A Model of Academic Enablers and Elementary Reading/Language Arts Achievement

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Abstract. This article includes a review of theoretical and empirical models of educational outcomes to identify student attitudes and behaviors that researchers have hypothesized to influence academic achievement. A theoretical model is proposed of the relationships between specific academic enablers (motivation, interpersonal skills, engagement, and study skills) and academic achievement. Structural equation modeling is used to test the fit of this model for two samples of elementary students. The results of these modeling analyses indicate that prior achievement and interpersonal skills influence motivation, which in turn influences study skills and engagement to promote academic achievement. The article concludes with a discussion of practical implications of the tested model as well as necessary directions for future research regarding models of academic enablers and academic achievement.

DiPerna and Elliott (2002) define the construct of academic enablers as “attitudes and behaviors that allow a student to participate in, and ultimately benefit from academic instruction in the classroom” (p. 294) and suggest that academic enablers include broad domains such as motivation, interpersonal skills, engagement, and study skills. In the present article, theoretical and empirical models of educational outcomes are reviewed briefly to identify student attitudes and behaviors that researchers have hypothesized to influence academic achievement. The results of this literature review are used to develop a theoretical model of the relationships between academic enablers and academic achievement and test the fit of this model for two samples of elementary students. This article concludes with a discussion of practical implications of this specific model as well as directions for future research to further clarify possible functional relationships between academic enablers and academic achievement.

Theoretical and Empirical Models of Academic Achievement

During the past four decades, several educational researchers (e.g., Bennett, 1978; Carroll, 1963; Glaser, 1976; Walberg, 1981) have proposed theoretical models to explain direct and indirect influences on students’ educational outcomes. Despite slight variations among the specific constructs included in these theoretical models, all share some conceptual similarities. Specifically, each theoretical model includes characteristics of the learner,
the learning environment, and the quality of instruction the learner receives (Haertel, Walberg, & Weinstein, 1983). Although some constructs from these models have received empirical support in the research literature, one potential shortcoming of existing theoretical models is that they do not include many of the significant student characteristics that influence educational outcomes. A review (Wang, Haertel, & Walberg, 1993) of the empirical literature regarding the correlates of one educational outcome, academic achievement, indicated that student characteristics exhibit the most significant direct influence on achievement.

One of the few empirically tested theories of academic achievement including student variables is Walberg’s (1981) theory of educational productivity. This theory posits that psychological characteristics of individual students and their immediate psychological environments influence educational outcomes (cognitive, behavioral, and attitudinal) (Reynolds & Walberg, 1992c). Based upon reviews of approximately 3,000 studies, Walberg identified nine key variables that influence educational outcomes: student ability/prior achievement, motivation, age/developmental level, quantity of instruction, quality of instruction, classroom climate, home environment, peer group, and exposure to mass media outside of school (Walberg, Fraser, & Welch, 1986). The first three of these variables (ability, motivation, and age) reflect aspects of student aptitude; the fourth and fifth variables reflect instruction (quantity and quality), and the final four variables (classroom climate, home environment, peer group, and exposure to media) represent aspects of the psychological environment.

Since proposing his theory of educational productivity, Walberg has engaged in a program of research exploring the effects of the aforementioned nine variables on the educational outcomes of achievement and attitude (e.g., Parkerson, Lomax, Schiller, & Walberg, 1984; Reynolds & Walberg, 1991, 1992a, 1992b, 1992c; Walberg, Fraser, & Welch, 1986). In addition, Keith and colleagues (e.g., Anderson & Keith, 1997; Cool & Keith, 1991) have tested models of academic achievement influenced by Walberg’s theory of educational productivity. Both Walberg and Keith consistently found that a student variable, prior achievement, had the largest direct effects on current achievement, and another student variable, motivation, had significant total effects on achievement. Similar to the aforementioned theoretical models, one potential limitation of the Walberg and Keith studies is that the models tested in these studies may have omitted other key student variables that contribute to academic achievement.

Wang, Haertel, and Walberg (1993) attempted to explore the relative magnitude of each of 228 variables on academic achievement. The authors used three different review methods (content analysis of review articles, expert ratings, and meta-analysis) to determine which of the 228 variables have the most significant effect on student achievement. Based on these reviews, the authors concluded that “proximal” variables such as psychological, instructional, and home environment characteristics have a more significant impact on achievement than “distal” variables such as state-, district-, or school-level policy or demographics. They also concluded that, within the proximal variables, student characteristics (i.e., social, behavioral, motivation, affective, cognitive, and metacognitive) have the most significant impact on student outcomes.

