Initial Exploration of a Construct Representing Native Language and Culture (NLC) in Elementary and Middle School Instruction

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Abstract

Students from American Indian/Alaska Native (AI/AN) backgrounds have typically experienced poor academic and behavioral outcomes. In response, the educational community has recommended that teachers integrate Native Language and Culture (NLC) into instruction to create a welcoming and culturally relevant classroom environment. However, translating this recommendation into practice has been challenging. In this study, we take the first steps toward a formal exploration of the effects of NLC on AI/AN performance by attempting to define a scientifically defensible set of variables that can measure the degree to which teachers and schools make use of NLC in instruction. We used data collected by the National Indian Education Study (NIES) in 2009 and 2011, and conducted exploratory and confirmatory factor analyses with the Student, Teacher, and School (Administrator) Surveys. Contrary to expectations, we found that use of NLC in the classroom was a multidimensional construct: student perceptions differentiated between media-based and live contact; teacher perceptions included both preparation and teaching activities; and, administrator reports included both instructional practices and access to local resources. Implications for further research are discussed.

Keywords: Native Language and Culture; National Indian Education Study; exploratory factor analysis; confirmatory factor analysis

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Research suggests that the current approach to schooling is not working for American Indian/Alaska Native (AI/AN) students, who experience low graduation rates, high drop-out rates, and low academic achievement. For example, in 2009, the national average freshman graduation rate for AI/AN students was 69% compared to 83% of White students (Faircloth & Tippeconnic, 2010). In 2010, AI/AN students had the highest drop-out rate (15%) of all students born in the United States (Aud et al., 2012). Based on 2013 National Assessment of Educational Progress (NAEP) data, AI/AN 4th and 8th grade students continue to lag behind other racial/ethnic groups in math and reading. The National Indian Education Association reports that AI/AN students remain highly over-represented among students targeted for special education services and have a greater likelihood of being suspended or expelled from school (NEA, 2010-2011). Importantly, modern schooling fails to inspire AI/AN students, who find school curricula to be irrelevant to their lives (Faircloth &Tippeconnic, 2010); as a result, AI/AN students often indicate a lack of interest in attending school (NEA, 2010-11; NIEA, 2008; Swisher, Hoisch, &Pavel, 1992).

To increase AI/AN students' motivation and engagement in school and decrease widespread discipline problems and high drop-out rates, scholars in the field have recommended that schools increase the cultural relevance of curricula and emphasize Native Language and Culture (NLC) in instruction (Bishop, Berryman, Cavanagh, & Teddy, 2009; Brayboy & Castagno, 2009; Brayboy, Faircloth, Lee, Maaka, & Richardson, 2015; Castagno & Brayboy, 2008; Chavers, 2000; Faircloth &Tippeconnic, 2010; Martinez, 2014; McCarty & Lee, 2014). NEA, 2010-11, NIEA, 2008). These scholars suggest that emphasizing NLC can decrease

students' inappropriate behavior, including non-compliance with teacher demands, disruption, or being tardy or truant, through culturally supportive and meaningful social environments (Bishop et al., 2009; Castagno & Brayboy, 2008; Demmert, Towner, & Yap, 2003; Reyhner, 1992; Swisher, Hoisch, & Pavel, 1992) and can increase students' perceptions of the relevance of the curriculum and their engagement with it (Brayboy et al., 2015; Chavers, 2000; Faircloth &Tippeconnic, 2010; McCarty & Lee, 2014; Trujillo & Alston, 2005). Specifically, NLC is operationalized at the student level as hands-on learning and validation of Native identity through use of Native language, culture, and history (Brayboy et al., 2015; Castagno & Brayboy, 2008), at the teacher level as student-centered instruction and use of Native languages as vehicles of Native culture and traditional knowledge (Bishop et al., 2009; Brayboy et al., 2015; Brayboy & Castagno, 2009), and at the school administrator level as community involvement (Castagno & Brayboy, 2008; CHiXapkaid et al., 2008; Keeshig-Tobias, 2003; McCarty & Lee, 2014; Tsai & Alanis, 2004), and explicit acknowledgement of the history of tribal self-determination, institutionalized racism, and the need for systemic change (Castago & Brayboy, 2008; McCarty & Lee, 2014). Primary obstacles in integrating NLC into instruction are lack of funding (Martinez, 2014); and a focus on overly simplified approaches limited to the inclusion of anecdotal materials at the expense of systemic change (Castagno & Brayboy, 2008).

In an effort to translate these recommendations into practice, the National Indian Education Association's (NIEA) 14th Annual Legislative Summit in February 2011 focused on the Executive Order 13336 (issued in 2004 by President George W. Bush and recently superseded by Executive Order 13592, issued by President Barack Obama), which stated that "It is the purpose of this order to assist American Indian and Alaska Native students in meeting the

challenging student academic standards of the No Child Left Behind Act of 2001 (Public Law 107-110) in a manner that is consistent with tribal traditions, languages, and cultures."

