

# Structural and Concurrent Validity Evidence for the Academic Competence Evaluation Scales-College Edition

James Clyde DiPerna

The purpose of this study was to explore the structural and concurrent validity of the Academic Competence Evaluation Scales-College (ACES-College; J. C. DiPerna & S. N. Elliott, 2001). Results indicated that the ACES-College is composed of 2 scales—Academic Skills and Academic Enablers—each with multiple subscales. Results also indicated that scores from the ACES-College are moderately correlated with students' current and cumulative grade point averages. Directions for future research and implications for practice are discussed.

Students attending postsecondary institutions frequently identify a need for support services related to academic difficulty (Bishop, Bauer, & Becker, 1998; Jennings, 1996). Because a variety of psychosocial (e.g., depression, anxiety, adjustment) and academically related (e.g., critical thinking, study strategies, motivation) factors can influence academic performance, one of the primary challenges facing practitioners is determining the cause of a student's academic difficulty. Although self-report measures have been developed for assessing social and affective problems that can influence academic achievement (e.g., Beck Depression Inventory [Beck, Steer, & Brown, 1996]; Multidimensional Anxiety Questionnaire [Reynolds, 1999]), few self-report instruments that assess academic skills and related behaviors have been developed for the college student population. The purpose of the current study was to explore structural and concurrent validity evidence for the Academic Competence Evaluation Scales-College Edition (ACES-College; DiPerna & Elliott, 2001), a self-report measure designed to assess a student's self-perception of his or her academically relevant skills and behaviors.

## Model of Academic Competence

An examination of the empirical literature indicates that researchers have been inconsistent in defining the term *academic competence* and that many use it interchangeably with terms such as *academic performance* and *academic ability* (e.g., Henggeler, Cohen, Edwards, Summerville, & Ray, 1991; Rotheram, 1987). For the development of ACES-College, academic competence was defined as a multidimensional construct composed of the skills, attitudes, and behaviors of a learner that contribute to academic success. This working definition was based on an analysis of related research exploring student factors that contribute to academic success (e.g., Greenwood, 1996; Wang, Haertel, & Walberg, 1993; Wentzel, 1993).

Recent research that has explored the construct of academic competence for elementary and secondary students has found that the skills, attitudes, and

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James Clyde DiPerna, Department of Educational and School Psychology and Special Education, The Pennsylvania State University. Correspondence concerning this article should be addressed to James Clyde DiPerna, 105 CEDAR Building, The Pennsylvania State University, University Park, PA 16802 (e-mail: jcd12@psu.edu).

behaviors contributing to academic competence fall into one of two domains: *academic skills* or *academic enablers* (DiPerna & Elliott, 1999, 2000). Academic skills are the basic and complex skills that are a central focus of academic curricula in K–12 schools; these skills are necessary for students to learn content knowledge at the postsecondary level. Academic enablers are attitudes and behaviors that allow a student to function in academic environments and benefit from instruction.

Each of these two broad domains includes multiple types of related skills. The academic skills domain is hypothesized to include skills in language (reading and writing), mathematics and scientific inquiry, and critical thinking. The academic enablers domain is hypothesized to include interpersonal skills, motivation, study skills, and engagement. Interpersonal skills are cooperative learning behaviors that allow students to interact effectively in academic settings. Motivation reflects a student's approach, persistence, and level of interest regarding learning academic skills or content knowledge. Study skills are behaviors or strategies that facilitate the processing of new material, and engagement reflects student behaviors that represent attentive, active participation in classroom settings. Although previous studies (DiPerna & Elliott, 1999, 2000) have directly examined the relationships between the academic enablers measured by the ACES (K–12 version) and academic skills, one of the purposes of the current study was to explore the relationships of enablers with indicators of academic achievement at the postsecondary level.

## Rationale

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Many practitioners who work with college students who are experiencing academic difficulty have not had a systematic method for assessing a student's academic competence and conceptualizing interventions, when necessary, to improve it. Currently, a limited number of individually administered achievement tests have normative data for a college population (e.g., Wechsler Individual Achievement Test [2nd edition, Psychological Corporation, 2002]; Woodcock-Johnson III Tests of Achievement [Woodcock, McGrew, & Mather, 2001]). Although these achievement batteries have evidence to support their reliability and validity for measuring college students' academic skills, they do not provide information about nonacademic behaviors (e.g., motivation, study skills) that potentially influence academic success. In addition, these instruments require a significant amount of time for administration, scoring, and interpretation because they are primarily intended for diagnostic rather than screening purposes.