As currently defined, the concept of academic enablers falls within the student characteristics that Wang et al. (1993) identified as having the most significant effect on academic achievement. As such, testing a model of the relationships between academic achievement and the academic enablers that DiPerna and Elliott (2000, 2002) have specified may lead to the identification of significant variables that have been omitted from prior empirically tested models. In addition, development of such a model may provide a framework for conceptualizing assessment, intervention, and prevention services for students experiencing academic difficulty. Based on the research of Walberg and Keith, it is clear that prior achievement and motivation must be considered in a model of academic enablers. The following section includes a review of research related to three other student variables—social behav-
ior, engagement, and study skills—that have been shown to contribute meaningfully to academic achievement and are included in our theoretical model of academic enablers.

Relationships Between Social Behavior, Engagement, Study Skills, and Academic Achievement

Wentzel (1993) and Malecki (1998) have contributed to a program of research exploring the relationship between social behaviors, problem behaviors, and academic outcomes. Wentzel (1993) examined the relationship between measures of academic outcomes (i.e., grades and standardized achievement test scores) and students’ social and academic behavior. In this study, teacher ratings of students’ prosocial, antisocial, and academic behavior were significant, independent predictors of students’ grade point averages. Prosocial and antisocial behavior also contributed indirectly to GPA through academic behavior. However, only prosocial behavior was a significant, independent predictor of standardized achievement test scores.

Malecki (1998; Malecki & Elliott, 2002) extended the work of Wentzel through the use of standardized measures completed by multiple informants (parent, teacher, and student) to explore the relationships between social behaviors and academic outcomes. In addition, Malecki collected data at two times to allow for replication of the relationships among variables and explore the predictive relationship between social behaviors at Time 1 and academic outcomes at Time 2. Using regression analyses, Malecki found that social skills were a significant predictor of academic competence ($\beta = .61$, $p < .01$); and academic competence, in turn, was a significant predictor of achievement ($\beta = .67$, $p < .01$). Like Wentzel (1993), Malecki concluded that social skills have a significant predictive relationship with academic outcomes.

Additional evidence supporting the relationships between academic achievement and the student variables of social skills, motivation, engagement, and study skills resulted from the development and standardization of the Academic Competence Evaluation Scales (ACES; DiPerna & Elliott, 2000), a teacher rating scale designed to measure students’ skills, attitudes, and behaviors that contribute to academic success in the classroom. During the 4-year period prior to publication, DiPerna and Elliott conducted several studies (e.g., DiPerna, 1997; DiPerna & Elliott, 1999, 2000) to explore the psychometric properties of the ACES. To explore the concurrent validity of a pilot version of the scales, the authors conducted correlational analyses between the scales and achievement test scores. The results across each of the studies indicated that the academic enablers measured by the ACES (motivation, study skills, interpersonal skills, and engagement) demonstrate variable relationships (as characterized by correlations ranging from .16 to .75) with grades and standardized tests of achievement (see DiPerna & Elliott, 2000 for a summary of this evidence).

A Theoretical Model of Academic Enablers and Academic Achievement

Based on the work of Reynolds and Walberg (1991, 1992a, 1992b, 1992c), Cool and Keith (1991), Anderson & Keith (1997), Wentzel (1993), Malecki (1998), DiPerna (1999), and DiPerna and Elliott (1999, 2000), five student predictor variables were identified for inclusion in a theoretical model of academic enablers and academic achievement. These variables were: prior achievement, interpersonal skills, study skills, motivation, and engagement. Figure 1 displays the proposed model including these academic enablers and their relationships with achievement. Specific pathways in this model were developed based on empirical data and theory. When a construct included in the proposed model had been included in previous model-testing research (e.g., DiPerna, 1999; Cool & Keith, 1991; Reynolds & Walberg, 1992a, 1992b, 1992c), the results of this research were used to predict the direct and indirect pathways extending to and from a variable within the proposed model. When previous model-testing data were not available for a specific variable, the results of correlational analyses (e.g., DiPerna & Elliott, 1999; Malecki, 1998; Wentzel, 1993) were used to generate hypotheses regarding the variable’s
direct and indirect pathways to achievement. After identifying pathways based on existing empirical data, all pathways were revisited from a theoretical perspective. That is, each pathway was evaluated to determine if it was consistent with prior theory and conceptually sound. For example, it is more likely that motivation influences the development and use of study skills rather than the reverse.