Unfortunately, little research has formally explored the effects of NLC on the behavior and academic performance of AI/AN students. The NIEA's Legislative Summit recognized this shortcoming, admitting that their emphasis on NLC was largely based on qualitative data and that "we have limited statistical data showing that Native language instruction directly improves academic success." (NCIA/NIEA, 2010, p. 4). Indeed, Demmert and colleagues (2003), in a search of the literature, only found 6 experimental or quasi-experimental studies and 8 non-experimental studies suggesting linkages between NLC and improved student outcomes.

This lack of empirical research may be due to the relatively small numbers of AI/AN students in U.S. public schools (1% of the overall U.S. public school student population; Aud et al., 2010), or may be a function of the sparse and isolated use of NLC in instruction, which is often limited to themes related to Thanksgiving (Pewewardy, 2002; Reese, 1996; Swisher &Tippeconnic, 1999); it may also be related to the lack of a common understanding of exactly what it means to integrate NLC into classroom instruction. We argue that a key to establishing a more formal science around use of NLC in classrooms is the establishment of a common measurement approach. In this study, we take the first steps toward a formal exploration of the effects of NLC on AI/AN performance by attempting to define a scientifically defensible set of variables that can measure the degree to which teachers and schools make use of NLC in instruction.

To conduct our analysis, we used data collected by the National Indian Education Study (NIES) in 2009 and 2011, including the school survey (completed by school administrators), the teacher survey, and the student survey. These surveys provide a number of variables related to

use of NLC in education, such as: (a) the frequency of AI/AN community member visits to schools, (b) the frequency of AI/AN community officials and elders' meeting with school officials, (c) the number of courses about AI/AN traditions and cultures offered, (d) whether instruction in AI/AN cultures is offered, (e) availability of materials on AI/AN culture, (f) teacher use of AI/AN languages during instruction, (g) teacher integration of AI/AN materials into reading curriculum, and (f) teacher integration of AI/AN materials into mathematics curriculum. We examined the cohesiveness of these items through factor analysis and attempted to derive a statistically defensible construct that can be used in future research on use of NLC in instruction (the text of the items is presented in Appendix A; items are identical for 2009 and 2011).

Method

Participants

For the analyses in this paper, we used the National Indian Education Study (NIES) data from 2009 and 2011. The collection of the NIES survey data was conducted by the National Center for Education Statistics (NCES) for the U.S. Department of Education, with the support of the Office of Indian Education. The NIES is conducted through the National Assessment of Education Progress (NAEP), which is the largest nationally representative and continuing assessment of American students in topics such as reading and mathematics (for more information, see http://nces.ed.gov/nationsreportcard/about/). Following the 2011 NIES administration, the study shifted from once every two years to once every four years; thus, the 2011 data represents the most current NIES data available (the results from the 2015 administration are expected to be released in 2016).

The NIES sample from 2009 included about 12,300 AI/AN students at approximately

2,300 schools at grade 4, and about 10,400 AI/AN students at approximately 1,900 schools at grade 8. Also responding to the survey were about 3,800 grade 4 teachers and 4,600 grade 8 teachers associated with these students. For more information on this sample, refer to National Center for Education Statistics (2011).

The NIES sample from 2011 included about 10,200 AI/AN students at approximately 1,900 schools at grade 4, and about 10,300 AI/AN students at approximately 2,000 schools at grade 8. Also responding to the survey were about 3,000 grade 4 teachers and 4,600 grade 8 teachers associated with these students. For more information on this sample, refer to National Center for Education Statistics (2013).

Procedures

The data was collected using a two-stage sampling procedure (i.e., schools were sampled first, and then students were sampled within schools). The schools and students participating in the assessments were selected to be nationally representative; however, BIE schools and AI/AN students are oversampled in order to enable more detailed reporting of their performance. To maximize student sample sizes, all fourth- and eighth-grade AI/AN students in the sampled schools were selected for participation in the NIES sample. Teacher data were collected simply by surveying each targeted student's reading/language arts and mathematics teacher(s).

NIES representatives visited the schools in late January through early March of 2009 and 2011 to administer the NIES surveys. The questions were read out loud to all students in grade 4 who needed assistance (questions were not read aloud to students in grade 8). Representatives were available to answer any questions that students had as they worked on the surveys.

Measures

A Technical Review Panel, assembled to advise NIES, oversaw the development of surveys for students in grades 4 and 8, their teachers, and their school administrators. Grade 8 teachers who taught both language arts and mathematics answered all 24 questions; teachers who taught only one of these subjects answered only the questions applicable to that subject. In this paper, the construct of "NLC" will be derived from items on these surveys, which include the school, teacher, and student survey (see Appendix A for individual items used; items are identical for 2009 and 2011). Item responses occasionally had to be re-coded to ensure equal directionality in all items, such that larger numbers indicated more use of NLC in instruction.

Analysis Plan

We randomly split each sample into two halves, one of which we used for Exploratory Factor Analysis (EFA) and the other of which we used for Confirmatory Factor Analysis (CFA). Following standard practice in the field, we used the EFA results to inform the CFA (Kline, 2004). Specifically, the exploratory portion of the analysis is meant to provide an initial indication of the number of dimensions of a construct (in this case, the use of NLC in instruction) as well as the items that are most closely linked to each dimension; in contrast, the confirmatory portion of the analysis is intended to empirically test the exploratory solution using an independent sample (or, in this case, an independent portion of the original sample).

