Investigating Socioeconomic Status Proxies: Is One Proxy Enough?

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Abstract

The use of proxy variables as measures of socioeconomic status (SES) is prevalent in educational research. Data from the 2013 Minnesota Student Survey were used to evaluate the validity of proxy variables and their associations with commitment to learning. This study used latent class analyses to group students from grades 9 and 12 (N = 79,339) of different SES statuses based on single and multiple variables. Results show that multiple indicators are better able to distinguish among different SES groups. In light of the ubiquitous use of proxy variables of SES, the differential use of these SES indicators has important educational implications.

Investigating Socioeconomic Status Proxies: Is One Proxy Enough?

For decades, socioeconomic status (SES) has been one of the main topics regarding the explanations of educational gaps, and its precise measurement is warranted since research describing educational and health outcomes of different SES groups has major implications in policy. The use of proxy indicator variables of SES is ubiquitous in the social and behavioral research arena, ranging from single indicators (e.g., level of education of the head of household) to SES scales (e.g., Duncan Socioeconomic Index). Single indicators used specifically in educational research vary from variables inquiring about the annual or monthly income of a parent or parents of a student, the number of siblings that students cohabit with, to whether the student qualifies for free or reduced-price lunch. Needless to say, there is a large variation of type, quality, and quantity of proxy variables of SES used in educational research studies (Cirino et al, 2002; Harwell & LeBeau, 2010). Their use differs from one study to the other, with some researchers advocating for one or more proxy variables and some researchers advocating for other proxy variables, while others advocating a proper selection process of proxy variables of SES uniquely suitable to one's study (e.g., Entwisle & Astone, 1994).

One of the most widely available, easy to collect, and vastly used indicators of SES in educational research is the eligibility of students to receive free or reduced-price lunch (FRL). Parents apply and submit proper paperwork delineating their household income—along with other information—and if the threshold is not passed, the students are flagged with an FRL status; seemingly making the FRL variable a relatively reliable indicator of SES in identifying at least one level of SES. The eligibility for FRL is fairly standard from school district to school district, making the variable rather consistent between schools. Further, when students are asked about their FRL status, they are able to accurately recall it, minimizing errors in proper

identification. Unfortunately, numerous researchers have highlighted the shortcomings and erroneous assumptions made from the use of FRL (Cabrera, Karl, Roohr, Klieger, & Rodriguez, 2014; Entwisle & Astone, 1994; Harwell & LeBeau, 2010; Luster & Okagaki, 2006). Inferences made from utilizing single indicators such as FRL as measures of SES are questionable and potentially biased as previously reported (Cabrera et al., 2014; Harwell & LeBeau, 2010). It is the aim of this study to continue previous investigations on the validity of single and multiple proxy variables of SES in the outcomes of data analyses that often utilize single proxy variables of SES.

Perspective

A plethora of proxy indicators of SES have been suggested to be utilized when collecting data for research investigations in education including single indicators, multiple indicators, and SES instruments as briefly described above. Single indicators used specifically in educational research include seemingly intrusive questions inquiring about the income or earnings of a parent of a student or less intrusive but innocuous questions about the level of education of the head of household, number of siblings, neighborhood quality, etc. (see Harwell & LeBeau, 2010 for review). Additionally, the quality of this information could be compromised and potentially inaccurate, depending on the age of the respondent providing this information and self-reporting information bias. When single item indicators are advocated for use, they are usually indicators that explicitly inquire about the occupation of the head(s) of household, since these indicators have been shown to be most reliable for researchers who study educational, developmental, and socialization processes (Mueller & Parcel, 1981). When occupation information is unable to be collected and when collecting additional information is not cumbersome, researchers have advocated for the use of multiple indicators of SES (Cabrera et al., 2014; Cirino et al., 2002;

Harwell & LeBeau, 2010; Mueller & Parcel, 1981). Furthermore, multiple instruments have been developed to measure SES constructs (e.g., prestige) that are commonly used in research studies (Edwards-Hewitt & Gray, 1995; Entwisle & Aston, 1994), such as the Duncan Socioeconomic Index (Duncan, 1961), the Siegel Prestige Scale (Siegel, 1971), the Hollingshead scale (Hollingshead, 1975), and the Nakao and Treas scale (Nakao, &Treas, 1992). The length of time to complete any given index, along with the timeliness and appropriateness of the use of these indices should be considered and reviewed.

