Edward H. Behrman
Chris Street

The Validity of Using a Content-Specific Reading Comprehension Test for College Placement

This study provides empirical evidence to support the validity of using a content-specific reading test for college placement decisions. A content-specific reading test presents passages exclusively from the subject area for which the placement decision is intended. Forty-nine students in a human anatomy class were administered a content-specific reading test, a content-general reading test, and a test of prior domain knowledge on the first day of class. In a forward-solution multiple regression, the content-specific reading test was a significant predictor ($p < .01$) of course grades, but neither the content-general reading test nor the knowledge test added significantly to the prediction. Thus, neither domain knowledge nor generic reading ability provided an independent contribution to the prediction, after partialing out the effects of content-specific reading ability.

The scope and importance of reading placement testing at American colleges cannot be underestimated. Reading placement tests often determine whether incoming students will be allowed to pursue degree-level course work immediately or be required first to enroll in developmental (remedial) courses. Each year a large proportion of entering college students are thus assigned to non-credit-level developmental reading courses. Of the 2.4 million freshmen attending 2-year and 4-year colleges in the United States in 2000, 11 percent or about 260,000 students were required to take a developmental reading course (Parsad & Lewis, 2003).

Unfortunately, despite the common wisdom that general reading ability should be related to academic achievement, reading placement tests have shown a negligible to modest relationship to grades in credit-level college courses (American College Testing Program, 1990; Armstrong, 1994; Brown, Fishco, & Hanna, 1993, citing Guidan; College of the Canyons, 1994; Feldt, 1989; Kessler, 1987). Reading tests in common use, such as ACCUPLACER, APS, ASSET, and Nelson-Denny, are grounded in a domain-generic model of comprehension that assumes "a good reader is a good reader," no matter the content. These content-general reading tests present passages from a variety of subject areas and yield a global comprehension score. However, research suggests that learning is based on both domain-specific and domain-generic factors, with emerging evidence that domain-specific factors may have primacy (for reviews, see Alexander & Judy, 1988; Byrnes, 1995). Further, both schema theory (Anderson, 1984; Anderson & Pearson, 1984; Mason & staff, 1984; Rumelhart, 1981; Wilson & Anderson, 1986) and the construction-integration model of reading (Kintsch, 1986, 1988; Kintsch & vanDijk, 1978; Mannes & Kintsch, 1987; Moravcsik & Kintsch, 1993; vanDijk & Kintsch, 1983) support the domain-related nature of understanding and learning from text.

As an alternative to using content-general reading tests that mask the influence of domain-specific knowledge and domain-specific reading strategies on comprehension, it has been recommended that content-specific reading placement tests might be more valid predictors of course success (Behrman, 2000). A content-specific reading test would measure the reader's ability to comprehend text in a particular subject area, such as history, psychology, literature, or biology. Such a test would present passages exclusively from the academic discipline for which the placement decision would be made, and the comprehension score would indicate the examinee's ability to understand text in that subject area. The purpose of the present study is to explore the validity of using content-specific reading tests for college placement decisions by examining the relationship among scores on a content-general reading test, a content-specific reading test, a test of prior domain knowledge, and grades in an introductory human anatomy class.

Theoretical Framework

Establishing Validity of Placement Decisions

Because the intent of placement testing is to predict whether or not a student will be successful in credit-level coursework, the proper external measure of a placement test's validity is the relationship between placement test scores and grades in the target credit-level course rather than

the developmental course (Sawyer, 1989, 1996). In the ideal placement situation we would be able to accurately predict which students are academically prepared for the demands of college study. Using Guilford's (1956) classification, each placement decision therefore falls into one of four quadrants: successful predictors, successful non-predictors, unsuccessful predictors, and unsuccessful non-predictors. A good placement test would minimize the proportion of successful non-predictors and unsuccessful predictors. Put another way, the majority of students placed directly in the credit-level course would be successful without the need for developmental coursework; and the majority of those placed into the developmental course would not have been successful if placed directly into the credit-level course.