Similarly, a limited number of rating scales have been developed to assess specific types of academic enablers, such as motivation or study skills. Two such scales are the Learning and Study Strategies Inventory (Weinstein, Schulte, & Palmer, 1987) and the Motivated Strategies for Learning Questionnaire (Pintrich, McKeachie, & Smith, 1989). Both of these self-report instruments assess a variety of study strategies and learning behaviors that have been shown to influence academic performance; however, neither instrument explicitly assesses the respondent's academic skills. The ACES-College has been designed to comple-

ment existing measures by providing practitioners with an efficient screening tool to assess both academic skills and academic enablers.

## Purpose and Predictions

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The purpose of this study was to explore validity evidence for a self-report instrument to measure the skills, attitudes, and behaviors hypothesized to contribute to academic competence. To achieve this goal, three predictions concerning the ACES-College were tested. First, it was predicted that the ACES-College Academic Skills Scale would include three factors: reading and writing, mathematics and science, and critical thinking. Second, it was hypothesized that the ACES-College Academic Enablers Scale would include four factors: motivation, study skills, engagement, and interpersonal skills. Third, it was predicted that the ACES Academic Skills and Academic Enablers subscales would demonstrate small to moderate positive relationships with students' current and cumulative grade point averages (GPA). Each of these predictions was developed primarily based on the previous research of DiPerna and Elliott (1999, 2000).

## Method

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### Participants

Students were recruited from institutions of higher education throughout the country. Institutions were selected based on their geographic location, degree programs (2- or 4-year), and funding status (public or private). The final sample, which represented 39 institutions across 13 states, included higher percentages of 4-year institutions (82%) as well as public institutions (59%). At each institution, a local research assistant recruited student participants through distributing information about the study in undergraduate courses with large enrollments. The final student sample consisted of 256 women and 158 men. Of this sample, 60% were of White non-Hispanic origin; the remainder of the sample was of African American (11%), Hispanic (10%), other (8%), and unidentified (11%) origin. Approximately 59% percent of the students were in their 1st or 2nd year of postsecondary study, and approximately 13% of the sample consisted of students with diagnosed learning disabilities. The sampling plan was developed to include a large percentage of students with learning disabilities because the ACES-College is primarily intended for students at risk for or already experiencing academic difficulty. To ensure that this goal was achieved, research assistants recruited students with disabilities through disability resource centers at participating campuses.

### Measures

*ACES-College* (DiPerna & Elliott, 2001). The ACES-College is a 66-item rating scale designed to measure the skills, attitudes, and behaviors of a student that contribute to academic success. Academic competence, as measured by the ACES-College, is conceptualized as a multidimensional construct with two primary domains: academic skills and academic enablers. The initial item pool for the ACES-College was created in three phases. First, items from the K-12 version of the

ACES (teacher form) were reviewed for relevance to the college population, and items determined to be less meaningful (e.g., takes care of classroom materials) were eliminated. Second, retained items were rewritten to reflect the student's perspective (first person) and an appropriate reading level (approximately seventh grade). Third, new items unique to the college academic experience (e.g., attend review sessions, attend class) were added to the item pool for the College form.

Similar to the K–12 version of the ACES, each item on the ACES-College includes two ratings. Items developed to assess academic skills require criterion-referenced ratings based on students' perception of grade-level expectations at their institution. Students provide ratings on a 5-point scale ranging from *far below* to *far above* grade-level expectations. Items developed to assess academic enablers use 5-point frequency ratings, ranging from *never* to *almost always*, to assess students' perceptions of how often they exhibit a specific enabling behavior. In addition to these 5-point ratings, each item on the ACES-College is rated on how important the skill is for academic success at the college level. These ratings use a 3-point scale ranging from *not important* to *critical*. The ACES-College requires approximately 15 minutes to complete.

**GPA.** To explore criterion-related validity, two types of GPA were collected for a subsample ( $n = 76$ ) of the participants. The first was the students' GPA from the most recently completed academic semester. The second was the students' cumulative GPA throughout their postsecondary education.

## Procedure

Student participants were recruited through research assistants at postsecondary institutions throughout the United States. After consenting to participate, each student completed a questionnaire that elicited demographic information (race, sex, age, disability status, and so on). Each student then completed the ACES-College.