Even though there are various instruments measuring SES that have been used in research studies, their use in large-scale studies, especially in large survey studies, is often impractical given time restraints in both the collection and the analysis of data. On the other hand, single indicators maximize the time a researcher spends in the collection and analysis of data, but their shortcomings have been extensively delineated (Entwisle & Astone, 1994; Harwell & LeBeau, 2010; Luster & Okagaki, 2006; Mueller & Parcel, 1981). Even the recommended single indicator (i.e., occupation) presents unique issues since it needs to be classified and differentiated among an extensive list of occupations (Mueller & Parcel, 1981). Other single indicators such as income are deemed sensitive and unfeasible to use in large-scale studies because they are prone to nonresponse bias (Harwell & LeBeau, 2010). In light of this evidence, several researchers have made recommendations for the use of multiple variables as indicators of SES (Cabrera et al., 2014; Cirino et al, 2002; Entwisle & Astone, 1994; Hauser, 1994; Luster & Okagaki, 2006; Sousa & Armor, 2010) and to follow a proper selection process for proxy variable(s) that are uniquely suitable to the study one is conducting (Entwisle & Astone, 1994; Harwell & LeBeau, 2010). The perceived benefits of the use of multiple variables as indicators of SES are many, however, the effects of using one or more variables of SES on the

classification of students of different SES groups using multiple indicator models has not been thoroughly studied.

In this study, following the framework from our recent work (Cabrera et al., 2014), and recommendations from Entwisle and Astone (1994), Hauser (1994), and Harwell and LeBeau (2010), carefully selected SES proxy variables from the Minnesota Student Survey, as well as all possible combinations of these proxy variables, were compared using latent class analyses. In addition, the effect sizes of their association with commitment to learning, after partialling out the effects of covariates (e.g., gender, grade) were also compared. It was hypothesized that single SES indicators, such as FRL, will be prone to produce biased results (i.e., higher standard error estimates, highly skewed SES classifications), whereas the use of multiple indicators will yield more robust results (Sousa & Armor, 2010).

Methodology

Data

Minnesota Student Survey (MSS). The current study entails a secondary analysis of a subset of the 2013 MSS database, consisting of 79,339 students from grades 9 (53.4%) and 11, with the majority of the sample being Caucasian (74.8%) and male (50.2%). MSS data are collected from public school students in Minnesota via local public-school districts and managed by the MSS Interagency Team, including the MN Departments of Education, Health, Human Services, Public Safety, and Corrections. During each year of administration all operating public school districts are invited to participate. The MSS is administered every three years, with the most recent administration in 2016.

Procedure

Latent Class Analyses (LCA). In this study, latent class analysis was used to split the individual student data in the sample into latent groups or classes (LCs) of SES. LCA is one of the general latent structure models used to identify and classify clusters of units that are closely homogenous with respect to observed variables (Hagenaars & McCutcheon, 2002). LCA has several assumptions, including homogeneity, local independence, unidimensionality, and monotonicity (see Hagenaars & McCutcheon, 2002). LCA is most appropriately used when mutually independent observed indicators are associated due to an underlying unobserved (latent) variable (in our case, SES), and when the observed indicator variables are categorical in nature, although observed variables could also be continuous and censored, which allows for a more flexible approach to multilevel analyses (Muthén & Muthén, 1998-2014). LCA generally relies on various model selection indices to aid in the identification of the model with the best fit (i.e., models with small deviations between the expected values and observed values). Reviewers of LCA studies have advocated for the use of information evaluation criteria when selecting models (Zhang, Zhang, Zhang, & Jiao, 2013) including Akaike's information criterion (AIC), Bayesian information criterion (BIC), and a slightly modified BIC. Operationally, models with higher number of latent classes usually have better model fits, thus, the trade-off between model complexity and model fit must be a priority in model selection (Zhang et al, 2013).

Measures

SES Proxy Variables. For this study, we expanded our search for SES proxy variables found in the MSS and carefully selected SES proxy variables following the recommendations of Cabrera et al. (2014), Entwisle and Astone (1994), Hauser (1994), Harwell and LeBeau (2010), among others. These variables include (a) an FRL variable, often noted as providing highly

accessible information bearing minimal nonresponse rates (Harwell & LeBeau, 2010); (b) a single-item indicator of student mobility (Mehana & Reynolds, 1995); (c) a set of social capital (i.e., home environment) indicators representing several resources embodied in social relationships (Entwisle & Astone, 1994); (d) financial capital indicators, representing the economic means to buy food, clothes, and other necessities (Coleman, 1988); (e) an indicator of economic power of consumption, representing participation in activities outside of school and frequency of routine preventative health care (Hauser, 1994); and, (f) a home resources indicator (Harwell & LeBeau, 2010); see Table 1. A total of 63 unique combinations of the SES variables are examined and their individual and combined values are used to categorize students into groups of different SESs guided by the LCAs.

Independent Variables. Independent student predictors and covariates, including existing MSS constructs (subsequently presented) measuring empowerment, family and community support, and teacher and school support, as well as grade, gender, ethnicity (Asian American as the reference group), family violence, mental distress, bullying, and bully behaviors were used to assess their individual effects in predicting commitment to learning.