However, the strength of the placement test-criterion relationship is not by itself sufficient for validity claims. AERA/APA/NCME standards emphasize that internal evidence, such as a conceptual framework underlying the test's development, may also be required to establish validity (Joint Committee, 1999). Although dissatisfied with current notions of reliability and validity, Schoenfeld (1999) echoes this same point: "If you are going to test for students' understanding of something, then (a) you have to have an adequate characterization of what it is you're assessing, and (b) you need to have a good idea of how performance on the assessment corresponds to being able to do whatever it is that's supposedly being assessed" (p. 11). Content-general reading tests may serve poorly as placement instruments because they score low in both areas: (a) they are founded on an assumption that reading comprehension is not mediated by the nature of the reading content; and (b) they attempt to predict performance in a particular course by presenting examinees with passages from different subjects altogether. An "adequate characterization" of reading comprehension would require attention to four areas of psychological and educational inquiry that build a theoretical basis for the role of content-specific factors in comprehension, and by extension, to the need for a domain-specific approach to placement testing: domain-knowledge research, schema theory, the construction-integration model, and expert-novice studies.

Domain-Knowledge Research

Although there has been a long-standing debate in cognitive psychology as to whether learning new concepts is more a function of domain-specific knowledge or general reasoning ability (Lawson et al., 1991), two extensive literature reviews (Alexander & Judy, 1988; Byrnes, 1995) provide evidence for the dominance of domain-specific knowledge. Byrnes (1995) found that declarative knowledge ("knowing what") is

domain-specific, and that procedural knowledge ("knowing how"), which may be domain-specific or domain-general, always starts out as domain-specific. Byrnes concluded that domain-general ability was less important than domain-specific ability as a determinant of learning. According to Byrnes, any apparent ability to learn across content areas may be a function of processing speed, cross-disciplinary strategy use, or metacognitive skills, not general capacity.

Alexander and Judy (1988) found that although domain-specific declarative knowledge by itself will not lead to successful task performance unless the learner can use strategic knowledge, accurate and complete domain-specific declarative knowledge is a necessary precondition for efficient use of both domain-specific and domain-general strategic knowledge. In addition, they reported that incorrect or incomplete domain-specific declarative knowledge may hinder task performance and that lack of domain-specific declarative knowledge leads to use of inefficient strategies. They concluded that the relative importance of domain-specific declarative knowledge may depend upon the nature of the domain or the requirements of the task.

Taken together, these two reviews suggest that the ability to read with understanding would not be constant across disciplines, since learning depends upon domain-based declarative knowledge and domain-related strategies, in addition to more generalized strategies. To the extent that "general reading ability" exists, it may therefore be limited to the ability to process text fluently and automatically, recognize the opportunity to use generalized strategies when applicable, and monitor reading progress. Further, because application of reading strategies is enhanced by domain-specific declarative knowledge, a reader who possesses "general reading ability" but lacks domain-specific knowledge may still be unable to derive meaning from text.

Schema Theory

According to schema theory (Anderson, 1984; Anderson & Pearson, 1984; Mason & staff, 1984; Rumelhart, 1981; Wilson & Anderson, 1986), a reader's schema, or abstracted mental structure, for a topic is activated while reading about that topic. Schema theory has strongly influenced reading educators to conclude that meaning resides not in the text alone but also in the mind of the reader (e.g., National Institute of Child Health and Human Development, 2000). Efficient readers have the ability to quickly call up the appropriate schema and correctly use the schema to fill in information not provided in the text (Rumelhart, 1981). Readers also utilize schemata to generate tentative hypotheses about text to be confirmed or rejected as reading continues (Mason & staff, 1984).

Anderson and Pearson (1984) concluded that prior experience or exposure improves comprehension, since a fully developed schema helps the reader make inferences, direct attention to important rather than trivial information, and plan for recall.

It follows that the reader may comprehend more from a passage dealing with familiar content than with unfamiliar content. But content-general reading assessments are insensitive to a reader's varied content, textual, and linguistic schemata. By amalgamating the examinee's responses across the range of passages from different subject areas, the composite reading-comprehension score purports to represent a trait (generic reading ability) that is difficult to interpret in light of schema theory, which posits that comprehension is highly content-dependent and thus differential across content areas. Proponents of content-general testing may claim that the effects of prior knowledge are "washed out" by the variety of content areas presented, but such a claim is unfounded. In fact, composite scores from content-general tests are biased, not controlled, by prior knowledge (Johnston, 1984). Examinees are placed at a great advantage (or disadvantage) depending on which subject areas and topics are presented on the content-general test.