The model resulting from the use of the aforementioned empirical and theoretical criteria suggest that motivation plays an indirect but central role in the promotion of academic achievement. Motivation is hypothesized to influence two other skills—engagement and study skills—that directly influence development of academic skills. Prior achievement and interpersonal skills, however, are hypothesized to influence a student's level of motivation for academic learning. This latter pathway (interpersonal skills to motivation) reflects the theoretical rationale that children who have higher levels of interpersonal skills are more likely to have positive experiences in the classroom environment. These positive experiences, in turn, result in increased drive on the part of that child to be successful in that environment.

**Rationale**

An empirical and practical rationale exists for developing a model of academic achievement including academic enablers. Many theoretical and empirical models have failed to include a broad array of student variables (with the exceptions of ability and motivation) to predict academic outcomes. The proposed model addresses this limitation by including student skills, attitudes, and behaviors that are empirically supported correlates of academic outcomes. Practically, school psychologists, as well as other educational professionals (e.g., teachers, administrators) need a framework for conceptualizing assessment, intervention, and prevention services to help students receive optimal benefit from their education (Keith, 1998). Failing to develop and use such a framework may result in assessment and intervention plans that overlook key factors contributing to a student’s academic difficulty.

![Diagram of Model of Academic Enablers and Academic Achievement](image)

**Figure 1. Hypothesized model of academic enablers and academic achievement.**
An Application of the Theoretical Model to Reading/Language Arts Achievement

The remainder of this article tests the adequacy of the academic achievement model displayed in Figure 1 for explaining the reading/language arts achievement of students in Grades K–6. The primary hypothesis was that this model is an accurate representation (i.e., demonstrates good fit) of the relationships among academic enablers and student reading/language arts achievement. A related objective was to explore the relative contributions of specific academic enablers to student achievement in language arts. To accomplish these objectives, Structural Equation Modeling (SEM) was used to analyze data collected for a sample of elementary students. A description of this sample along with the methods and procedures is provided in the following section.

Method

Participants

Participants in this study were 394 students and 104 teachers in kindergarten through sixth grade. The sample was drawn from 21 schools in the Northeastern United States. For purposes of group comparison, participants were divided into two samples: primary (Grades K–2) and intermediate (Grades 3–6). The primary sample consisted of 192 students and included slightly higher percentages of both females (56%) and first graders (48%). In addition, approximately 27% of the primary sample was of minority status and 11% of the students had an identified disability. The intermediate sample consisted of 202 students and included slightly higher percentages of females (55%) and fourth graders (33%). Approximately 19% of the intermediate sample was of minority status and 15% of the students had an identified disability. Data were collected as part of a multisite evaluation of The Responsive Classroom (Charney & Wood, 1981), an instructional philosophy intended to enhance children’s social and academic competence.

Instrumentation

Academic Competence Evaluation Scales (ACES). The ACES was designed to measure students’ skills, attitudes, and behaviors that contribute to academic competence (DiPerna & Elliott, 2000). The teacher version of the ACES used in this study was an 81-item questionnaire with two separate scales (Academic Skills and Academic Enablers), and each of these scales included multiple subscales. Specifically, the Academic Skills Scale includes three subscales (Reading/Language Arts, Mathematics, and Critical Thinking), and the Academic Enablers Scale includes four subscales (Interpersonal Skills, Motivation, Study Skills, and Engagement). The Academic Skills subscales require two 5-point ratings for each item: Proficiency and Importance. The Reading/Language Arts subscale was the only Academic Skills subscale used in the current analyses, and sample items from this subscale include “reading comprehension,” “written communication,” and “oral communication.” The Academic Enablers subscales also require two 5-point ratings (Frequency and Importance) for each item. All four of the Academic Enablers subscales were used for the current analyses, and sample items include “follows classroom rules” (Interpersonal), “participates in class discussions” (Engagement), “prefers challenging tasks” (Motivation), and “completes homework” (Study Skills).