As mentioned above, several additional individual constructs were included in the regression analyses, these constructs measure developmental supports including family and community support (FCS), empowerment (EM), and teacher and school support (TSS). Two primary sources of validity evidence for these measures include content-related evidence (documented in Benson, 1990, 2002; Benson, Scales, Hamilton, & Sesma, 2006; and Search Institute, 2013) and internal-structure or construct-related evidence (documented in the MSS Technical Report, Rodriguez, 2017). To support construct-related inferences, the internal structure of the measures was evaluated through confirmatory factor analysis (CFA; using Mplus

v. 7; Muthén & Muthén, 2012) and differential item functioning analyses by race/ethnicity, gender, and grade (using Winsteps v. 3.92; Linacre, 2016; with results summarized in Rodriguez, 2017). Common guidelines for adequate fit indices were followed, where RMSEA below than 0.10, CFI and TLI greater than 0.90 (Brown, 2015; Kline, 2011), and standardized factor loadings 0.40 or higher (Brown, 2015) are desired; although it is noted that in many factor analytic studies of research surveys, standardized factor loadings of 0.30 are often used to define salient loadings. The measures were then scored using the partial credit Rasch model in Winsteps 3.92 (Linacre, 2016). The partial credit Rasch model 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. The Rasch reliabilities of these measures were also adequate: EM (0.72), FCS (0.71), and TSS (0.85).

A three-factor CFA was fit to the data for the three measures of developmental supports (i.e., FCS, EM, TSS). The global fit indices indicate nearly adequate fit, where RMSEA is 0.13, CFI is 0.89, and TLI is 0.87. The model fit indices for each developmental support as a separate measure also were estimated. For FCS, RMSEA is 0.13, CFI is 0.98, TLI is 0.95; for EM, RMSEA is 0.23, CFI is 0.91, and TLI is 0.85; and for TSS, RMSEA is 0.13, CFI is 0.98, and TLI is 0.97. In the three-factor CFA, the standardized factor loadings ranged from 0.53 to 0.91. Overall, these fit indices, and particularly the factor loadings, support the use of these items as indicators of development support measures. Moreover, since the measures are not used at the individual level, they provide strong indicators of developmental supports at the group level, the intended level of analyses. These constructs have adequate internal consistency, robust psychometric properties, and have been constructed with strong theoretical properties.

Dependent variable. Commitment to learning (CtL) was chosen as the dependent variable in our analyses in order to highlight the impact that different SES proxies have on the measure. Much research has been done with CtL (described as a developmental skill) by Search Institute (2013) highlighting that CtL is highly associated with better grades; succeeding in and finishing high school and enrolling in college; managing stress; increased leadership skills; and, valuing diversity (e.g., Scales, Benson, Roehlkepartain, Sesma, & van Dulmen, 2006; see Scales, Roehlkepartain, & Shramko, 2017).

The CtL scale was previously constructed with eight survey items, e.g., caring about doing well in school, paying attention in class, going to class prepared (Rodriguez, 2017). The global fit indices indicate adequate fit, where RMSEA is 0.11, CFI is 0.95, and TLI is 0.91. The standardized factor loadings ranged from 0.35 to 0.79. Common guidelines for fit indices were the same as presented above. The Rasch reliability of the measure was also adequate, 0.70. Overall, these fit indices and factor loadings support the use of these items as indicators of the CtL developmental skill measure.

Regression Analyses

Multiple regression analyses of multiple covariance with additional indicators were performed using the statistical software R (R Core Team, 2018). Comparisons of partial η^2, changes in statistical significance of predictor variables, comparisons of standard errors of predictor coefficients, and changes in sign of predictor coefficients were made between all estimates for the variables in the models created from the combinations of SES proxy variables referenced above.

Results

Latent Class Analyses

Previous exploratory and confirmatory work showed that a model with three Latent Classes (LCs) was able to distinguish between students in all three LCs better than the 1-, 2- or 4-class models (Cabrera et al., 2014). Given the exploratory and confirmatory evidence, we utilized the model with three LCs as the best model to fit the current data. A model comparison between the 4-class model and the 3-class model was performed to verify the exploratory and confirmatory evidence using the Lo-Mendell-Rubin test (`TECH11 LMR` test; Asparouhov & Muthén, 2012); the usual likelihood ratio chi-square test is not used since 2 times the loglikehood difference is not chi-square distributed (Nylund, Asparouhov, & Muthén, 2007, as cited in Asparouhov & Muthén, 2012). The p-value from the analysis was zero, rejecting the 3-class model when comparing it to the 4-class model. However, the class proportions for the high SES group and the med SES group did not differ substantially from one class model to the other (less than 1% for each). As previously mentioned, models with higher number of latent classes usually have better model fits, something that was also found when comparing model fit indices for the 4-class and the 3-class models in these data. However, as Zhang et al. (2013) reminded us, the trade-off between model complexity and model fit must be a priority in model selection. Therefore, additional `TECH11 LMR` tests were performed on the subsequent six five-index models. The p-value for one of the six models was found to not be statistically significant, thus not rejecting the 3-class model. This pattern of 3-class versus 4-class model was suspected to continue throughout the subsequent analyses with less variables, thus the model with three LCs was chosen as the best model to fit the current data while balancing model complexity and model fit. The intended purpose of this study is to compare the impact that different classifications of SES of different proxy variables have on an outcome variable, indicator significance and direction, and weight. In order to make sure that we can compare across the majority of the LC

