* 599-630. https://doi.org/10.1177/0743558403254779