In the initial research exploring the psychometric properties of the ACES, each of the scales and subscales has demonstrated strong evidence of reliability and validity (DiPerna & Elliott, 1999; DiPerna & Elliott, 2000). Internal consistency coefficients (Cronbach’s alphas) were high for the scales, ranging from .92 to .98, and 6-week test-retest stability coefficients for the scales were adequate, ranging from .81 to .92. Correlations between the ACES and students’ scores (Composite, Mathematics, Reading, and Language) from the Iowa Test of Basic Skills (ITBS; Hoover, Hieronymus, Frisbie, & Dunbar, 1993) ranged from moderate (.55) to high (.76). In addition, the ACES exhibited moderate (.43) to high (.80) correlations with the Academic Compe-
tence scale from the teacher version of the Social Skills Rating System (SSRS-T; Gresham & Elliott, 1990). Pearson correlations between the ACES and Social Skills scores from the SSRS-T ranged from moderate (.49) to high (.74), and correlations between the ACES and ratings of students’ problem behaviors on the SSRS-T ranged from low (-.03) to high (-.70).

**Procedure**

Each participating teacher randomly selected up to 5 students from her class roster and completed an ACES rating for each student approximately 6 to 8 weeks into the school year. (This time period was used to allow teachers to become familiar with their students before providing their initial ACES rating.) Teachers then completed a second ACES rating for each student during the final month of the academic year.

**Data Analysis**

Structural Equation Modeling (SEM) was used as the primary method for analyzing the data. SEM allows a researcher to specify a priori the relationships among variables included in a model. This specification is necessary for testing the model of academic achievement developed through the literature review. In addition, SEM allows a researcher to establish direct and indirect effects of each variable included in a model on the primary outcome of interest. Partitioning of effects was useful in the current study for comparing the relative contributions of specific student variables to student achievement in reading/language arts.

AMOS 4.0 (Arbuckle, 1999) was used to test the student model proposed in the present study. Raw data were submitted for analysis, and model parameters were generated via maximum likelihood estimation. Several indices were used to assess the fit of the proposed model based on the recommendations of Kline (1998) and Hu and Bentler (1995) as well as a review of the fit indices commonly reported across the SEM studies included in the literature review. These indices included the generalized likelihood ratio ($\chi^2$), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Non-Normed Fit Index (NNFI), and Root Mean Squared Error of Approximation (RMSEA). These six indices assess different aspects of model fit and have different criteria for identifying a model demonstrating good fit. Specifically, a model demonstrating good fit will yield a nonsignificant chi square: GFI, CFI, and NNFI > .90; and RMSEA <.08 (Browne & Cudeck, 1993; Kline, 1998).

Although SEM is used to explore the appropriateness of the proposed model, an attempt has been made to present the results of the analyses so they are appropriate for readers who have limited knowledge of SEM techniques. Also, because the primary objective of this manuscript is to highlight issues and implications of models of academic enablers, alternative models are not discussed in this article. Interested readers are encouraged to see DiPerna (1999) for results of a previous study of alternative models of academic enablers and academic achievement.

**Model Specification**

The proposed model consisted of two exogenous latent variables (Prior Reading/Language Arts Achievement, Interpersonal Skills), each with a single measured indicator (Reading/Language Arts and Interpersonal Skills subscales, respectively) collected during the first administration of the ACES rating scale. The remaining latent variables in the model (Motivation, Study Skills, Engagement, Current Reading/Language Arts Achievement) were constructed with single measured indicators generated by teacher ratings on the ACES at Time 2, with Current Achievement indicated by the Reading/Language Arts scale. Following the procedure outlined by Keith (1999) to account for measurement error in single indicator variables, residual variances were imposed for each measured variable by multiplying the value (1 - Cohen's alpha) by the sample variance for that measure. The resulting products served as specified error terms for their respective measured variables, hence saving degrees of freedom that would otherwise have been used to estimate these parameters.
Table 1
Correlations, Means, and Standard Deviations of the Variables Included in the Model for the Primary Group (n = 192)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prior Reading Achievement</td>
<td>.33*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Interpersonal Skills</td>
<td></td>
<td>.58*</td>
<td>.49*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Motivation Skill</td>
<td>.38*</td>
<td>.42*</td>
<td>.59*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Study Skills</td>
<td></td>
<td>.61*</td>
<td>.32*</td>
<td>.78*</td>
<td>.54*</td>
<td></td>
</tr>
<tr>
<td>5. Engagement</td>
<td>.75*</td>
<td>.31*</td>
<td>.62*</td>
<td>.40*</td>
<td>.63*</td>
<td></td>
</tr>
<tr>
<td>6. Reading Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>20.42</td>
<td>41.26</td>
<td>36.59</td>
<td>39.12</td>
<td>31.57</td>
<td>22.75</td>
</tr>
<tr>
<td>SD</td>
<td>7.25</td>
<td>7.96</td>
<td>9.95</td>
<td>11.17</td>
<td>7.13</td>
<td>8.02</td>
</tr>
</tbody>
</table>

Note. M = mean; SD = standard deviation. * p < .01.