Construction-Integration Model

The construction-integration model of reading (Kintsch, 1986, 1988; Kintsch & vanDijk, 1978; Mannes & Kintsch, 1987; Moravcsik & Kintsch, 1993; vanDijk & Kintsch, 1983) asserts that the reader engages text at three levels of representation. Surface-level representations are "processes concerned with the parsing of text" (Kintsch, 1986, p. 89) when words, phrases, and their linguistic relations are encoded into working memory. Textbase representation establishes meaning of text as the reader builds propositions and works toward coherence by finding the relationships among propositions. Situational representation occurs as the reader connects the overall situation described by the text to his or her knowledge system. Situational representation may involve adding to an existing situation model or developing a new one. In general, the textbase model allows the reader to recall or summarize the text and the situational model allows the reader to draw inferences, elaborate, and solve problems.

According to the construction-integration model, the representations needed by an examinee during a reading comprehension test would depend upon the nature of the test items. Comprehension-test items that require the examinee to reproduce or recall stated information may require only a sufficient textbase representation. On the other hand, items that require the examinee to expand, interpret, apply, or elaborate upon stated information may require a sufficient situational represen-

tation. Thus, reading tests that include items measuring inference or application would tend to favor readers who have enough knowledge to develop an adequate situational representation.

Expert-Novice Studies

Overall, empirical studies that compare high-knowledge subjects (domain experts) to low-knowledge subjects (domain novices) in relation to comprehension and other factors related to reading support the theoretical position that prior knowledge is strongly related to college students' understanding of text, although not all studies agree on the performance outcomes of prior knowledge. For example, Stahl, Hare, Sinatra, and Gregory (1991) found no differences in factual recall between high-knowledge and low-knowledge subjects, but high-knowledge subjects were better able to infer an organization of the facts. Shimoda (1993) found that topic familiarity improved speed and improved short-term accuracy for recognition questions. Royer, Carlo, Dufresne, and Mestre (1996) found that without domain expertise, a reader may be able to understand the gist of non-technical text, but is unable to draw inferences. Domain expertise of college students has been shown to be related to reading comprehension in history (Hall & Edmundson, 1992; McNamara & Kintsch, 1996; Shapiro, 2004; Voss & Silfies, 1996), literature (Zeitz, 1994), psychology (Royer et al., 1996; Shapiro, 2004), and physics (Alexander & Kulikowich, 1994; Royer et al., 1996).

Two studies emphasizing the important role of domain expertise among college students are of particular interest. In the first study, college students were pre-tested for history knowledge and then presented either expanded (well developed causal structure) or unexpanded (poorly developed causal structure) versions of fictitious history accounts (Voss & Silfies, 1996). Prior knowledge was not significantly correlated with literal comprehension after reading expanded text but was significantly related with comprehension after reading unexpanded text. In other words, prior knowledge had a positive effect on literal comprehension when texts were sparse in content and readers had to rely more on schemata. It should be noted that since researchers used fictitious text, subjects could not use prior knowledge of the text topic, but rather background knowledge of more general history concepts as well as content-related reading skills.

In the second study, college students were asked to read a physics or psychology text to investigate how domain expertise was affected by complexity of cognitive task (Royer et al., 1996). Experts were advanced undergraduate majors and novices were students in an introductory class. Subjects were post-tested at three increasing levels of cognitive

skill development: (1) surface-level understanding; (2) near inference (combining information from two different sections of text) and far inference (combining text information with outside knowledge); and (3) the representational stage of problem solving in which subjects decided whether or not an example problem conformed to the underlying concept or principle in a previously stated problem. Experts outperformed novices on all tests, even after controlling for verbal and math SAT scores. Overall, the differential in performance between experts and novices increased as the level of cognitive skill increased: in psychology, difference increased at each level, while in physics differences on inference and problem-solving tests were about the same, but greater than on surface-level understanding. Thus, after students read technical academic text in either content area, expertise was significantly related to test performance, with expertise becoming more advantageous as tasks became more complex. Such a finding makes the proposal for content-specific reading assessment even more compelling, as success in credit-level college courses may be more related to inferential thinking and problem-solving skills than upon lower-level cognitive tasks.