For the EFA, we used principal axis factoring and reviewed the scree plot to determine the appropriate number of factors, since the standard eigenvalue cutoff of 1.0 is highly influenced by the number of variables in the analysis and often leads to the retention of too many factors (Reise, Waller, & Comrey, 2000). Promax rotation (kappa = 4) was used when there was more than one factor extracted. Those variables with factor loadings > .30 and no

cross-loadings were retained for the CFA. The EFA was conducted in SPSS 19.

The factor structure suggested by the EFA was tested using Mplus 7.1. Model fit was evaluated using the chi-square (χ^2), comparative fit index (CFI), non-normed or Tucker-Lewis index (TLI), and root-mean squared error of approximation (RMSEA). These values indicated how well the factor structure specified by the EFA matched (or *fit*) the underlying structure of the data. CFI/TLI values greater than .95, RMSEA values less than 0.5, and a non-significant χ^2 (or a ratio of $\chi^2/df < 3.0$) indicated good model fit (Bentler, 1990; Bentler & Bonett, 1980; Hu & Bentler, 1999).

We conducted one set of analyses (i.e., EFA and CFA) for students, teachers, and administrators (schools) for both 4th and 8th grade and for both 2009 and 2011, resulting in a total of 12 sets of analyses. When conducting these analyses, we weighted the student and administrator (school) data using the appropriate weights from the NIES dataset; however, since teachers were not deliberately sampled (i.e., teacher data were collected simply by surveying each targeted student's teacher), there are no weights defined for teachers, and thus they were not weighted during our analysis. Because students were nested within schools, we accounted for this nesting in our CFA; the nesting could not be reflected in our EFA due to software limitations.

Given that some survey items contained multiple sub-items that we expected to correlate more highly with one another than with other items, we allowed these sub-items to correlate as dictated by model fit concerns (Kenny, 1976; Marsh, 1989; Saris & Aalberts, 2003). In each case, these correlations improved model fit but did not alter the direction or magnitude of factor loadings.

Results

The EFAs with the 2009 and 2011 4th grade Student data suggested an identical two-factor solution, and we tentatively labeled the factors Live Exposure (to indicate direct contact with Native people) and Media Exposure (to indicate exposure to learning materials about Native Americans). No cross-loadings (i.e., loading of one item on two different factors) were apparent. The CFA confirmed the two-factor solution and demonstrated good fit for both the 2009 and 2011 models (fit indices provided in Table 1). Model results are provided in Table 2.

The EFAs with the 2009 and 2011 8th grade Student data also suggested a two-factor solution, and again we labeled the factors Live Exposure and Media Exposure (see Table 3). No cross-loadings were apparent in either analysis; however, items 4 and 10c in the 2009 EFA and item 4 in the 2011 EFA demonstrated sub-optimal loadings and were not included in the respective CFAs. The 2009 data CFA confirmed the two-factor solution; however, item 5 demonstrated sub-optimal loading and contributed to poor model fit, so it was removed. The sub-items for 6 and 7 demonstrated strong correlations with one another and were allowed to correlate outside of the factor structure; this improved model fit but did not alter the magnitude of the factor loadings; the final model demonstrated good fit (see Table 1). The 2011 data CFA also confirmed the two-factor solution, and the final model demonstrated good fit (see Table 1).

Both the 2009 and 2011 4th and 8th grade School/Administrator data suggested a three-factor solution, which we labeled Involvement (to indicate involvement of local Native people in the affairs of the school), Instruction/Culture (to indicate that the school provided instruction in Native cultural issues), and Instruction/Language (to indicate that the school provided instruction in Native language); see Tables 4 and 5. No cross-loadings were apparent, but items 14g and 15 in the 2009 4th grade data and item 15 in the 2011 4th grade data demonstrated sub-

optimal loadings and were not included in the CFA. In addition, the 2009 and 2011 Instruction/Language factors both only contained two items and thus were not analyzed further; only the Involvement and Instruction/Culture factors were included in the CFAs. All four CFAs confirmed the two-factor solution; however, items 11c (both grades and years) and 14g and 15 (8^{th} grade) demonstrated sub-optimal loading and contributed to poor model fit, so they were removed. The final 2009 and 2011 models demonstrated good fit (see Table 1).

Both the 2009 and 2011 4^{th} and 8^{th} grade Teacher data suggested a three-factor solution, which we labeled Instruction/Math (to indicate use of Native culture, history, and issues in mathematics instruction), Teacher Prep (to indicate teachers' consultation of Native materials and resources in teaching), and Instruction/ReadWrite (to indicate use of Native culture, history, and issues in reading and writing instruction); see Tables 6 and 7. No cross-loadings were apparent. All four CFAs confirmed the three-factor solutions. The final models demonstrated good fit (see Table 1).