Results

Tables 1 and 2 display the correlations among all of the variables as well as their means and standard deviations for the primary and intermediate samples. Tests of univariate normality across the student variables indicated that skewness and kurtosis did not significantly depart from a univariate normal distribution. Similarly, tests for multivariate outliers via calculation of Mahalanobis distances revealed only 12 observations for the primary group and 15 observations for the intermediate group that were falling improbably far (p < .05) from the centroid assuming a multivariate normal data distribution for the models including the student variables. Inspection of the raw data for these cases indicated no errors in data entry or patterns in responses. Thus, these observations were retained for the modeling analyses.

The initial modeling analysis explored the fit of the proposed model for reading/language arts achievement. Results of this analysis indicated that the model fit the data reasonably well for the kindergarten through second-grade sample ($\chi^2 (7) = 36.34, p = .00$, GFI = .94, CFI = .95, NNFI = .90, and RMSEA = .15), and quite well for the third- through sixth-grade sample ($\chi^2 (7) = 13.74, p = .06$, GFI = .98, CFI = .99, NNFI = .98, and RMSEA = .07).

Next, several simultaneous analyses were conducted to further investigate the degree to which the proposed model generalized across the two age groups. In all of these analyses the measurement error terms were specified separately for each group using Keith's (1999) procedure. In the first comparative analysis, all pathways and variances were estimated independently for each group. As expected, this model fit the data reasonably well ($\chi^2 (14) = 50.08, p = .00$, GFI = .96, CFI = .97, NNFI = .94, and RMSEA = .08). The pathway coefficients resulting from this analysis are displayed in Figures 2 and 3. Table 3 displays the direct, indirect, and total effects of each variable on current reading/language arts achievement based on these pathways. Next, a restricted model was performed on each sample simultaneously wherein each parameter, with the exception of measurement error terms, was restricted to equality across groups. This resulted in a comparable fit to the unrestricted model ($\chi^2 (22) = 64.88, p = .00$, GFI = .95, CFI = .97, NNFI = .96, and RMSEA = .07).
Table 2
Correlations, Means, and Standard Deviations of the Variables Included in the Model for the Intermediate Group (n = 202)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prior Reading Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Interpersonal Skills</td>
<td>.46*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3. Motivation Skill</td>
<td>.65*</td>
<td>.58*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Study Skills</td>
<td>.56*</td>
<td>.57*</td>
<td>.78*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Engagement</td>
<td>.43*</td>
<td>.39*</td>
<td>.64*</td>
<td>.58*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Reading Achievement</td>
<td>.83*</td>
<td>.43*</td>
<td>.66*</td>
<td>.60*</td>
<td>.52*</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>22.67</td>
<td>41.80</td>
<td>35.15</td>
<td>40.13</td>
<td>31.36</td>
<td>24.29</td>
</tr>
<tr>
<td>SD</td>
<td>6.24</td>
<td>8.37</td>
<td>10.74</td>
<td>10.01</td>
<td>7.56</td>
<td>6.58</td>
</tr>
</tbody>
</table>

Note. M = mean; SD = standard deviation.
*p < .01.

The calculation of difference in $\chi^2$ between models (restricted and nonrestricted) indicated that the difference in $\chi^2$ did not reach the level of statistical significance at the level $p \leq .05$. However, critical ratios of differences, or the difference of parameters divided by the estimated standard error of those differences, indicated statistically significant differences between

Figure 2. Model of reading/language arts achievement for primary grades. (Effects reported as standardized regression weights.)
Table 3
Direct, Indirect, and Total Effects of Variables Included in the Best-Fitting Model of Reading Achievement

<table>
<thead>
<tr>
<th></th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Sample</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior Reading Achievement</td>
<td>.60</td>
<td>.12</td>
<td>.72</td>
</tr>
<tr>
<td>Interpersonal Skills</td>
<td></td>
<td>.09</td>
<td>.09</td>
</tr>
<tr>
<td>Motivation</td>
<td></td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td>Study Skills</td>
<td>.02</td>
<td></td>
<td>.02</td>
</tr>
<tr>
<td>Engagement</td>
<td>.29</td>
<td></td>
<td>.29</td>
</tr>
<tr>
<td><strong>Intermediate Sample</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior Reading Achievement</td>
<td>.72</td>
<td>.10</td>
<td>.82</td>
</tr>
<tr>
<td>Interpersonal Skills</td>
<td></td>
<td>.07</td>
<td>.07</td>
</tr>
<tr>
<td>Motivation</td>
<td></td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Study Skills</td>
<td>.13</td>
<td></td>
<td>.13</td>
</tr>
<tr>
<td>Engagement</td>
<td>.14</td>
<td></td>
<td>.14</td>
</tr>
</tbody>
</table>