models, the model with three LCs was chosen. We note that if we were going to classify based solely on the full six-indicator model, the evidence of a 4-class model is strong. These results might also differ from previous work since additional SES proxy items are being used.

The three LCs in these data represent distinct groups of students with differing SES backgrounds. The largest group (49.0%), referred to as *high SES*, represents students that experienced no to minimal known socioeconomic disadvantages (e.g., 92.4% reported not getting FRL at school, 93.0% reported living with both biological parents, and 1.3% reported having changed schools 2 or more times), whereas the two remaining groups experienced these disadvantages differently. The second largest group, termed *low SES* (33.1%), reported higher incidences of living with either mom or dad (51.2%), step parents (20.4%), related adults (8.7%), adoptive parents (6.6%), non-related adults (2.3%), no adults (1.5%), and foster parents (0.8%). The smallest group (17.9%), termed *med SES*, reported residing with both biological parents at a higher rate than the low SES group but at a lower rate (65.9%) than the high SES group, residing with either one of their biological parents at a lower rate than the low SES group but higher rate (27.4%) than the high SES group, and, similarly, reported living with a step-parent(s) at a rate (12.4%) that falls in the middle of the low SES and high SES groups. Regarding FRL, 52.6% of the low SES group reported receiving this service, compared to 22.9% of the med SES group and 7.6% of the high SES group. Moreover, additional differential evidence between the low, med, and high SES groups was apparent as the low SES group reported higher incidences of changing schools than both the med and high SES groups (10.2% versus 3.7% and 1.3%, respectively). See Table 2 for all the latent class proportions for the three LCs.

SES Classification

Sixty-two additional 3-LC models were ran using all possible combinations of the six SES proxy variables. Many minor and major classification differences between the models were found including changes in the (a) number of SES groups, (b) proportion of students classified in all SES groups, and (c) majority of students in low and med SES groups.

One of the major classification differences between the models with individual and multiple indicators was the dichotomization and trisection of SES groups. Both single indicator models (i.e., FRL and mobility) dichotomized the SES groups into low and high groups, given that they were binary response items. Additionally, the home resources indicators also dichotomized the SES groups into low and high, even though three MSS items were used and one of those items was not a binary response-type item. Fifty-six out of the remaining LC models using two or more indicators and their combinations classified students into low, med, and high SES groups. The only model that did not classify students into three groups was the model that combined the FRL and mobility variables, the two binary survey items. See Table 3.

The proportion of students classified into SES groups differed significantly between models. Taking into consideration the three models with only the low and high dichotomies from the first six LC models (Models 1 through 6, Table 3), the FRL variable had the largest low SES group (26.3%), followed by the home resources model (21.8%), while the mobility indicator had a small low SES group (4.9%). Of the remaining three models, with three SES groups, the low SES groups ranged from 1.3% to 8.1%, the med SES groups ranged from 7.1% to 25.8%, and the high SES groups ranged from 66.1% to 91.6%.

In the LC models using two to six indicator variables, classification differences continued to be present. The classification of high SES differed significantly in the two-, three-, four-, five-, and six-indicator LC models, ranging from 47.0% to 90.6%, while the spread for the med and

low SES groups were 28.0% and 32.0%, respectively for these models. In the models where two SES proxies were combined (e.g., FRL and economic consumption power indicators), low SES ranged from 3.1% to 27.2%; similarly, in the set of three proxy indicators, the low SES ranged from 5.3% to 30.2%; in the set of four, the low SES group ranged from 8.8% to 34.5%; in the set of five, the low SES group ranged from 17.4% to 35.0%; lastly, in the model with all indicators, 33.1% of students were classified as low SES. Looking at all the models, the low SES classifications ranged from 1.3% to 35.0%, the med SES ranged from 0% to 29.9% (1.8% to 29.9% if the dichotomized models are ignored), and the high SES ranged from 47.0% to 95.1% (47.0% to 91.6% if the dichotomized models are ignored).