In the present study, college freshmen enrolled in an introductory human anatomy class were administered a content-general reading test, a content-specific reading test, and a test of prior domain knowledge on the first day of class in order to contrast the ability of each test to predict course grades. Three research questions are addressed in the study:

1. How well does a content-specific reading comprehension test predict grades in a credit-level college course?
2. Does the content-specific reading comprehension test predict course grades better than a content-general reading comprehension test?
3. Would the prediction of course grades be improved by using a combination of content-general reading comprehension, content-specific reading comprehension, and domain knowledge tests?

Method

Setting

The study was conducted in an introductory human anatomy class at a large community college in southern California. The anatomy course was required for students entering biology, nursing, or health-related majors. Although it was recommended that students entering the anatomy class be eligible to enroll in English 1A (reading and composition), there was no formal reading prerequisite for the anatomy class. The course included a two-hour lecture and six-hour lab session each week over the

16-week semester. In addition to weekly class meetings, students were expected to devote a considerable amount of time reading and studying outside of the classroom.

Historically, the anatomy course had proven difficult for many students and tended to derail some students interested in health sciences, with failure or withdrawal rates as high as 50 percent. Many students who were unable to attain a grade of C in the course (even after several attempts) dropped out of their health-related major. Informal conversation with several department chairs from area community colleges indicated that the high attrition rate at this college was typical for this course across institutions.

Participants

Forty-nine community college students in an introductory human anatomy course participated in the study. At the first class meeting the instructor requested that the students voluntarily participate and all agreed. There was no compensation for participation. There were 28 women and 21 men in the class. The class comprised 16 Hispanic American, 14 European American, 10 African American, and 9 Asian American students. Fourteen of the students reported they were non-native English speakers.

Instruments and Procedure

A content-general reading comprehension test, a content-specific reading comprehension test, and a test of prior knowledge were used as predictors of course success. The content-general reading comprehension test was Form C1 of ASSET (*Assessment of Skills for Successful Entry and Transfer)*. ASSET is described by its publisher as "an educational advising, course placement, and retention planning tool…to serve students entering two-year academic institutions" (American College Testing Program, 1990, p. 1). The reading section of ASSET/C1 contained three passages on topics from prose fiction, business, and social studies presumed to be "representative of the level and kinds of writing commonly encountered in college freshman curricula" (p.4): a Cajun festival, electronic mail service, and Hellenic ideas. Each passage was followed by eight multiple choice questions that measured literal comprehension, inferential comprehension, or vocabulary in context.

Researcher-developed tests served as measures of content-specific reading comprehension and prior domain knowledge. The content-specific reading test included three passages taken from the course textbook (Marieb & Mallatt, 2003). Topics were embryonic development of the brain, special parts of the skull, and epithelia and glands. Each

passage included both the words and accompanying diagrams from the textbook. In order to eliminate testing format as a confounding variable in this study, the content-specific reading test was designed with a multiple-choice item format to mirror that of the commercially developed content-general reading test. The first two passages were followed by six items and the third passage was followed by eight items that measured literal or inferential comprehension.

The test of prior domain knowledge contained 20 multiple-choice items. A multiple-choice test is considered a valid and objective method for measuring prior domain knowledge (Dochy, Segers, & Buehl, 1999). Each item asked the student about a term related to human anatomy, in ascending order of difficulty. For example, an easy item was, "The *patella* is a bone in the (a) pelvis, (b) knee, (c) thigh, or (d) ankle." A more difficult item was, "Which of the following is not a type of white blood cell? (a) neutrophils, (b) eosinophils, (c) lymphocytes, or (d) thrombocytes."

All three predictor measures were administered in the same sequence (domain knowledge, content-specific reading, and content-general reading) to all subjects on the first day of class. Students were provided 15 minutes to complete the domain knowledge test and 25 minutes to complete each reading test. The criterion measure of course success was the final grade earned (A, B, C, D, F, or W) at the end of the semester. Although many factors influence final grade, and final grade is not always a true indicator of student learning, because college placement is specifically concerned with ensuring that students are not placed into courses that they will fail, final grade is the most appropriate measure of course success when validating placement decisions.