Discussion

Large databases such as NIES/NAEP often provide significant benefits to researchers, policymakers, and practitioners in terms of the scientific knowledge that can be gleaned from them and the subsequent changes that can be made to improve policy and practice. At the same time, there is also a risk that findings across multiple studies will not be comparable due to varying approaches to measurement of key constructs. In this study, we provide a scientifically defensible definition of the use of NLC in instruction, and our findings can be of use to other researchers who plan to make use of the NIES/NAEP dataset to build knowledge that can aid AI/AN students and the teachers and school administrators who work with them.

The outcomes of our analyses also provide useful insight into the multi-dimensional

nature of using NLC in instruction. For example, the results indicated that students' perceptions of the use of NLC in instruction contained two independent dimensions that referred to the media in their classroom (e.g., books, other print materials, DVDs) and their live contact with Native people demonstrating Native traditions and language. Future research can probe whether these dimensions of NLC can impact students' academic and behavioral success.

Our results are also informative with regards to teachers. Although teachers are often encouraged to integrate NLC into instruction to improve outcomes for AI/AN students, they have very little guidance on what to do to achieve this integration. Our outcomes suggest that the extent to which teachers integrate NLC into instruction can be measured by their engagement with available resources to improve their knowledge of Native culture and traditions, as well as by the extent to which they anchor reading and math instruction on concepts, issues, and ideas relevant to AI/AN students. While teacher practices are perceived as critical for student success, the precise dimensionality of the NLC construct can provide a method for measuring specific practices in relation to student outcomes, and research findings related to these constructs can provide specific guidance for policy and practice. With regards to school administrators, our results suggest that teacher access to professional development in Native culture and traditions as well as encouraging teacher use of specific aspects of Native culture (e.g., history, traditions, art, music, tribal government) represent independent dimensions of NLC use at the school level.

The dimensions of NLC suggested by our analyses both validate and build on the work of the Technical Review Panel that collaborated on the development of the NIES surveys. The panel identified the following core domains to be measured by the surveys: (a) the extent to which NLC is part of the curriculum, (b) the availability of resources to improve AI/AN student

achievement, (c) schools' use of assessment data, (d) Native community involvement, and (e) students', teachers', and administrators' perceptions of education (National Center for Education Statistics, 2012). Our results further refine these domains into measurable constructs. As such, our results provide an important step within the larger research agenda of developing teacher practices and school environments conducive to AI/AN students' success in school. We can now assess relationships between these dimensions of NLC and student outcomes to evaluate which are most critical in promoting AI/AN students' success. Given the multi-dimensional nature of these constructs, it is quite possible that different dimensions would be more central to different types of students (e.g., those who do vs. do not speak Native language in the home) attending different types of schools (e.g., BIE vs. non-BIE school). We can assess relationships among these dimensions to assess if, for example, teacher professional development in NLC significantly contributes to AI/AN students' academic success, or if school-level involvement of Native people is a stronger contributor. As such, we can conduct nuanced analyses of the relationship between use of NLC and AI/AN student outcomes which can then inform the development of interventions specifically designed to improve AI/AN student academic and behavioral success.

The dimensions of NLC defined in this paper can be used by future researchers in a variety of ways. For those using a Structural Equation Modeling (SEM) framework for their data analyses, the items associated with each dimension can be included in a *latent variable*, which represents an unobserved variable that is inferred or derived statistically using the observed indicator items. For example, a latent variable representing 4th grade students' perceptions of the availability of media on NLC can be created using items 7, 8, and 12 from the student survey. Alternatively, researchers can combine the items in each dimension

mathematically using the factor loadings as weights, or, for research using other samples or for the sake of simplicity, the items for each dimension can simply be averaged.

There are several limitations to these results that should temper their interpretation. First, although the NIES dataset is designed to be nationally representative, non-response among students, teachers, and administrators may create an unknown degree of bias in the results; additional replication of these results with other datasets is warranted. Second, the limitations of the NIES surveys did not permit us to examine more nuanced aspects of use in NLC in the classroom (e.g., how the teacher presented these concepts or activities, how the students reacted, etc.). Further research is required to assess these details. Third, given the way in which teacher data were collected, there were no weights that could be used in those analyses. Thus, the results related to teachers may be biased to an unknown degree. Finally, our results lack a degree of predictive validity in that we have not correlated our dimensions of NLC with expected outcomes, such as academic achievement; space limitations preclude a thorough investigation of this issue. However, our findings do enable those working with the NIES/NAEP dataset to use the same constructs in their research, so that results can be compared across papers and across projects and knowledge regarding NLC in schools can be accumulated.

In conclusion, existing research suggests that AI/AN students perceive their classroom environments as culturally irrelevant and therefore are ill-motivated to engage with the curriculum (Castagno & Brayboy, 2008). The results of our factor analyses can guide further inquiry into what aspects of the classroom environment we need to change to promote AI/AN students' academic and behavioral success.