*Note. Effects are reported as standardized regression weights.*

In both samples, motivation and engagement contributed positively to reading achievement, with the effects being larger in the primary sample. This suggests that these variables are more influential in earlier grades. The magnitude and direction of these effects are consistent with previous research (e.g., Pintrich & De Groot, 1990). The observed variations can be attributed to different contexts and student populations.

Although this investigation was cross-sectional, the data suggest that study skills begin to assume a more significant role in promoting achievement as students advance through the elementary curriculum. Researchers and curriculum experts (National Reading Panel, 2000) have documented that beginning in the intermediate grade levels there is a shift in curricular emphasis from learning to read to reading to learn. As curriculum increasingly emphasizes the acquisition of content relative to skill development, it is conceivable that study skills would assume a more significant role in the learning process. Conversely, engagement within the classroom would assume a smaller role because students are expected to learn some of the curriculum outside of the immediate classroom environment through homework and independent learning activities. Although it is premature to draw a definitive conclusion regarding the increasing importance of study skills as students advance through their educational experience, it is an interesting direction for future research—particularly across

The primary goal of this study was to test one model of academic achievement including academic enablers. As predicted, the proposed model demonstrated acceptable fit across both primary and intermediate samples of students. Although six pathways were statistically equivalent across the two samples, two pathways demonstrated moderate variations between the primary and the intermediate level. Specifically, the direct pathway between study skills and reading/language arts achievement demonstrated a slight increase in magnitude; whereas the direct pathway between engagement and reading achievement demonstrated a slight decrease in magnitude. From both a curricular and developmental perspective, however, the observed variations are conceptually defensible.
Table 4
Comparison of Parameter Estimates between Primary- and Intermediate-Grade Groups

<table>
<thead>
<tr>
<th>Parameters in Model</th>
<th>Primary Group</th>
<th>Intermediate Group</th>
<th>Critical Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior Reading Achievement $\rightarrow$ Motivation</td>
<td>.66</td>
<td>.84</td>
<td>1.40</td>
</tr>
<tr>
<td>Interpersonal Skills $\rightarrow$ Motivation</td>
<td>.43</td>
<td>.48</td>
<td>.50</td>
</tr>
<tr>
<td>Motivation $\rightarrow$ Study Skills</td>
<td>.68</td>
<td>.75</td>
<td>.84</td>
</tr>
<tr>
<td>Motivation $\rightarrow$ Engagement</td>
<td>.57</td>
<td>.47</td>
<td>2.10*</td>
</tr>
<tr>
<td>Engagement $\rightarrow$ Reading Achievement</td>
<td>.33</td>
<td>.12</td>
<td>2.60*</td>
</tr>
<tr>
<td>Study Skills $\rightarrow$ Reading Achievement</td>
<td>.02</td>
<td>.08</td>
<td>1.30</td>
</tr>
<tr>
<td>Prior Reading Achievement $\rightarrow$ Reading Achievement</td>
<td>.65</td>
<td>.76</td>
<td>1.40</td>
</tr>
<tr>
<td>Interpersonal $\leftrightarrow$ Prior Reading Achievement</td>
<td>.34</td>
<td>.47</td>
<td>.78</td>
</tr>
</tbody>
</table>

*Note. Parameters reported as raw regression weights.*

*p < .05

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![Diagram](image.png)

Figure 3. Model of reading/language arts achievement for intermediate grades. (Effects reported as standardized regression weights.)
samples with greater age disparity (e.g., elementary vs. middle vs. secondary).

An examination of overall contributions to current achievement by the five predictor variables included in the model indicates that enablers have varying levels of impact on achievement (see Table 3). Using Pedhazur's (1982) criteria for classifying the magnitude of effects, prior achievement and motivation demonstrate large and moderate total effects, respectively, with current reading/language arts achievement in both samples. The magnitude of these relationships is consistent with the previous modeling research of Reynolds and Walberg (1991, 1992c) and Anderson and Keith (1997) as well as the bivariate correlational analyses of DiPerna and Elliott (1999). Interpersonal skills also exhibited consistent relationships with achievement across the two samples; however, similar to the findings of Wentzel (1993) and Malecki and Elliott (2002), the magnitude of total effects was small.