The classification of students into low, med, and high SES groups also differed in what group was the majority among the low and med SES groups. Of the 59 models with all three SES groups, 28 models classified a larger proportion of students into the low SES group than into the med SES group (e.g., in the model with all six indicators, 33.1% versus 17.9%, respectively). In other words, almost half of the models flipped as to which group, low or med SES, was greater than the other, changing the ranking by size of the SES groups dramatically. In all 59 models, the high SES group consistently classified a larger proportion of students in this group than the med and low SES groups.

Multiple Regression Analyses

Multiple regression analyses were used to assess the effects of covariate and predictor variables, including the 63 SES class categorizations derived from the LCA, on commitment to learning. Only the multiple regression analysis for the full six-indicator model is briefly discussed here (see Table 4) and differences in effect sizes (partial η^2), changes in statistical

significance of predictor variables, and changes in sign of predictor coefficients are highlighted in Table 5.

Socioeconomic status was a significant predictor of commitment to learning (CtL) controlling for all the other covariate and predictor variables in the model with a partial η^2 = 0.001. The predicted CtL scores for the low SES group was 0.095 lower than the high SES group and the med SES group was 0.100 lower than the high SES group. Teacher and school support was predominantly the strongest positive predictor of CtL with a partial η^2 = 0.123. Empowerment and bullying encountered were positively associated with CtL and had small partial η^2s. On the other hand, family and community support, bullying, and mental distress were negatively associated with CtL with fairly small partial η^2s (ranging from 0.001 to 0.015). Students in grade 11 had lower CtL scores than students in grade 9, males demonstrated a significantly lower CtL than females, and all ethnicities included in the model indicated a significantly lower CtL than Asian Americans (Asian Americans were chosen as the reference group in the analyses since they displayed higher CtL scores in comparison to other groups).

The SES variable from this regression model was replaced with the other 62 SES variables constructed from the LCAs as described. Changes in effect size, predictor significance, and sign of predictor estimates of these 62 additional regression models from the model described above with all six indicators are delineated and tallied (Table 5). In summary, 6 out of the 62 SES variables had a change of partial η^2 greater than .001 (200% gain from the variance explained by the full six indicator model); please note that these values are small. There was a change in p-value in 57 of the 62 models in which the significance level of at least one covariate changed from being less than 0.05 to greater than 0.05 or vice versa when compared to the six-indicator model. For many of the models, the African American (versus Asian American)

dummy variable as well as the family violence variable were variables that changed in statistical significance. The direction of the association between some of the variables and CtL changed from positive to negative (or vice versa) in 15 of the 62 models. Lastly, the standard errors differed for most of the individual indicator models (i.e., models 1 through 6) from the full six-indicator model, showing higher standard errors for four of the models, no change in one of the models, and a higher standard error for low SES versus high SES and a lower standard error for med versus high SES.

Conclusions and Educational Implications

For many years, educational researchers have used FRL as a sole indicator of SES as other measures and indices of SES (e.g. Duncan Socioeconomic Index, Holland Scale) are generally not feasible when collecting data in educational research given the lack of time available and the method or source of data collection (i.e., self-report or obtained from the school district). While FRL status is commonly available, the use of this and other single dichotomous variables provide narrow categories of SES (i.e., low versus high). If the goal of the use of an FRL variable is to simply indicate whether a student is potentially a member of a low SES group in a model versus all others, perhaps the use of FRL would suffice. However, the LCA results presented here using the MSS dataset indicate that there are more than two distinct classes of SES (i.e., low, med, and high) for this sample, suggesting a further breakdown of SES. Similar results were found in our previous work (Cabrera et al., 2014). Further, these results designate that using indicators with binary response-type items, such as FRL or student mobility, is not the most useful in informing differences between differing levels of SES groups. However, the results do indicate that these may function better when combined with other indicators of SES. The value of which indicators offer the greatest discernment between the SES groupings should

be further explored to determine which combinations work best and how many indicators is optimal for these data.

This sample offers some limitations as the data comes from one state in the Upper Midwest. With the data coming from one state, the sample is relatively homogeneous in ethnicity as it is predominantly Caucasian (74.8%); the state itself is represented by 80.6% of Non-Hispanic White people compared to the 61.3% of Non-Hispanic White people in the country (U.S. Census Bureau, 2015). Additionally, the majority (almost half) of the sample is categorized as high SES, with the smallest proportion of students in the med SES groups. The percentage of people between 5 and 17 years of age reported as living below the poverty level is 12.7% for this Upper Midwest state (U.S. Census Bureau, 2015), signaling that perhaps more classes of SES are warranted. A more diverse sample of students from other states may be helpful in the further classification into one of the three or more SES classes as the diverse sample is likely to have more varied responses on items like those included in the survey. Model limitations were also present since it is believed that we failed to meet the LCA assumption that observations are independent of one another. In LCA models, and other models that assume local independence, this assumption is not often met with many data structures collected through surveys or state assessments, especially when the data include responses from students nested in schools, or students nested in classrooms that are nested in schools, which is often the case in large-scale data collection practices. Further exploration of higher-level analyses ought to be done with these data.