## Analyses

**Factor analyses.** Exploratory factor analysis using the principal axis factoring method was used to explore the internal structure of the ACES-College scales. Decision-making criteria for the factor analyses were consistent with current practice (Bryant & Yarnold, 1995). Three common criteria were used to determine the number of factors retained in each solution: eigenvalues greater than 1, location of the "elbow" on the scree plot, and fit with theory. The factors retained were then submitted to oblique (Oblimin) and orthogonal (Varimax) rotations. (Varimax solutions are reported in this article because they maximized interpretability of the retained factors.) Item loadings greater than .40 was the criterion used to determine if an item was loading strongly on a specific factor. Dual-loading items (items with less than .20 separating the highest factor loading and second highest factor loading) were assigned to the factor most consistent with the content of the item (Comrey, 1988; Crocker & Algina, 1986).

**Correlation analyses.** Partial correlations (controlling for grade) were calculated to examine the relationship between the ACES-College subscales and students' most recent and cumulative GPAs.

## Results

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### **Prediction 1: Structure of the Academic Skills Scale**

The first prediction stated that three subscales would contribute to the Academic Skills Scale on the ACES-College. To test this prediction, the 30 academic skills items were submitted for exploratory factor analysis using the SPSS principal axis factoring method. The results of this analysis yielded three factors with eigenvalues greater than 1; and the scree plot indicated a distinct elbow occurring after the third factor. Review of orthogonally rotated two-, three-, and four-factor solutions indicated that the three-factor model yielded the most interpretable solution, because the factors in this solution were conceptually distinct and theoretically supported. The rotated three-factor solution accounted for 59.87% of the total scale variance, and the retained factors (subscales) reflected reading and written language (10 items), mathematics and science (10 items), and critical thinking (10 items).

The final structure for the Academic Skills subscales was guided by empirical analyses and theory. All of the items had factor pattern coefficients greater than .40, and all but six items had greater than .20 separating the highest factor pattern coefficient from pattern coefficients on any other factor. Four of the six dual-loading items were moved from the scale on which they had the highest pattern coefficient because the content of the item appeared more consistent with the content of the other scale on which the item loaded highly. All of these “relocated” items exhibited pattern coefficients greater than .30 with the scale to which they were moved.

### **Prediction 2: Structure of the Academic Enablers Scale**

The second prediction stated that four subscales would contribute to the Academic Enablers Scale on the ACES-College. To test this prediction, the 36 Academic Enablers items were submitted for exploratory factor analysis. The results of this analysis yielded six factors with eigenvalues greater than 1, but the scree plot indicated an elbow occurring after the fourth factor. Review of orthogonally rotated three-, four-, and five-factor solutions indicated that the four-factor model yielded the best solution. The rotated four-factor solution accounted for 45.29% of the total scale variance, and the factors in this solution were theoretically supported and conceptually distinct. The four retained factors reflected motivation (10 items), study skills (10 items), engagement (8 items), and interpersonal skills (8 items).

The final structure for the Academic Enablers Scale was also guided by empirical analyses and theory. All of the 36 items included in the analysis exhibited factor pattern coefficients greater than .40, and eight items had less than .20 separating the highest factor pattern coefficient from pattern coefficients on any other factor. Two items were moved from the scale on which they had the highest pattern coefficient, but these relocated items still exhibited significant pattern coefficients with the scales to which they were moved.

### **Prediction 3: Relationships of ACES Scores With Current and Cumulative GPAs**

The third prediction stated that the ACES-College scales and subscales would exhibit small to moderate relationships with students’ cumulative and most recent

semester GPAs. Correlations between the ACES-College and students' GPAs are displayed in Table 1. Interpersonal Skills demonstrated the smallest relationship (.20) with the most recent semester GPA and no linear relationship (.01) with cumulative GPA. The Academic Enablers Total Score demonstrated the largest relationship (.47) with current GPA, and the Academic Skills Total Score demonstrated the largest relationship (.38) with the cumulative GPA.

## Discussion

The research reported in this article focused on structural and concurrent validity evidence for a self-report measure of academic competence. This instrument, the ACES-College, was designed to measure student skills, attitudes, and behavior related to academic success at the postsecondary level. Previous research with versions of the scale developed for students at the elementary and secondary levels has demonstrated that academic competence is a multidimensional construct comprising multiple academic skills and academic enabler domains (e.g., DiPerna & Elliott, 2000), and results from the current study appear to support a similar model of academic competence for students at the postsecondary level.

