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Title: Core Academic Language skills: Moving beyond vocabulary knowledge to predict reading comprehension

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Abstract 3 Body

Background / Context:

Despite a longstanding awareness of academic language as a pedagogically-relevant research area, the construct of academic language proficiency--understood as a more comprehensive set of skills than just academic vocabulary-- has remained only vaguely specified (Cummins, 1979, 2008). Academic language proficiency, broadly understood as proficiency in “the language of schooling” (Schleppegrell, 2001, 2004), has increasingly become a topic of interest in educational circles because of its hypothesized contribution to reading comprehension and content-area achievement (Abedi & Herman, 2010; August and Shanahan, 2006; Bailey, 2007; Biancarosa & Snow, 2006). It has become commonplace to argue that the reading comprehension difficulties documented for a large proportion of students in grades 4 and above (particularly, for students living in poverty and/or acquiring English as a second language in the U.S.) are, in large part, the result of students’ challenges understanding the academic language of school texts. Moreover, students’ academic language proficiency is being increasingly understood in the field as a malleable factor that can be effectively scaffolded through high-quality instruction. One of the central shifts in practice advocated by the recently and widely-adopted Common Core State Standards in the U.S. calls for “regular practice with academic language and complex texts” throughout the upper elementary and secondary school years (National Governors Association, 2010). Paradoxically, though, an operational definition of academic language proficiency that would be sufficiently precise to inform instruction remains elusive. In the absence of a comprehensive operational construct, the field continues to be largely dominated by a narrow definition of academic language as academic vocabulary. In response to various researchers’ calls for more expansive definitions (Nagy & Townsend, 2012; National Research Council, 2010; Schleppegrell, 2004; Valdés, 2004), this study examines the potential—for both research and practice—of a more inclusive operationalization of an academic language proficiency construct. We refer to this operational construct as *Core Academic Language Skills (CALs)*. We define CALs as a constellation of high-utility language skills that support academic reading across school content areas (e.g., knowledge of logical markers that connect ideas, such as *nevertheless*, *consequently*; knowledge of structures that pack dense information, such as nominalizations or embedded clauses; knowledge of structures for organizing analytic texts). Using an innovative and psychometrically robust assessment, the *Core Academic Language Skills Instrument (CALs-I)*, this study explores the relationship of these cross-disciplinary academic language skills and reading comprehension in a socioeconomically diverse cross-sectional sample of students from 4th and 6th grade.

Purpose / Objective / Research Question / Focus of Study:

Two research questions guided our study:

3. Do 4th and 6th-grade students’ core academic language skills --as measured by the CALs-I-- vary by students’ grade or socioeconomic status?
4. Controlling for socio-demographic characteristics, word recognition & decoding, and academic vocabulary knowledge, are 4th and 6th-grade students’ cross-disciplinary academic language skills --as measured by the CALs-I-- predictive of students’ reading comprehension scores?

Setting:

As part of the IES-funded project *Catalyzing Comprehension through Discussion and Debate* (CCDD), the data for this study were collected as baseline data in 4th- and 6th-grade classrooms that participated in the control and treatment conditions during the first year of the Word Generation intervention. Data were collected in seven schools in two large urban school districts in the Northeastern U.S. (three schools in District 1 and four schools in District 2).

Population / Participants / Subjects:

A total of 282 students – 85 4th graders and 197 6th graders-- were included in this study. The sample was comprised by all the students who fulfilled two criteria:

1. students who participated in the pre-test data collection (Fall 2011) of the Word Generation (WG) intervention in year 1 of the CCDD study; and
2. students who had complete pre-test data for the following three assessments in study year 1: (a) the RISE, (b) the WG Academic Vocabulary Test, and (c) the CALS Instrument.

The overall sample was approximately balanced by students' gender and socio-economic status (SES), as indexed by free/reduced price lunch eligibility. A total of 149 (52%) students qualified for free/reduced price lunch (101 6th graders). The vast majority of students in this sample were classified as English proficient according to official school records. Only 4% of students were designated as English Language Learners (ELL).

Intervention / Program / Practice:

Even though all participants were taking part of the control or treatment classrooms of the WG intervention, the data used in this study were collected as baseline data before the intervention had started. Thus, the description of the intervention is irrelevant for the purposes of this paper.