The results presented are only the tip of the iceberg in the discussion of the use of combined SES proxy variables in distinguishing SES differences between students over single measures of SES and should be considered in future research. Furthermore, the big

discrepancies in SES categorizations between models is somewhat worrisome, especially models with single indicators such as FRL. The effects that these misclassifications have on inferences could be great since the relationship between SES and outcomes variables are shown here to be somewhat inaccurate.

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Table 1
Item information for Socioeconomic Status (SES) proxy variables for the Minnesota Student Survey (MSS)

FRL Indicator

1. Do you currently get free or reduced-price lunch at school?
   Yes
   No

Student Mobility Indicator

2. Since the beginning of this school year, how many times have you changed schools?
   0
   2 or more times

Social Capital Indicator

3. Which adults do you live with? (*Mark all the apply*)
   The woman who gave birth to me {my biological mother) or my biological father
   The mother or father that adopted me
   My stepmother or my stepfather
   My foster parent(s)
   My grandparent(s) or other relative(s)
   An adult or adults I am not related to
   None

Financial Capital Indicator

4. During the last 30 days, have you had to skip meals because your family did not have enough money to buy food?
   Yes
   No

5. In general, why don't you participate in any school-based or community-based activities and clubs? (*Mark all that apply*)
   Activities cost too much
   I don't have a way to get there or home

6. During the past 12 months, have you stayed in a shelter, somewhere not intended as a place to live, or someone else's home because you had no other place to stay? (*Mark all that apply*)
   No
   Yes

Economic Consumption Power Indicator

7. During a typical week, how often do you participate in each of the following activities outside the regular school day?
   Club or community sport teams, such as park and rec teams, in-house teams or traveling teams
   Lessons, such as music, dance, tennis or karate lessons

8. When was the last time you saw a doctor or nurse for a check-up or physical exam when you were not sick or injured?
   During the last year
   Between 1 and 2 years ago
   More than 2 years ago
   Never

(continued)

Table 1 (continued)
Item information for Socioeconomic Status (SES) proxy variables for the Minnesota Student Survey (MSS)

9. When was the last time you saw a dentist or dental hygienist for a regular check-up, exam or teeth cleaning or other dental work?
   - During the last year
   - Between 1 and 2 years ago
   - More than 2 years ago
   - Never

Home Resources Indicator

10. In general, why don't you participate in any school-based or community-based activities and clubs? (*Mark all that apply*)
    - I have to take care of other family members

11. Where do you usually GO after school? (*Mark all that apply*)
    - A job

12. During a typical week, how many hours do you work for pay outside of the regular school day?
    - 0 hours
    - 1 to 2 hours
    - 3 to 5 hours
    - 6 to 10 hours
    - 11 to 20 hours
    - 21 to 30 hours
    - 31 or more hours

Note: On the MSS survey, questions 5, 7, and 10 have multiple response options, however, only the indicators of SES of students are listed here.

Table 2

Latent Class Proportions for the Three-Class Level-1 Model

		Class 1 33.1%	Class 2 17.9%	Class 3 49.0%
		SES		
Indicator		Low	Med	High
Do you currently get free or reduced-price lunch at school?	Yes	0.53	0.23	0.08
Since the beginning of this school year, how many times have you changed schools?	2 or more times	0.10	0.04	0.01
Which adults do you live with? (Mark all that apply)				
Biological parent(s)	Both	0.31	0.66	0.93
	Mom or Dad	0.51	0.27	0.06
Adoptive parent	Yes	0.07	0.03	0.00
Step parent	Yes	0.20	0.12	0.02
Foster parent	Yes	0.01	0.00	0.00
Relative	Yes	0.09	0.03	0.01
Non-related adult	Yes	0.02	0.01	0.00
No adult	Yes	0.02	0.01	0.00
Have you had to skip meals because your family did not have enough money to buy food?	Yes	0.10	0.05	0.01
In general, why don't you participate in any school-based or community-based activities and clubs?				
Activities cost too much	Yes	0.28	0.17	0.07
I don’t have a way to get there or home	Yes	0.30	0.09	0.08
I have to take care of other family members	Yes	0.15	0.06	0.02
Have you stayed in a shelter, somewhere not intended as a place to live, or someone else’s home because you had no other place to stay?	Yes	0.10	0.04	0.02
How often do you participate in each of the following activities outside the regular school day?				
Club or community sport teams, such as park and rec teams, in-house teams or traveling teams	0 days	0.76	0.70	0.57
Lessons, such as music, dance, tennis or karate lessons	0 days	0.83	0.81	0.75
Last time you saw a doctor or nurse for a check-up or physical exam when not sick or injured	Never	0.04	0.02	0.01
Last time you saw a dentist or dental hygienist for a check-up, exam or cleaning or other dental work	Never	0.04	0.01	0.00
Where do you usually go after school?				
Job	Yes	0.04	0.95	0.01
During a typical week, how many hours do you work for pay outside of the regular school day?	21 Hours or more	0.02	0.19	0.01