### Implications of Findings Relative to Predictions

The first prediction stated that three subscales would contribute to the Academic Skills Scale of the ACES-College. As predicted, exploratory factor analysis for the 30 academic skills items resulted in a three-factor solution. Based on a review of the items contributing to each of these factors, these subscales were identified as measuring reading and writing, mathematics and science, and critical thinking skills. The Reading/Writing subscale consists of skills necessary for generating and understanding written language, ranging from reading comprehension to written

**TABLE 1**  
**Correlations Between the Academic Competence Evaluation Scales-College Edition, Last Semester Grade Point Average (GPA), and Overall GPA**

Variable	GPA	
	Last Semester	Overall
Academic Skills Total	.32	.38
Reading/Writing	.27	.35
Mathematics/Science	.31	.30
Critical Thinking	.27	.30
Academic Enablers Total	.47	.32
Interpersonal Skills	.20 <sup>a</sup>	.01 <sup>b</sup>
Motivation	.39	.35
Study Skills	.44	.28
Engagement	.38	.22 <sup>a</sup>

*Note.* Grade level was partialled out of the correlations. All correlations significant at the  $p < .05$  level unless indicated otherwise. *ns* ranged from 58 to 76.

<sup>a</sup> $p < .10$ . <sup>b</sup>nonsignificant.

communication. The Mathematics/Science subscale primarily reflects skills related to the use and application of numbers and scientific concepts. This subscale includes items reflecting measurement, computation, and problem solving. Finally, the Critical Thinking subscale assesses higher order thinking skills, including items reflecting analysis, synthesis, and investigation.

The second prediction stated that four subscales would contribute to the Academic Enablers Scale of the ACES-College. As predicted, exploratory factor analysis for the 36 academic enabler items resulted in a four-factor solution: motivation, study skills, engagement, and interpersonal skills. The Motivation subscale assesses a student's initiative and persistence regarding academic endeavors, including items that reflect responsibility, preference for challenging tasks, and goal-directed behavior. The Study Skills subscale reflects behaviors and skills that facilitate learning new information. The items on this subscale primarily fall within three domains: work preparation, work completion, and work review. The Engagement subscale assesses a student's level of active participation during class, with items that reflect asking questions, volunteering answers, or assuming leadership in groups. Finally, the Interpersonal Skills subscale measures communication and cooperation behaviors necessary to interact with other students, with items in three domains: social interaction, work interaction, and responsive behavior.

The third prediction stated that the ACES-College scales and subscales would demonstrate small to moderate positive relationships with students' current and cumulative GPAs. Overall, the observed pattern of correlations supported the third prediction. The Academic Skills total and subscale scores demonstrated small positive relationships with current GPA and slightly larger relationships with cumulative GPA.

Conversely, the Academic Enablers total and subscale scores (with the exception of Interpersonal Skills) demonstrated moderate positive relationships with current GPA and smaller relationships with cumulative GPA. The Academic Enablers subscales measure behaviors and skills related to GPA—particularly to current GPA. Conceptually, stronger relationships between enablers and current rather than cumulative GPA make sense because one would expect that students' enablers develop during their college career. Thus correlating current levels of enablers to an achievement index primarily comprising performance in prior semesters should lead to a weaker relationship than current enablers to current GPA.

Although the Interpersonal Skills subscale demonstrated the weakest relationships of all of the Enablers subscales, this subscale was retained due to the internal structure of the measure as well as the important role these skills play in functioning within a college environment. Although interpersonal skills are necessary to function successfully in a college environment (both academically and socially), these skills are de-emphasized in many instructional contexts at the college level. Prosocial behavior, which has been demonstrated to be a significant predictor of current GPA for students in Grades K–12 (e.g., Malecki & Elliott, 2002; Wentzel, 1993), appears to be related to current GPA at the college level as well. This relationship, however, has not been adequately explored to date in postsecondary education.

## Directions for Future Research

Although evidence reported in this article supports the original predictions, there are at least two necessary directions for future research regarding the ACES-College. First, confirmatory factor analyses with additional samples of college students are necessary to determine the replicability of the current findings and confirm the structure of the scale. A second limitation of the current study is that the data reflect only two sources of validity evidence (structural and criterion). As indicated in the third edition of the *Standards for Educational and Psychological Testing* (American Educational Research Association, 1999), multiple sources of validity evidence are necessary to justify the use of an assessment instrument for a specific purpose. Thus, future studies are necessary to explore evidence based on relationships between the ACES-College and other constructs (i.e., convergent and discriminant evidence), as well as other real-world criteria (predictive and concurrent evidence).