Research Design:

Two main hypotheses are tested in this study. First, we hypothesized that CALS-I scores would capture individual variability in core academic language skills within and across grades, with students in 6th grade outperforming students in 4th grade, and students from more privileged SES environments outperforming their peers from less privileged backgrounds. Second, the main hypothesis tested by this study was whether CALS-I scores would be predictive of reading comprehension above and beyond the contribution of socio-demographic status, basic word-level reading skills, and academic vocabulary knowledge. To test these hypotheses, data from a socio-economically diverse sample of 4th- and 6th-grade students was collected via group-administered assessments. Reading comprehension, was measured with the RISE Reading Comprehension Subtest and was used as outcome variable in the regression analyses. Academic language skills -- measured by the CALS-I-- were the main predictor. The covariates included basic word-level reading skills --measured by the RISE Word Recognition & Decoding Subtest-- and academic vocabulary knowledge --measured using the Word Generation Academic Vocabulary Test. On the basis of well-documented contributions of socio-demographic characteristics (i.e., grade, SES), reading fluency, and academic vocabulary knowledge to reading comprehension, we anticipated all these covariates to be significant predictors of reading comprehension. Alternatively, CALS-I scores might not capture variability across individuals because by this age, all students have already mastered the school-relevant language skills tested. Moreover, given that vocabulary knowledge is positioned

as a critical contributor to reading comprehension, CALS-I scores might not offer any unique contribution beyond the explanatory power of vocabulary knowledge.

Data Collection and Analysis:

MEASURES

All participants completed the following group-administered assessments:

- 1. Reading Inventory and Scholastic Evaluation (RISE):** a 45 to 60 minute web-administered assessment developed by a team of researchers at ETS (Sabatini, O'Reilly, Halderman, & Bruce, 2014; Sabatini, Bruce, & Steinberg, 2013) to assess six constructs that underlie reading proficiency in the middle grades (i.e., reading comprehension, word recognition and decoding, vocabulary, morphological awareness, sentence processing, efficiency of basic reading comprehension). The RISE is designed for upper elementary and middle school students and provides subtest scores for each reading component with the goal of informing decisions about literacy instruction at the district, school, and classroom levels. Two RISE subtests are used in this analysis:
 - (a) RISE - Reading Comprehension (RC)** (22 items, 20 minutes, $\alpha = .76$): RISE RC scale scores are used as outcome variable
 - (b) RISE - Word Recognition & Decoding (WRC)** (50 items, 6 minutes, $\alpha = .91$): RISE WRC scale scores are used as a control variable.
- 2. WG Academic Vocabulary test** (50 items, $\alpha = .91$): multiple-choice test that assesses academic words targeted by the WG intervention in grades 4 to 8. The majority of target words are selected from the Academic Word List (Coxhead, 2000). Each target word is presented in a neutral sentence context with four responses to choose from: (a) a synonym (correct answer), an incorrect semantic associate, a phonological associate and a nonrelated word. The test includes 50 items. Percent correct scores were used for analysis (Hwang, Lawrence, & Snow, in preparation).
- 3. Core Academic Language Skills Instrument (CALS-I)** (44 items, $\alpha = .93$; split reliability=.90): group-administered test that evaluates students' core academic language skills in grades 4 to 8. The purpose of this test is to assess students' skills in understanding, producing, and reflecting upon language forms that are prevalent in academic texts (e.g., logical connectives, nominalizations). Tasks assess a range of skills through multiple choice, matching, or short written responses. Two statistically equated forms with robust psychometric properties comprise the CALS-I: Form 1 (for grades 4 to 6) and Form 2 (for grades 7 and 8). Form 1 was used for this study and included six tasks: Connecting Ideas, Tracking Themes, Organizing Texts, Breaking Words, Comprehending Sentences, Identifying Definitions. Prior studies have yielded robust reliability (.93 as indexed by coefficient alpha and .90 by split half reliability) and validity (.70 as indexed by the zero order correlation with the Gates-MacGinitie Passage Comprehension). Raw scores were used for this analysis, but IRT factors scores will be generated for the final analysis. Past studies have shown raw scores and IRT factors scores to be highly correlated.

ANALYTIC PLAN

To answer RQ1, we used analysis of variance with CALS-I scores as dependent variable and two between-subject factors: grade (two levels, grade 4 and 6) and SES (two levels, eligibility for free/reduced lunch=1; no eligibility=0). To answer RQ2, after examining

correlations between all variables, we conducted hierarchical OLS regression analysis with RISE Reading Comprehension as outcome variable. First, socio-demographic characteristics --i.e., grade level, English language learner (ELL) designation¹, SES-- were entered as covariates. In the second step, the word recognition/decoding was entered to the model as covariate to control for students' basic word-level skills. Then, the CALS-I scores were entered to examine the predictive relations between core academic language skills and reading comprehension scores above and beyond the contribution of socio-demographic factors (i.e., grade, SES, ELL designation) and word recognition/decoding. As a final step, WG academic vocabulary knowledge was entered to the model to explore the predictability of CALS-I scores even when controlling for academic vocabulary.