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Table 1

Model fit indices

	χ2	*CFI*	*TLI*	*RMSEA with 90% C.I.*
2009 4th grade Student	$\chi2(8) = 17.48$, $p < .05$, $\chi2/df = 2.19$	.99	.98	.01 (.01|.02)
2011 4th grade Student	$\chi2(8) = 19.19$, $p < .05$, $\chi2/df = 2.40$	.98	.96	.02 (.01|.02)
2009 8th grade Student	$\chi2(17) = 94.69$, $p < .001$, $\chi2/df = 5.57$	.97	.95	.03 (.02|.04)
2011 8th grade Student	$\chi2(23) = 75.97$, $p < .001$, $\chi2/df = 3.30$	.99	.98	.02 (.01|.03)
2009 4th grade Administrator	$\chi2(26) = 73.55$, $p < .001$, $\chi2/df = 2.83$	.94	.92	.04 (.03|.05)
2011 4th grade Administrator	$\chi2(23) = 84.59$, $p < .001$, $\chi2/df = 3.68$	.94	.90	.05 (.04|.07)
2009 8th grade Administrator	$\chi2(26) = 80.25$, $p < .001$, $\chi2/df = 3.09$	.95	.92	.05 (.03|.06)
2011 8th grade Administrator	$\chi2(23) = 68.35$, $p < .001$, $\chi2/df = 2.97$	.94	.92	.04 (.03|.06)
2009 4th grade Teacher	$\chi2(164) = 906.53$, $p < .001$, $\chi2/df = 5.53$	.95	.94	.05 (.05|.05)
2011 4th grade Teacher	$\chi2(163) = 740.61$, $p < .001$, $\chi2/df = 4.54$	.95	.94	.05 (.05|.05)
2009 8th grade Teacher	$\chi2(184) = 1168.61$, $p < .001$, $\chi2/df = 6.35$	.97	.97	.05 (.05|.05)
2011 8th grade Teacher	$\chi2(182) = 648.57$, $p < .001$, $\chi2/df = 3.56$	.93	.92	.05 (.04|.05)

Table 2

Factor analysis results for 4th grade students (N rounded to nearest 100)

	2009 Exploratory (N = 6300)		*2009 Confirmatory (N = 6400)*		*2011 Exploratory (N =6400)*		*2011 Confirmatory (N = 6300)*	
Item	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*
4	-.03	.39[a]		.38	-.07	.42[a]		.38
5	.02	.49[a]		.51	.05	.49[a]		.50
6	.01	.31[a]		.33	.01	.33[a]		.34
7	.36[a]	.11	.43		.34[a]	.16	.46	
8	.59[a]	.07	.58		.43[a]	.14	.61	
12	.61[a]	-.11	.55		.64[a]	-.15	.44	

Note. a = primary loading.

Table 3

Factor analysis results for 8th grade students (N rounded to nearest 100)

	2009 Exploratory (N = 5300)		*2009 Confirmatory (N = 5400)*		*2011 Exploratory (N = 5300)*		*2011 Confirmatory (N =5300)*	
Item	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*	*Factor 1 (Media Exposure)*	*Factor 2 (Live Exposure)*
4	.28	.17			.28[a]	.18		
5	.25	.33[a]			.28	.32[a]		
6a	.76[a]	-.04	.70		.78[a]	-.07	.74	
6b	.70[a]	.03	.71		.74[a]	-.02	.74	
6c	.82[a]	-.11	.75		.78[a]	-.05	.76	
6d	.47[a]	.06	.57		.50[a]	.06	.52	
7a	.01	.56[a]		.55	.03	.57[a]		.60
7b	.03	.65[a]		.64	.02	.68[a]		.53
8a	-.02	.66[a]		.58	-.03	.69[a]		.62

8b	.03	.70[a]	.65	.02	.67[a]	.52
10c	-.08	.28		-.06	.33[a]	

Note. a = primary loading.

Table 4

Factor analysis results for 4th grade school administrators (N rounded to nearest 100)

	2009 Exploratory (N = 1200)			*2009 Confirmatory (N = 1100)*		*2011 Exploratory (N = 1000)*			*2011 Confirmatory (N = 1000)*	
Item	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*	*Factor 3 (Instruct/ Lang)*	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*	*Factor 3 (Instruct/ Lang)*	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*
9a	.58[a]	.13	-.11	.57		.80[a]	-.02	-.04	.68	
9b	.62[a]	.15	-.10	.61		.74[a]	-.02	.12	.61	
9c	.80[a]	-.05	.01	.68		.83[a]	.01	-.00	.74	
10a	.84[a]	-.13	-.02	.80		.89[a]	-.01	-.09	.84	
10b	.87[a]	-.05	.01	.87		.85[a]	-.07	-.02	.86	
11c	.55[a]	-.07	.13			.36[a]	.26	.01		
14a	.00	.00	.94[a]			.03	-.03	.91 [a]		
14b	-.07	-.02	.96[a]			-.09	-.01	.93[a]		
14c	-.05	.77[a]	-.03		.80	-.02	.77	.17		.78

14d	.01	.75[a]	-.08	.85	-.09	.92[a]	-.06	.91
14e	-.04	.70[a]	.06	.75	.02	.67[a]	.08	.70
14f	.13	.34[a]	.25	.43	.05	.48[a]	.23	.40
14g	.26	.26	.24		.10	.45[a]	.21	
15	.23	.17	.06		.24	.25	.18	

Note. a = primary loading.