As a result of the aforementioned variations in pathways across the two samples, the remaining predictors, engagement and study skills, exhibited different levels of total effects across the two samples. Specifically, engagement demonstrated large effects in the primary sample and moderate effects for the intermediate sample. In contrast, study skills demonstrated negligible effects for the primary level and moderate effects for the intermediate level.

Limitations

There are three limitations that must be considered before drawing conclusions from the results of this research. The first limitation is that the findings require replication to demonstrate that they are not unique to the current sample. A second but related limitation is that alternative models of academic enablers must be explored to determine if the current model best represents the relationship between student variables and academic outcomes. Multiple models can demonstrate good fit with the same dataset; thus, it is important that a variety of models are explored to determine which model is optimal from both an empirical and theoretical perspective. In addition to testing alternative models including the same constructs, it is important that alternative models including additional constructs are explored. Christenson and Anderson (2002) suggest that there may be academic enablers in addition to those included in the current model. As such, the contributions of the enablers included in the current model may change significantly upon the addition of other enablers (e.g., cognitive ability, home support for learning) in a model of academic achievement.

A third limitation of the current study regards the use of teacher judgments to measure all of the variables included in the model. Although there is substantial evidence to support the accuracy of teacher judgments of academic achievement relative to actual student performance (e.g., Demaray & Elliott, 1998; Hoge & Coladaci, 1989) and academic enablers (e.g., DiPerna & Elliott, 2000; Gresham & Elliott, 1990), data were collected to cross-validate measured variables via source (e.g., parent, teacher, and/or student) or method (e.g., direct and indirect). As such, observed relationships in the model may have been strengthened by shared variation due to common sources and method of measurement. Although the lack of direct measures of reading/language arts achievement and academic enablers precludes analysis of this possible threat to the validity of the study, the results are consistent with observed relationships in other models that included direct measures of achievement (e.g., Anderson & Keith, 1997; DiPerna, 1999; Reynolds & Walberg, 1992a, 1992b, 1992c).

Implications of Findings for Practice

Although the aforementioned limitations must be addressed before making strong recommendations for practice, there are several potential implications for practice based on the results of the current study. When helping students who are experiencing academic difficulty, school psychologists and other educational professionals must make decisions about skills, attitudes, and/or behaviors to target for assessment, and ultimately, intervention. The results of this study suggest that prior achievement is a strong predictor of current achieve-
ment. A slight variation on the interpretation of this finding is that current achievement (knowledge and skills) is a strong predictor of future achievement. Thus, for students experiencing academic difficulty, chances for future academic success may be limited unless a change (intervention) is implemented to address specific academic skill problems. As such, delaying intervention to allow a student's academic skills to mature and possibly "catch up" to grade level expectations may not be a wise choice for many students—even students at the primary level. Realizations such as this are prompting a discussion of the criteria used to define learning disabilities and the frequent delays in classification that result from the current LD definition (see Gresham, 2001).

In addition, the results of this study also suggest that the four academic enablers included in the model (i.e., motivation, engagement, study skills, and interpersonal skills) are domains worth considering when developing assessment protocols for students experiencing academic difficulty. Although analyses were performed on general student samples in the current study, the resulting model of relationships among enablers and achievement may serve as a useful framework for identifying problems and prioritizing specific skills to target for intervention. For example, if a practitioner designs an assessment that focuses exclusively on motivation and current academic skills, he or she may be overlooking key variables possibly contributing to the child's academic performance (e.g., study skills, interpersonal skills). This omission could result in the identification of the wrong cause of the academic difficulty (e.g., low motivation) as well as the development of an intervention that fails to address the true problem (e.g., difficulty getting along with others in their class that has decreased a student's motivation to succeed in the classroom).

A model of academic enablers (whether the one tested in the current study or an alternative) should not be considered exclusively in the context of an assessment or intervention framework. Perhaps most importantly, it should be considered as a framework for conceptualizing target skills for universal prevention services. If academic enablers truly contribute in meaningful ways to academic achievement, and the primary responsibility of schools and educational professionals is to promote achievement, then schools and educators need to consider what is being done to promote the development of academic enablers for all students. Academic skills are, and should be, the primary focus of instruction in schools; however, if there is empirical support for a model indicating that academic enablers meaningfully contribute to academic achievement, then there are additional skills and attitudes that should be taught explicitly to optimize students' learning.