Table 3

Latent Class Percentages for all Combinations of the Three-Class Level-1 Model

	Class 1	Class 2	Class 3
		SES	
Model	Low	Med	High
1, 2, 3, 4, 5, 6	33.07	17.89	49.04
1, 2, 3, 4, 5	17.44	23.19	59.38
1, 2, 3, 4, 6	35.04	17.96	47.00
1, 2, 3, 5, 6	31.85	18.17	49.98
1, 2, 4, 5, 6	20.06	17.71	62.23
1, 3, 4, 5, 6	34.86	18.03	47.12
2, 3, 4, 5, 6	31.74	18.05	50.21
1, 2, 3, 4	10.95	26.49	62.57
1, 2, 3, 5	8.76	29.86	61.38
1, 2, 3, 6	27.82	18.16	54.03
1, 2, 4, 5	10.76	12.10	77.14
1, 2, 4, 6	17.58	16.29	66.13
1, 2, 5, 6	22.14	18.22	59.64
1, 3, 4, 5	16.53	23.88	59.60
1, 3, 4, 6	34.45	18.04	47.51
1, 3, 5, 6	31.38	18.19	50.43
1, 4, 5, 6	19.03	17.76	63.21
2, 3, 4, 5	12.23	26.59	61.18
2, 3, 4, 6	25.33	18.09	56.59
2, 3, 5, 6	27.50	18.17	54.33
2, 4, 5, 6	14.15	17.85	68.00
3, 4, 5, 6	31.79	18.11	50.10
1, 2, 3	8.12	26.27	65.61
1, 2, 4	5.25	10.49	84.26
1, 2, 5	5.39	24.02	70.59
1, 2, 6	21.81	18.40	59.79
1, 3, 4	11.54	26.95	61.51
1, 3, 5	8.74	29.21	62.05
1, 3, 6	27.54	18.17	54.29
1, 4, 5	13.85	12.38	73.77
1, 4, 6	15.62	17.67	66.71
1, 5, 6	21.00	18.25	60.75
2, 3, 4	28.57	8.49	62.94
2, 3, 5	7.80	26.33	65.87
2, 3, 6	27.29	18.16	54.55

Note: FRL = 1; Student Mobility = 2; Social Capital = 3; Financial Capital = 4; Economic Consumption Power = 5; Home Resources = 6

(continued)

Table 3 (continued)

Latent Class Percentages for all Combinations of the Three-Class Level-1 Model

	Class 1	Class 2	Class 3
		SES	
Model	Low	Med	High
2, 4, 5	9.24	4.97	85.78
2, 4, 6	10.08	17.84	72.08
2, 5, 6	9.61	18.17	72.21
3, 4, 5	11.95	27.75	61.30
3, 4, 6	30.15	18.15	51.70
3, 5, 6	27.41	18.18	54.41
4, 5, 6	13.39	17.98	68.63
1, 2	26.16	-	73.84
1, 3	8.12	25.84	66.05
1, 4	10.50	6.93	82.57
1, 5	5.51	19.54	74.95
1, 6	3.07	19.11	77.82
2, 3	7.53	26.27	66.21
2, 4	7.58	1.82	90.60
2, 5	3.41	10.60	85.99
2, 6	4.02	21.56	74.42
3, 4	8.50	28.31	63.20
3, 5	8.10	25.92	65.99
3, 6	27.22	18.17	54.61
4, 5	9.08	4.31	86.61
4, 6	9.91	18.10	71.99
5, 6	9.93	18.28	71.79
6	21.79	-	78.21
5	2.95	8.86	88.16
4	1.32	7.14	91.55
3	8.14	25.75	66.11
2	4.87	-	95.13
1	26.29	-	73.71

Note: FRL = 1; Student Mobility = 2; Social Capital = 3; Financial Capital = 4; Economic Consumption Power = 5; Home Resources = 6