Table 5

Factor analysis results for 8th grade school administrators (N rounded to nearest 100)

	2009 Exploratory (N = 1000)			*2009 Confirmatory (N = 1000)*		*2011 Exploratory (N = 1000)*			*2011 Confirmatory (N = 1100)*	
Item	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*	*Factor 3 (Instruct/ Lang)*	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*	*Factor 3 (Instruct/ Lang)*	*Factor 1 (Local Involve)*	*Factor 2 (Instruct/ Cultural)*
9a	.70[a]	.00	-.02	.81		.80[a]	-.02	-.04	.72	
9b	.77[a]	.05	.01	.76		.74[a]	-.02	.12	.70	
9c	.73[a]	.00	.00	.71		.83[a]	.01	-.00	.70	
10a	.81[a]	.08	-.09	.90		.89[a]	.01	-.09	.87	
10b	.81[a]	-.08	-.03	.86		.85[a]	-.07	-.02	.76	
11c	.54[a]	-.01	.03			.36[a]	.26	-.01		
14a	-.02	.01	.99[a]			.03	-.03	.91[a]		
14b	-.01	.01	.90[a]			-.09	-.01	.93[a]		
14c	-.07	.89[a]	-.14		.80	-.02	.77[a]	-.17		.75

14d	-.05	.93[a]	-.09	.88	-.09	.92[a]	-.06	.90
14e	.01	.67[a]	.16	.69	.02	.67[a]	.08	.72
14f	.10	.54[a]	.16	.49	.01	.48[a]	.23	.52
14g	.12	.42[a]	.18		.1	.45[a]	.21	
15	.34[a]	-.07	.23		.24	.26	.18	

Note. a = primary loading.

Table 6

Factor analysis results for 4th grade teachers (N rounded to nearest 100)

	2009 Exploratory (N = 1900)			*2009 Confirmatory (N = 1900)*			*2011 Exploratory (N = 1600)*			*2011 Confirmatory (N = 1600)*		
Item	*Factor 1 (Instruct/ Math)*	*Factor 2 (Teacher Prep)*	*Factor 3 (Instruct/ ReadWrt)*	*Factor 1 (Instruct/ Math)*	*Factor 2 (Teacher Prep)*	*Factor 3 (Instruct/ ReadWrt)*	*Factor 1 (Instruct/ Math)*	*Factor 2 (Teacher Prep)*	*Factor 3 (Instruct/ ReadWrt)*	*Factor 1 (Instruct/ Math)*	*Factor 2 (Teacher Prep)*	*Factor 3 (Instruct/ ReadWrt)*
5a	-.11	.84[a]	.00		.77		-.08	.83[a]	.01		.78	
5b	.01	.79[a]	.00		.77		-.01	.75[a]	.05		.81	
5c	.03	.68[a]	.04		.76		-.01	.69[a]	.12		.78	
5d	-.05	.81[a]	-.03		.78		-.07	.84[a]	-.05		.74	
5e	.11	.67[a]	.00		.79		.12	.74[a]	-.06		.75	
6	.13	.59[a]	.01		.62		.24	.53[a]	-.00		.63	
9	.45[a]	.11	.03	.50			.39[a]	.16	.03	.52		
12	-.13	.09	.81[a]			.74	-.09	.11	.75[a]			.72
13	.06	.01	.77[a]			.83	.10	.00	.72[a]			.83
14a	-.05	-.03	.82[a]			.70	-.07	-.01	.79[a]			.65

14b	.06	-.04	.70[a]		.70	-.00	-.04	.74[a]		.67
14c	.10	-.03	.75[a]		.83	.08	-.04	.77[a]		.83
14d	.20	.01	.61[a]		.74	.15	.00	.61[a]		.79
14e	.27	.21	.35[a]		.70	.30	.17	.35[a]		.74
16	.79[a]	.04	.04	.88		.78[a]	.04	.05	.83	
17	.82[a]	.00	.04	.86		.83[a]	-.05	.07	.83	
18a	.71[a]	.04	.02	.77		.75[a]	.08	-.07	.80	
18b	.73[a]	.01	.02	.79		.82[a]	-.06	-.02	.83	
18c	.85[a]	-.08	-.02	.69		.79[a]	-.06	-.02	.76	
18d	.82[a]	-.05	-.04	.68		.73[a]	-.04	.01	.75	

Note. a = primary loading.