Results

A forward-solution multiple regression was computed using SPSS, with domain knowledge, content-specific reading comprehension, and content-general reading comprehension as predictor variables and course grade as the criterion variable. The three predictor variables were entered as scale values based on number of questions answered correctly on each test (maximum score was 24 for content-general reading comprehension, 20 for content-specific reading comprehension, and 20 for domain knowledge). Course grades were also entered as scale values with A = 4, B = 3, C = 2, D = 1, and F or W = 0. Although it may be argued that A, B, C grades are not technically scale values, the SPSS program treats scale and ordinal values identically (George & Mallery, 2003).

Means and standard deviations for all variables are shown in Table 1. The grade-point average for the class was 1.53 on a four-point scale.

Consistent with the historical difficulty of the human anatomy course, only 25 of the 49 students passed with a grade of D or higher. All of the failing students were encouraged by the instructor to withdraw (W) rather than receive an F.

Table 1
*Means, Standard Deviations, and Intercorrelations Among Course Grade, Domain Knowledge, Content-Specific Reading, and Content-General Reading (*N = *49)*

Variable	M	SD	GR	DK	CS	CG
Grade (GR)	1.53	1.65	---	.311*	.398**	.219
Domain Knowledge (DK)	11.29	3.60		---	.543**	.297*
CS Reading (CS)	11.48	3.22			---	.725**
CG Reading (CG)	17.33	5.00				---

*Significance level (two-tailed) < .05
**Significance level (two-tailed) < .01

Zero-order correlations between all variables are also presented in Table 1. Prior domain knowledge was a significant predictor of course grade at the .05 level (r = .311, two-tailed p = .029). Content-specific reading comprehension was a significant predictor of course grade at the .01 level (r = .398, p = .005). Content-general reading comprehension was not a significant predictor of course grade (r = .219, p = .131). In addition, both prior domain knowledge (r = .543, p = .000) and content-general reading comprehension (r = .725, p = .000) were highly correlated with content-specific reading comprehension.

The forward-solution multiple regression analysis is shown in Table 2. In a forward-solution procedure, the predictor variable with the highest zero-order correlation with the criterion is entered first. The next variable entered is the one that produces the greatest increment in variance (R-squared), after partialing out the variable already in the equation (Kerlinger & Pedhazur, 1973). Because it had the highest zero-order correlation, content-specific reading comprehension was the first variable entered. The amount of variance accounted for by content-specific reading comprehension (R-squared) was .158 (F = 8.824, p =

.005). However, neither prior domain knowledge nor content-general reading comprehension produced a significant increase in variance (*R*-squared) after partialing out the effects of content-specific reading comprehension, and both were excluded from the regression equation using a criterion of .05 for the significance of the change in *F* ratio. Post-hoc analysis showed that the incremental variance attributed to prior domain knowledge was only .013 ($F = .722$, NS) and to content-general reading comprehension was only .007 ($F = .389$, NS).

Table 2
Forward-Solution Multiple Regression of Course Grade on Domain Knowledge, Content-Specific Reading, and Content-General Reading (N = 49)

Variable	*R*	R^2	ΔR^2	*F*	df	*p*
CS Reading	.398	.158	.158	8.824	1,47	.005
Domain Knowledge	.414	.171	.013	.722	2,46	NS
CG Reading	.422	.178	.007	.389	3,45	NS

Variable entered: CS Reading
Variables excluded: Domain Knowledge, CG Reading
Entry criterion: Probability of *F* to enter < = .05

Table 3 displays the distribution of course grades by content-specific reading comprehension scores. Since a grade of C or higher is required for students in the anatomy course to continue in their health-related majors, course success is defined here as a grade of C or above. For students scoring 16 or above on the content-specific reading test, the success rate was 100 percent (6 of 6). For students scoring between 12 and 15 on the content-specific reading comprehension test, the success rate was 44 percent (8 of 18). For students scoring 10 or 11 on the content-specific reading comprehension test, the success rate was 55 percent (6 of 11). For students scoring 9 or below on the content-specific reading comprehension test, the success rate was only 29 percent (4 of 14).