Table 4

Linear regression results for Model 1 predicting Commitment to Learning

Variable	*β*	SE	η^2	*Partial* η^2
Intercept	8.350 ***	0.080		
Grade (11th)	-0.070 ***	0.010	0.000	0.001
Gender (Male)	-0.307 ***	0.010	0.010	0.015
Ethnicity			0.006	0.010
African American	-0.068 *	0.033		
American Indian	-0.555 ***	0.054		
Caucasian	-0.457 ***	0.023		
Hispanic American	-0.362 ***	0.029		
Multiple/Other	-0.428 ***	0.029		
SES			0.001	0.001
Low	-0.095 ***	0.012		
Med	-0.100 ***	0.014		
Empowerment	0.204 ***	0.004	0.033	0.049
Family/Community Support	-0.021 ***	0.004	0.000	0.001
Teacher/School Support	0.265 ***	0.003	0.089	0.123
Bullied	0.060 ***	0.005	0.002	0.003
Bullying	-0.166 ***	0.006	0.010	0.015
Mental Distress	-0.034 ***	0.005	0.001	0.001
Family Violence	-0.009	0.005	0.000	0.000
R^2	36.72%			
Adjusted R^2	36.70%			

Note: * $p < .05$. ** $p < .01$. *** $p < .001$

Table 5

Changes in Effect Sizes and Significance for the SES indicators

	Effect Size		Number of Predictors	
Model	η^2	*Partial* η^2	Change in Significance	Change in Sign
1, 2, 3, 4, 5, 6	0.001	0.001	-	-
1, 2, 3, 4, 5	0.001	0.002	2	
1, 2, 3, 4, 6	0.001	0.001	1	
1, 2, 3, 5, 6	0.001	0.002	1	
1, 2, 4, 5, 6	0.000	0.000	1	
1, 3, 4, 5, 6	0.001	0.002		
2, 3, 4, 5, 6	0.001	0.002	1	
1, 2, 3, 4	0.002	0.002	3	1
1, 2, 3, 5	0.001	0.002	1	
1, 2, 3, 6	0.002	0.003	1	
1, 2, 4, 5	0.000	0.001	1	1
1, 2, 4, 6	0.000	0.001	1	1
1, 2, 5, 6	0.001	0.001		
1, 3, 4, 5	0.001	0.002	2	
1, 3, 4, 6	0.001	0.001	1	
1, 3, 5, 6	0.001	0.002	1	
1, 4, 5, 6	0.000	0.001	1	1
2, 3, 4, 5	0.001	0.002	3	
2, 3, 4, 6	0.001	0.002		
2, 3, 5, 6	0.002	0.003	1	
2, 4, 5, 6	0.000	0.001	2	
3, 4, 5, 6	0.001	0.002		
1, 2, 3	0.001	0.002	1	
1, 2, 4	0.000	0.000	2	1
1, 2, 5	0.000	0.001	2	
1, 2, 6	0.000	0.000	2	
1, 3, 4	0.002	0.002	3	
1, 3, 5	0.001	0.002	1	
1, 3, 6	0.002	0.003	1	
1, 4, 5	0.001	0.001	2	
1, 4, 6	0.000	0.001	1	1
1, 5, 6	0.001	0.001	1	
2, 3, 4	0.001	0.002	1	
2, 3, 5	0.001	0.002	1	
2, 3, 6	0.002	0.003	1	

Note: FRL = 1; Student Mobility = 2; Social Capital = 3; Financial Capital = 4; Economic Consumption Power = 5; Home Resources = 6

(continued)

Table 5 (continued)

Changes in Effect Sizes and Significance for the SES indicators

	Effect Size		Number of Predictors	
Model	η^2	*Partial* η^2	Change in Significance	Change in Sign
2, 4, 5	0.000	0.001	1	1
2, 4, 6	0.000	0.001	1	1
2, 5, 6	0.001	0.001	1	
3, 4, 5	0.001	0.002	3	
3, 4, 6	0.001	0.002	1	
3, 5, 6	0.002	0.003	1	
4, 5, 6	0.000	0.001	1	1
1, 2	0.000	0.000	2	
1, 3	0.001	0.002	1	
1, 4	0.000	0.000		2
1, 5	0.001	0.001	1	
1, 6	0.000	0.001	1	1
2, 3	0.001	0.002	1	
2, 4	0.000	0.000	2	1
2, 5	0.001	0.002	1	
2, 6	0.001	0.001	1	
3, 4	0.001	0.002	1	
3, 5	0.001	0.002	1	
3, 6	0.002	0.003	1	
4, 5	0.000	0.001	1	1
4, 6	0.000	0.001	1	1
5, 6	0.001	0.001	1	
6	0.000	0.001	1	
5	0.001	0.001	1	
4	0.000	0.000	2	1
3	0.001	0.002	1	
2	0.000	0.001	1	
1	0.000	0.000	2	

Note: FRL = 1; Student Mobility = 2; Social Capital = 3; Financial Capital = 4; Economic Consumption Power = 5; Home Resources = 6