Table 7

Factor analysis results for 8th grade teachers (N rounded to nearest 100)

	2009 Exploratory (N = 2300)			*2009 Confirmatory (N = 2300)*			*2011 Exploratory (N = 1500)*			*2011 Confirmatory (N =1500)*		
Item	*Factor 1 (Instruct/ Math)*	*Factor 2 (Instruct/ ReadWrt)*	*Factor 3 (Teacher Prep)*	*Factor 1 (Instruct/ Math)*	*Factor 2 (Instruct/ ReadWrt)*	*Factor 3 (Teacher Prep)*	*Factor 1 (Instruct/ Math)*	*Factor 2 (Instruct/ ReadWrt)*	*Factor 3 (Teacher Prep)*	*Factor 1 (Instruct/ Math)*	*Factor 2 (Instruct/ ReadWrt)*	*Factor 3 (Teacher Prep)*
4a	.00	-.04	.90[a]			.86	-.04	-.12	.88			.78
4b	-.01	-.02	.90[a]			.87	-.05	.00	.75			.78
4c	.02	.03	.81[a]			.84	.04	.17	.54			.73
4d	-.01	-.01	.86[a]			.82	-.04	-.01	.76			.76
4e	-.01	.05	.86[a]			.85	.11	.12	.67			.77
5	.03	.21	.53[a]			.68	.17	.10	.55			.65
12	-.01	.91[a]	.05		.92		-.02	.81	.12		.85	
13	-.03	.91[a]	.05		.94		.02	.83	-.06		.88	
14	.01	.94[a]	-.06		.88		.45	.22	.04		.46	
15a	.01	.95[a]	-.02		.92		.12	77	-.07		.72	

15b	.06	.96[a]	-.05		.89	.22	.74	-.20		.66
15c	-.04	.91[a]	.03		.94	-.05	.83	.09		.86
15d	-.01	.93[a]	.02		.94	-.10	.92	.05		.79
15e	-.01	.84[a]	.07		.89	-.06	.73	.20		.70
19	.99[a]	.00	.00	.99		.75	.02	.18	.79	
20	.99[a]	-.01	.01	.99		.71	.01	.23	.79	
21	.99[a]	.00	-.01	.99		.62	.03	.03	.43	
22a	.99[a]	.00	.01	.99		.74	-.12	.10	.71	
22b	.99[a]	.01	.00	.99		.89	.01	-.06	.85	
22c	.99[a]	.00	.00	.99		.98	.04	-.20	.74	
22d	.99[a]	.00	.00	.99		.80	.03	-.05	.67	

Note. a = primary loading.

Appendix A

Items related to use of NLC from 2009/2011 4th grade student survey

4	How often do people in your school talk to each other in your American Indian or Alaska Native language?	1 - Never or hardly ever 2 - Once or twice a month 3 - Once or twice a week 4 - Every day or almost every day
5	During 4th grade, have any American Indian or Alaska Native people come to your school to talk about their traditions and cultures (ways of life, customs)?	0 - No 1 - Yes
6	During 4th grade, have you attended school field trips to museums, traditional villages, or other places to learn about American Indian or Alaska Native people?	0 - Not offered to 4th-grade students 1 - No, but other 4th-grade students did 2 - Yes
7	During 4th grade, have you used books, videos, or other materials about American Indian or Alaska Native people?	0 - No 1 - Yes
8	During 4th grade, have you used or checked out books, videos, or other materials about American Indian or Alaska Native people from your school library?	0 - No 1 - Yes
12	I enjoy reading about American Indian or Alaska Native people.	0 - This is not like me 1 - This is a little like me 2 - This is a lot like me

Items related to use of NLC from 2009/2011 8th grade student survey

4	How often do people in your school talk to each other in your American Indian or Alaska Native language?	1 - Never or hardly ever 2 - Once or twice a month 3 - Once or twice a week 4 - Every day or almost every day
5	During 8th grade, how often have any of your teachers talked to your class about the history, traditions, and cultures (ways of life, customs) of American Indian or Alaska Native people?	1 - Never or hardly ever 2 - Once or twice a month 3 - Once or twice a week 4 - Every day or almost every day
6	During 8th grade, have you attended any of the following through your school?	
a	Presentations by American Indian or Alaska Native people about their traditions and cultures (ways of life, customs)	0 - Not offered to 8th-grade students 1 - No, but other 8th-grade students did 2 - Yes
b	American Indian or Alaska Native art and craft demonstrations	Same as 6a
c	Traditional American Indian or Alaska Native music and/or dance performances	Same as 6a
d	Field trips to museums, traditional villages, or other places to learn about American Indian or Alaska Native people	Same as 6a
7	During 8th grade, have you used any of the following materials?	
a	Books, videos, websites, or computer software about American Indian or Alaska Native history, traditions, and cultures (ways of life, customs)	0 - No 1 - Yes
b	Books, videos, websites, or computer software about current issues that are important to American Indian or Alaska Native people	Same as 7a
8	During 8th grade, have you used any of the following materials from your school library?	
a	Books, videos, websites, or computer software about American Indian or Alaska Native history, traditions, and cultures (ways of life, customs)	0 - No 1 - Yes
b	Books, videos, websites, or computer software about current issues that are important to American Indian or Alaska Native people	Same as 8a
10c	I enjoy reading about American Indian or Alaska Native people.	0 - This is not like me 1 - This is a little like me 2 - This is a lot like me