Table 3
Distribution of Course Grades by Content-Specific Reading Scores (N = 49)

	Grade				
CS Reading Score	F/W	D	C	B	A
16 or above	0	0	0	3	3
12-15	9	1	2	1	5
10-11	5	0	3	2	1
9 or below	10	0	2	2	0

Discussion

The first research question addressed the test-criterion relationship between a content-specific reading comprehension test and grades in a credit-level college course. In this study, a researcher-developed test of comprehension of text taken from a human anatomy textbook was a significant predictor (at the .01 level) of course grades in a community college introductory human anatomy class. The second research question addressed whether the content-specific reading comprehension test would predict course grades better than a commercially developed content-general reading comprehension test. Results indicate that the content-specific reading comprehension test was a significant predictor of course grades, while the content-general reading comprehension test was not. The third research question addressed whether the prediction of course grades would be improved by using a combination of content-general reading comprehension, content-specific reading comprehension, and domain knowledge tests. It was found that the tests of domain knowledge and content-general reading comprehension did not add significantly to the prediction of course grades after using the test of content-specific reading comprehension as a single predictor.

The present study therefore offers support for the validity of using content-specific rather than content-general reading comprehension tests for placement into credit-level college courses. Further, the present study does not support the validity of including a test of prior knowledge or a content-general reading test if a content-specific reading test is being used for course placement.

Conclusions

Content-general reading placement tests that measure comprehension across a variety of subject areas may have limited utility in academic placement decisions. As an alternative to using content-general reading placement tests, it is suggested that reading placement tests be specific to the courses for which placement decisions will be made. A content-specific reading comprehension test would draw passages from a defined subject area and yield a comprehension score intended to indicate reading comprehension ability in that subject rather than generic reading ability. The present study offers preliminary empirical evidence that a placement system using content-specific reading comprehension tests could enhance the validity of placement decisions over a placement system using content-general reading tests. Results of this study also suggest that there may be limited value in administering a content-general reading test if content-specific reading tests are being used to make placement decisions.

Although results underscore the important relationship between content-specific reading ability and academic performance, there may be limits to the ability of any single measure to predict course success. In this study about 16 percent of the variance in course grades was explained by scores on the content-specific reading comprehension test. The tests of domain knowledge and content-general reading comprehension did not improve the prediction, since both of these tests were highly correlated with content-specific reading comprehension. Nonetheless, it is likely that stronger prediction of course grades will require a multiple-factor model. However, many of the personal, social, economic, as well as academic factors that influence course success may be difficult to measure through a placement instrument. In addition, there may be statistical limits to the maximization of test-criterion coefficients, since either low reliability (Sawyer, 1989) or restricted range[1] of either the predictor or criterion variable can depress the magnitude of the observed correlation.

Ultimately, the validity of any placement testing system must be determined within the context of its use. Each college using a reading test to place students into credit-level courses has the responsibility for determining the extent to which the placement test really serves its intended purpose for each of the courses that require placement. The college should study which courses are most dependent upon content-specific reading ability and which other academic factors contribute to success in each course. In addition, the college may wish to consider whether the testing prompts and response formats are consistent with the kinds of tasks students will encounter in the target course.

There will never be a placement test with perfect predictability, so the goal of placement testing should be to reduce the proportion of successful non-predictors and unsuccessful predictors. Until researchers are able to identify reading placement tests that will improve the validity of placement decisions, large proportions of college students may continue to be misplaced based on the results of reading test scores. Any reduction in the number of students who are misplaced would be a move in the right direction.

Footnote

[1]In the formula for a bivariate coefficient of correlation, both the numerator and denominator are based on calculations involving deviations of X and Y scores from the mean (Capon, 1988). The arithmetic effect of one of the variables having restricted range, or less deviation from the mean, is always a lower correlation.

References

Alexander, P. A., & Judy, J. E. (1988). The interaction of domain-specific and strategic knowledge in academic performance. *Review of Educational Research, 58,* 375-404.

Alexander, P. A., & Kulikowich, J. M. (1994). Learning from physics text: A synthesis of recent research. *Journal of Research in Science Teaching, 31,* 895-911.