Directions for Future Research

Models of academic enablers. Given the limitations of the present study, there are several directions for future research regarding models of academic enablers and academic achievement. The first is to conduct additional studies with similar samples to explore the replicability of the current results. In addition, these studies should include analyses of models specifying alternative pathways among academic enablers and academic achievement. After identifying a best-fitting model, it should be tested across groups of students distinguished by sex, race, disability status, and level of education (elementary, middle, high school) to determine the effect of these variables on the strength of relationships among academic enablers and academic achievement.

In addition to testing models of achievement featuring student variables, future research is necessary to test more comprehensive models of achievement including student, instructional, and home variables. Previous work by Walberg (e.g., Reynolds & Walberg, 1991, 1992a, 1992b, 1992c) and Keith (e.g., Anderson & Keith, 1997; Cool & Keith, 1991) as well as other articles in this miniseries (e.g., Christenson & Anderson, 2002; Keith, 2002) provide ideas regarding other constructs to be considered in comprehensive models of academic achievement. These more comprehensive models also should be tested across different groups of students according to sex, race, disability status, and level of education. Across
all of these modeling studies, multiple methods and sources of data should be used to minimize the effect of measurement methods on the modeling results.

One additional direction for future research is the systematic exploration of the measurement method used to assess academic achievement. Wentzel (1993) found differential effects for prosocial and antisocial behavioral variables depending on the measure used to assess academic achievement (i.e., grade point average or standardized test scores). Similarly, pathways may change across the domain (reading, math, science) of academic achievement used for the criterion. Walberg and Reynolds (1991, 1992a, 1992b, 1992c) found slight differences when testing the theory of educational productivity across two subject areas (math and science). Thus, the academic achievement criterion variable, as well as the method used to assess it, may have implications for the constructs and pathways ultimately retained in the model.

In sum, future modeling research is necessary to adequately develop and test comprehensive models of academic achievement including student variables as well as home and instructional variables. These studies should use multiple methods and sources of data to measure the constructs included in the modeling analyses. After identifying a good-fitting model for the general population, this model should be tested across subgroups of students differentiated by sex, race, disability status, and level of education.

**Intervention research.** The identification of significant academic enablers via multivariate techniques such as SEM is a useful first step in determining causal relationships among multiple variables. Ultimately, however, researchers must employ experimental manipulation to determine if such causal pathways exist. From an applied perspective, practitioners want to know if implementing an intervention for a specific problem will yield a specific outcome. Models of academic enablers provide a framework to generate testable hypotheses for intervention research. They also provide a framework for thinking about outcomes that should be considered when conducting research to evaluate the efficacy of interventions. For example, if a researcher is attempting to determine the effect of an intervention to promote social skill development for students with behavioral difficulties, that researcher may want to include additional measures to assess the effect of the intervention on related variables (e.g., motivation, academic achievement).

An additional implication of modeling research is that it provides directions for systematic research efforts within the field of school psychology. If, as Keith (1998) has suggested, the goal of school psychology (and school psychologists) is to help students receive optimal benefit from their education, then the research that guides the field should address topics and questions that help achieve this goal. This is not to say that the published research has failed to move the field in this direction; rather, it is to suggest that empirically supported frameworks be used to identify (and address) relative weaknesses in the professional literature. As such, it is hoped that this article will stimulate needed research in the area of academic enablers.

**Conclusions**

The purpose of this article was to introduce readers to theoretical and empirical models of academic achievement as well as to facilitate thinking about how academic enablers might contribute to overall academic achievement. In addition, it includes an attempt to outline the potential implications, pending replication, of one model of academic enablers and achievement for practice and research. Identifying comprehensive models of academic enablers and achievement that are meaningful and supported by data is a complex process that requires decisions based on theoretical and empirical criteria. The goal is for this process to assist with the identification of key variables that have a significant effect on important outcomes. This study represents the continuation of research on identifying key variables that affect one important outcome in the lives of children: academic achievement. The results from this study suggest that prior achievement and interpersonal skills influence
motivation, which in turn influences study skills and engagement to promote achievement. Further investigation of this model, as well as alternatives, is necessary to identify specific skills and behaviors that practitioners should consider in their assessment, intervention, and prevention practices.

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