Items related to use of NLC from 2009/2011 4th and 8th grade school survey

9	In a typical school year, how many times has a member of the American Indian or Alaska Native community done the following?	
a	Visited the school to discuss education issues with students and staff, other than a conference regarding an individual student	0 - Never 1 - 1 or 2 times 2 - 3 or more times
b	Visited the school to share American Indian or Alaska Native traditions and culture with students and staff	Same as 9a
c	Participated in Indian Education Parent Groups	Same as 9a
10	In a typical school year, how many times have officials (including elders) of the American Indian or Alaska Native community done the following?	
a	Met with school officials on education issues, other than a conference regarding an individual student	0 - Never 1 - 1 or 2 times 2 - 3 or more times
b	Attended meetings with school personnel with or on behalf of (other) parents	Same as 10a
11	How many of the following courses and programs about American Indian or Alaska Native traditions and culture are offered at your school each year?	
c	Workshop or unit	1 - None 2 - 1 3 - 2 4 - 3 5 - 4 or more
14	Do students in your school receive instruction about American Indian or Alaska Native cultures in any of the following areas?	
a	Oral language	0 - No 1 - Yes
b	Written language	Same as 14a
c	History of tribes or cultural groups	Same as 14a
d	Traditions and customs	Same as 14a
e	Arts, crafts, music, or dance	Same as 14a
f	Tribal or village government	Same as 14a
g	Current events and issues important to tribes or cultural groups	Same as 14a
15	To what extent are books and materials on American Indian or Alaska Native issues/topics available in the school library?	0 - Not at all 1 - Small extent 2 - Moderate extent 3 - Large extent

Note. Items 11a, b, d, and e were excluded due to limited variability (>80% “None”).

Items related to use of NLC from 2009/2011 4th and 8th grade teacher survey

5/4	During the last two years, how many times have you consulted each of the following resources to help you improve the academic performance of your American Indian or Alaska Native students?	
a	Online websites or databases	0 - Never 1 - 1 or 2 times 2 - 3 or 4 times 3 - 5 or more times
b	Articles in professional journals	Same as 5a
c	Local libraries or cultural centers	Same as 5a
d	Other teachers in your school	Same as 5a
e	Elders or other experts	Same as 5a
6/5	During the last two years, how many times have you attended in-service classes and workshops to help you improve the academic performance of your American Indian or Alaska Native students?	0 - Never 1 - 1 or 2 times 2 - 3 or 4 times 3 - 5 or more times
9/-	To what extent do you use your students' American Indian or Alaska Native language(s) when you teach any core subject (reading, mathematics, science, and social studies)?	0 - Instruction is entirely in English 1 - Instruction is primarily in English, but words or phrases from the students' American Indian or Alaska Native language(s) are included occasionally 2 - Instruction is primarily in English, but words or phrases from the students' American Indian or Alaska Native language(s) are included frequently 3 - Instruction is primarily in the students' American Indian or Alaska Native language(s)
12/12	To what extent do you integrate lessons and materials about American Indian or Alaska Native culture and history into your reading/language arts curriculum?	0 - Never 1 - At least once a year 2 - At least once a month 3 - At least once a week 4 - Every day or almost every day
13/13	To what extent do you integrate lessons and materials about current issues affecting American Indian or Alaska Native people and communities into your reading/language arts curriculum?	0 - Never 1 - At least once a year 2 - At least once a month 3 - At least once a week 4 - Every day or almost every day
-/14	To what extent do you use your students' American Indian or Alaska Native language(s) when you teach reading/language arts?	Same as 9/-
14/15	How often do you have your students do each of the following reading/language arts activities?	

a	Read literature with American Indian or Alaska Native themes	0 - Never 1 - At least once a year 2 - At least once a month 3 - At least once a week 4 - Every day or almost every day
b	Read literature by American Indian or Alaska Native authors	Same as 14a
c	Read about, or discuss, current issues of concern to the American Indian or Alaska Native community	Same as 14a
d	Write about experiences or issues affecting American Indian or Alaska Native people	Same as 14a
e	Write about their own experiences as an American Indian or Alaska Native person	Same as 14a
16/19	To what extent do you integrate lessons and materials about American Indian or Alaska Native culture and history into your mathematics curriculum?	0 - Never 1 - At least once a year 2 - At least once a month 3 - At least once a week 4 - Every day or almost every day
17/20	To what extent do you integrate lessons and materials about current issues affecting American Indian or Alaska Native people and communities into your mathematics curriculum?	0 - Never 1 - At least once a year 2 - At least once a month 3 - At least once a week 4 - Every day or almost every day
-/21	To what extent do you use your students' American Indian or Alaska Native language(s) when you teach mathematics?	Same as 9/-
18/22	How often do you have your students do each of the following mathematics activities?	
a	Solve mathematics problems that reflect situations found in American Indian or Alaska Native communities	0 - Never 1 - At least once a year 2 - At least once a month 3 - At least once a week 4 - Every day or almost every day
b	Participate in activities that integrate mathematics with American Indian or Alaska Native themes (for example, use traditional symbols and designs to teach geometric concepts)	Same as 18a
c	Study traditional American Indian or Alaska Native mathematics (for example, American Indian or Alaska Native systems of counting, estimating, and recording quantities)	Same as 18a
d	Study mathematics within traditional American Indian or Alaska Native contexts (for example, American Indian or Alaska Native systems of astronomy and physics)	Same as 18a

Note. Item numbers before the slash refer to 4th grade; after the slash refers to 8th grade.