## Conclusion

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The research reported in this article indicates that the ACES-College comprises two scales (Academic Skills and Academic Enablers), consisting of multiple subscales that demonstrate positive relationships with other measures of academic achievement. Additional validation studies are necessary to replicate the current results as well as provide evidence necessary to support the use of the ACES-College for its intended purposes. If such studies yield similar results, then the ACES-College will be of potential use to practitioners working with college student populations. Specifically, the ACES-College could serve as a useful tool during the initial assessment of students who are experiencing academic difficulties at the postsecondary level. If the measure is used for this purpose, a client would complete the ACES-College prior to or immediately following an intake session. Results from the ACES-College could be used in conjunction with results from other intake assessments (e.g., interviews, other self-report measures) to determine if a client is experiencing difficulty due to academic functioning, mental health functioning, or some combination thereof. If the cause of difficulty is determined to be the former, ratings of items from the ACES-College can be used to identify and prioritize specific skills to target for improvement.

In addition to identifying and prioritizing skills for intervention, the ACES-College can be used as a measure to evaluate changes in student performance after completion of an intervention program. The primary benefit of using the ACES-College for assessment and evaluation purposes is that it offers a standardized framework for assessing both academic skills and academic enablers. These latter skills, which are not assessed in individually administered norm-referenced tests of achievement, are often overlooked in the assessment and intervention process. As such, the ACES-College may prove to be a useful instrument for developing comprehensive assessment and intervention plans with college students who are experiencing academic difficulty.



## References

- American Educational Research Association. (1999). *Standards for educational and psychological testing* (3rd ed.). Washington, DC: Author.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Beck Depression Inventory* (2nd ed.). San Antonio, TX: The Psychological Corporation.
- Bishop, J. B., Bauer, K. W., & Becker, E. T. (1998). A survey of counseling needs of male and female students. *Journal of College Student Development*, 39, 205-210.
- Bryant, F. B., & Yarnold, P. R. (1995). Principal-components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 99-136). Washington, DC: American Psychological Association.
- Comrey, A. L. (1988). Factor-analytic methods of scale development in personality and clinical psychology. *Journal of Consulting and Clinical Psychology*, 56, 754-761.
- Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. Fort Worth, TX: Harcourt Brace Jovanovich College Publishers.
- DiPerna, J. C., & Elliott, S. N. (1999). The development and validation of the Academic Competence Evaluation Scales. *Journal of Psychoeducational Assessment*, 17, 207-225.
- DiPerna, J. C., & Elliott, S. N. (2000). *The Academic Competence Evaluation Scales* (K-12 ed.). San Antonio, TX: The Psychological Corporation.
- DiPerna, J. C., & Elliott, S. N. (2001). *The Academic Competence Evaluation Scales* (College ed.). San Antonio, TX: The Psychological Corporation.
- Greenwood, C. R. (1996). The case for performance-based instructional models. *School Psychology Quarterly*, 11, 283-296.
- Henggeler, S. W., Cohen, R., Edwards, J. J., Summerville, M. B., & Ray, G. E. (1991). Family stress as a link in the association between television viewing and achievement. *Child Study Journal*, 21, 1-10.
- Jennings, M. L. (1996). Student counseling needs: The small urban college. *Journal of College Student Psychotherapy*, 11, 33-46.
- Malecki, C. K., & Elliott, S. N. (2002). Children's social behaviors as predictors of academic achievement: A longitudinal analysis. *School Psychology Quarterly*, 17, 1-23.
- Pintrich, P. R., McKeachie, W. J., & Smith, D. (1989). *The Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor, MI: National Center for Research to Improve Post-Secondary Teaching and Learning.
- Psychological Corporation. (2002). *Wechsler Individual Achievement Test* (2nd ed.). San Antonio, TX: Author.
- Reynolds, W. M. (1999). *Multidimensional Anxiety Questionnaire*. Lutz, FL: Psychological Assessment Resources.
- Rotheram, M. J. (1987). Children's social and academic competence. *Journal of Educational Research*, 80, 206-211.
- Wang, M. C., Haertel, G. D., & Walberg, H. J. (1993). Toward a knowledge base for school learning. *Review of Educational Research*, 63, 249-294.
- Weinstein, C. E., Schulte, C., & Palmer, D. H. (1987). *Learning and Study Strategies Inventory*. Clearwater, FL: Hemisphere.
- Wentzel, K. R. (1993). Does being good make the grade? Social behavior and academic competence in middle school. *Journal of Educational Psychology*, 85, 357-364.
- Woodcock, R. J., McGrew, K. S., & Mather, N. (2001) *Woodcock-Johnson III Tests of Achievement*. Itasca, IL: Riverside.