Findings / Results:

RQ1: Results revealed that CALS-I scores differed significantly as a function of grade and SES. CALS-I scores were, on average, higher for 6th grade students (M=28.44; SD=8.5) than for 4th-grade students (M=20.65; SD=7.8), and also higher for students with higher SES backgrounds (see Table 1).

RQ2: As the series of regression models in Table 2 illustrates, OLS regression analyses revealed that most variables --with the only exception of grade-- significantly contributed to explain the variability in students' reading comprehension scores. More specifically, as displayed in our final model (Model 6), performance on the CALS-I was found to be a significant predictor of students' reading comprehension above and beyond the contribution of students' SES, word recognition/decoding, and academic vocabulary knowledge. It is interesting to note that despite the shared variance between academic vocabulary knowledge and CALS ($r=.6$), each of them offered a significant independent contribution to predict the variability in reading comprehension. Notably, once CALS-I scores and academic vocabulary knowledge² were added to the model, SES was no longer a significant predictor of reading comprehension.

Conclusions:

While it should be of no surprise that, analogous to academic vocabulary knowledge, a broader set of general academic language skills would be predictive of reading comprehension, the innovation of this study resides in having identified and empirically tested an initial set of high-utility cross-disciplinary academic language skills associated with text comprehension. These results suggest that after basic word recognition/decoding skill is controlled for, the variability in students' core academic language skills and academic vocabulary capture the very pedagogically-relevant skills that are typically only poorly indexed by the categorical SES variable which can serve only as an imperfect proxy for identifying students in need of language and reading support. By specifying a set of language skills associated with reading comprehension, this study advances our understanding of school-relevant language skills beyond the narrow definition of academic vocabulary and contributes relevant information for the design of more comprehensive interventions that provide cognitively demanding yet linguistically accessible and productive instruction.

¹ Even though the sample included only very few students designated as English Language Learners (ELL), the ELL designation variable was included to account for the variability in performance of this specific subgroup. The results of the regression analysis were comparable when ELL designation was not included in the models.

² In an alternative model WG Academic Vocabulary Test scores were added to the regression model before CALS-I scores. In this case, vocabulary scores also removed the impact of SES, even in the absence of CALS-I scores.

Appendices

Appendix A. References

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Appendix B. Tables and Figures

Not included in page count.

Table 1: Mean scores for all measures by grade.

Grade		<i>Academic Language (CALIS-I)</i>	<i>Academic Vocabulary (WG AV)</i>	<i>Word Reading Fluency (RISE)</i>	<i>Reading Comprehension (RISE)</i>
<i>4th grade (Total)</i>	85	20.65(7.83)	0.65(0.18)	361.86(27.78)	363.07(28.33)
<i>6th grade (Total)</i>	197	28.44(8.46)	0.60(0.18)	362.69(28.87)	357.22(30.31)
<i>Total sample</i>	282	26.09 (9.01)	0.62 (0.18)	362.80 (28.66)	358.62 (29.60)

Table 2: Step-wise regression table with RISE Reading Comprehension as outcome.

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>
Grade	-2.32 (1.91)	-2.59 (1.90)	-2.96 (1.81)	-2.37 (1.45)	-6.10 (1.61)***	-3.88(1.72)**
English Language Proficiency Designation		-23.46 (8.64)***	-14.64 (8.41)	-2.05 (6.77)	-0.59 (6.55)	1.62(6.47)
SES (Free/Reduced Lunch Eligibility)			-18.08 (3.40)***	-5.77 (2.88)*	-4.05 (2.80)	-2.76(2.78)
Word Recognition/Decoding (RISE)				0.64 (0.05)***	0.47 (0.06)**	0.37(0.07)***
Academic Language (CALS-I)					0.96 (0.21)***	0.67(0.22)**
Academic Vocabulary (WG AV)						36.94(11.10)**
Observations	282	282	282	282	282	282
Variance Explained (R^2)	0.01	0.03	0.12	0.44	0.48	0.50
Change in R^2		0.03*	0.09***	0.32***	0.04***	0.02**

*p<.05, **p<.01, ***p<.0001