American College Testing Program. (1990). *ASSET technical manual for use with Forms B and C.* Iowa City, IO: Author.

Anderson, R. C. (1984). Role of the reader's schema in comprehension, learning, and memory. In R. C. Anderson, J. Osborn, & R. J. Tierney (Eds.), *Learning to read in American schools: Basal readers and content texts* (pp. 243-257). Hillsdale, NJ: Erlbaum.

Anderson, R. C., & Pearson, P. D. (1984). A schema-theoretic view of reading comprehension. In P. D. Pearson (Ed.), *Handbook of reading research* (pp. 255-291). New York: Longman.

Armstrong, W. B. (1994). *English placement testing, multiple measures, and disproportionate impact: An analysis of the criterion- and content-related validity evidence the reading & writing placement tests in the San Diego Community College District.* San Diego, CA: San Diego Community College District, Research and Planning. (ERIC Document Reproduction Service No. 398965)

Behrman, E. H. (2000). Developmental placement decisions: Content-specific reading assessment. *Journal of Developmental Education, 23*(3), 12-14, 16, 18.

Brown, J. I., Fishco, V. V., & Hanna, G. (1993). *Nelson-Denny Reading Test: Manual for scoring and interpretation, Forms G & H.* Chicago: Riverside.

Byrnes, J. P. (1995). Domain specificity and the logic of using general ability as an independent variable or covariate. *Merrill-Palmer Quarterly, 41,* 1-24.

Capon, J. A. (1988). *Elementary statistics for the social sciences*. Belmont, CA: Wadsworth.

College of the Canyons. (1994). *Predictive validity study of the APS Reading Test.* Santa Clarita, CA: Author. (ERIC Document Reproduction Service No. ED 374853)

Dochy, F., Segers, M., & Buehl, M. M. (1999). The relation between assessment practices and outcomes of studies: The case of research on prior knowledge. *Review of Educational Research, 69,* 145-186.

Feldt, R. C. (1989). Reading comprehension and critical thinking as predictors of course performance. *Perceptual and Motor Skills, 68,* 642.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step. 11.0 update* (4th ed.). Boston: Allyn & Bacon/Pearson.

Guilford, J. P. (1956). *Fundamental statistics in psychology and education* (3rd ed.). New York: McGraw-Hill.

Hall, V. C., & Edmondson, B. (1992). Relative importance of aptitude and prior domain knowledge on immediate and delayed posttests. *Journal of Educational Psychology, 84,* 219-223.

Johnston, P. (1984). Prior knowledge and reading comprehension test bias. *Reading Research Quarterly, 19,* 219-239.

Joint Committee on Standards for Educational and Psychological Testing of the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education. (1999). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.

Kerlinger, F. N., & Pedhazur, E. J. (1973). *Multiple regression in behavioral research.* New York: Holt, Rinehart and Winston.

Kessler, R. P. (1987). *Can reading placement scores predict classroom performance? A discriminant analysis.* Santa Ana, CA: Rancho Santiago Community College District. (ERIC Document Reproduction Service No. ED 291440)

Kintsch, W. (1986). Learning from text. *Cognition and Instruction, 3,* 87-108.

Kintsch, W. (1988). The role of knowledge in discourse comprehension: A construction-integration model. *Psychological Review, 95,* 163-182.

Kintsch, W. (1994). Text comprehension, memory, and learning. *American Psychologist, 49,* 294-303.

Kintsch, W. & vanDijk, T. A. (1978). Towards a model of discourse comprehension and production. *Psychological Review, 85,* 363-394.

Lawson, A. E., McElrath, C. B., Burton, M. S., James, B. D., Doyle, R. P., Woodward, S. L., et al. (1991). Hypothetico-deductive reasoning skill and concept acquisition: Testing a constructivist hypothesis. *Journal of Research in Science Teaching, 28,* 953-970.

Mannes, S., & Kintsch, W. (1987). Knowledge organization and text organization. *Cognition and Instruction, 4,* 91-115.

Marieb, E. N., & Mallat, J. (2003). *Human anatomy* (3rd ed. update). San Francisco: Benjamin Cummings.

Mason, J. M., & the staff of the Center for the Study of Reading, University of Illinois. (1984). A schema-theoretic view of the reading process as a basis for comprehension instruction. In G. G. Duffy, L. R. Roehler, & J. Mason (Eds.), *Comprehension instruction: Perspectives and suggestions* (pp. 26-38). New York: Longman.

McNamara, D. S., & Kintsch, W. (1996). Learning from texts: Effects of prior knowledge and text coherence. *Discourse Processes, 22,* 247-288.

Moravcsik, J. E., & Kintsch, W. (1993). Writing quality, reading skills, and domain knowledge as factors in text comprehension. *Canadian Journal of Experimental Psychology, 47,* 360-374.

National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction.* (NIH Publication No. 00-4769). Washington, DC: U.S. Government Printing Office.

Parsad, B., & Lewis, L. (2003). *Remedial education at degree-granting postsecondary institutions in Fall 2000. Statistical analysis report.* (NCES Publication No. 2040-010). Washington, DC: U.S. Government Printing Office.

Royer, J. M., Carlo, M. S., Dufresne, R., & Mestre, J. (1996). The assessment of levels of domain expertise while reading. *Cognition and Instruction, 14,* 373-408.

Rumelhart, D. E. (1981). Schemata: The building blocks of learning. In J. T. Guthrie (Ed.), *Comprehension and teaching: Research reviews* (pp. 3-26). Newark, DE: International Reading Association.

Sawyer, R. (1989). *Validating the use of ACT Assessment scores and high school grades for remedial course placement in college.* (Research Report No. 89-4). Iowa City, IO: American College Testing.

Sawyer, R. (1996). Decision theory models for validating course placement tests. *Journal of Educational Measurement, 33,* 271-290.

Schoenfeld, A. H. (1999). Looking toward the 21st Century: Challenge of educational theory and practice. *Educational Researcher, 28*(7), 4-14.

Shapiro, A. M. (2004). How including prior knowledge as a subject variable may change outcomes of learning research. *American Educational Research Journal, 41,* 159-189.

Shimoda, T. A. (1993). The effects of interesting examples and topic familiarity on text comprehension, attention, and reading speed. *Journal of Experimental Psychology, 61,* 93-103.

Stahl, S. A., Hare, V. C., Sinatra, R., & Gregory, J. F. (1991). Defining the role of prior knowledge and vocabulary in reading comprehension: The retiring of Number 41. *Journal of Reading Behavior, 23,* 487-508.

Van Dijk, T. A., & Kintsch, W. (1983). *Strategies of discourse comprehension.* New York: Academic.

Voss, J. F., & Silfies, L. N. (1996). Learning from history text: The interaction of knowledge and comprehension skill with text structure. *Cognition and Instruction, 14*, 45-68.

Wilson, P. T., & Anderson, R. C. (1986). What they don't know will hurt them: The role of prior knowledge in comprehension. In J. Orasanu (Ed.), *Reading comprehension: From research to practice* (pp. 31-48). Hillsdale, NJ: Erlbaum.

Zeitz, C. M. (1994). Expert-novice differences in memory, abstraction, and reasoning in the domain of literature. *Cognition and Instruction, 12,* 277-312.

Edward H. Behrman *is an associate professor of teacher education at National University in Los Angeles, where he regularly teaches a course on content-area literacy. His research interests include reading comprehension, reading testing, content-area literacy, and adolescent literacy. He is a member of the editorial boards for the Journal of Literacy Research and Issues in Teacher Education and is serving a two-year term as a member of the International Reading Association's Critical Perspectives on Literacy Committee. He formerly was an elementary and secondary reading specialist and taught developmental reading and writing at community colleges in Pennsylvania and New Jersey. Correspondence concerning this article should be addressed to Dr. Behrman at 2289 Chelan Drive, Los Angeles, CA 90068, 323-851-3402. E-mail:* edwardbehrman@aol.com. ***Chris Street*** *is an assistant professor of secondary education at California State University, Fullerton. A former secondary English teacher, he now teaches graduate level courses in the following areas: literacy in the content areas, composition studies, and teaching and learning at a distance. He writes often on these topics and has presented many professional papers for local, state, national, and international audiences. He is also a teacher/consultant with the National Writing Project.*