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ABSTRACT

This paper examines the efficacy of content-general reading tests used to place students into development courses. It argues that the discipline-generic model of comprehension supporting content-general reading tests is challenged by conclusions emerging from studies of schema theory, construction-integration theory, domain-knowledge theory, and expert-novice studies. This paper reviews how each orientation questions the efficacy of the discipline-generic model and proposes that content-specific tests, which measure the reader's ability to comprehend text in particular subject areas, rather than content-general reading tests, should be used in developmental placement. It suggests that content-specific reading assessment can focus on comprehension at the broad domain level (such as literature, science, or social studies), at the narrow domain or discipline level (such as geology or ancient history), or at the topical level (tectonic plates, Punic Wars), and use a wide array of testing options, including fixed-response, constructed-response, or performance items. Two tables present reading passage topics on a variety of different tests. (Contains approximately 40 references.) (JM)

Developing Content-Specific Reading Placement Tests

Presented at the 32nd annual conference of the College Reading and Learning Association New Orleans, LA, November 6, 1999

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ABSTRACT

A content-specific reading test is defined as a test that measures the reader's ability to comprehend text in a particular subject area. To date, reading tests used to place students into developmental courses have been content-general rather than content-specific. Unfortunately, the discipline-generic model of comprehension that supports content-general reading tests is challenged by conclusions emerging from several research orientations: schema theory, construction-integration theory, domain-knowledge theory, and expert-novice studies. This paper briefly reviews how each orientation questions the efficacy of the discipline-generic model and proposes that content-specific rather than content-general reading tests should be used in developmental placement.

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To date, reading assessment and reading instruction at the college level have been grounded largely in a discipline-generic model of comprehension. That is, there is an inherent assumption in many of our learning assistance efforts that reading ability crosses disciplinary boundaries, so that "a good reader is a good reader," no matter the content. We test students using content-general tests that yield a global comprehension score and place students into courses based on that global score. We often advise or even require "weak" readers to enroll in reading improvement classes designed to instruct students in cross-disciplinary reading strategies that will make them better readers in all their classes. Yet theory and research over the past three decades have begun to erode the notion of comprehension as a discipline-generic ability. In fact, comprehension appears based on both discipline-specific and discipline-generic factors, with emerging evidence that discipline-specific factors may have primacy. Thus, the current emphasis on discipline-generic placement testing and discipline-generic reading assistance may be inconsistent with what most reading educators and psychologists now believe about reading.

Each year critical placement decisions are made that affect whether students may enroll in credit-level or developmental courses. The construct validity of using content-general reading tests as part of the placement process needs to be re-examined in light of current views of reading and learning. AERA/APA/NCME (1985) standards for testing emphasize that without a solid theoretical basis for the test's development, empirical evidence is meaningless. Although dissatisfied with current notions of reliability and validity, Schoenfeld (1999) echoes this same point when he says, "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 (Behrman, in press). The purpose of this paper is to provide theoretical support for the use of content-specific rather than content-general reading tests in developmental placement. Further, it will provide a few examples of content-specific reading tests and examine potential issues that may affect the development of content-specific reading tests.

A content-specific reading test measures the reader's ability to comprehend text in a particular subject area, such as history, psychology, literature, or biology. Such a test presents passages exclusively from the subject field being tested. The comprehension score indicates the examinee's ability to understand text in that subject area. In contrast, a content-general reading test measures the reader's ability to comprehend text in all

subject areas. Passages are drawn from a variety of subject areas. The comprehension score indicates the examinee's global ability to understand text across subject areas. Reading tests commonly used for developmental placement are content-general. For example, *Assessment and Placement Services for Community Colleges* (APS) presents eight passages drawn from natural science, social science, and contemporary life (College Board, 1990). The *Assessment of Skills for Successful Entry and Transfer* (ASSET) presents three passages from prose fiction, business, and social science (American College Testing Program, 1990). The comprehension section of the *Nelson-Denny Reading Test* (NDRT) presents seven passages from humanities, natural science and social science (Brown, Fishco, & Hanna, 1993). Table 1 illustrates the range of topics included on each test.

Unfortunately, the discipline-generic model of comprehension that supports the construct validity of content-general reading tests is challenged by conclusions emerging from several research orientations that inform our understanding of reading processes: schema theory, construction-integration theory, domain-knowledge theory, and expert-novice studies. In the subsequent sections, each research orientation will be briefly reviewed with attention to how each questions the efficacy of the discipline-generic model.

Schema Theory

A real estate investment adviser once told me, "The easiest way to make a million dollars is to start with a billion." Similarly, the best way to comprehend text is to already know something about the content. Henk, Stahl, and Melnick (1993) assert that "it is now almost universally accepted that prior topical knowledge exerts a significant impact on reading comprehension and retention practices (p. 1)." Schema theory (Anderson & Pearson, 1984; Mason & Staff, 1984; Rumelhart, 1981) has strongly influenced reading educators to conclude that meaning resides not in the text alone but also in the mind of the reader. Readers interpret text based on their culture, experience, and content expertise. Ryder and Graves (1998) state, "More than any factor, the reader's ability to draw upon prior knowledge will affect whether a text is comprehended and how efficiently it is comprehended (p. 20)." Most reading experts conceive reading as an interactive process in which readers gain meaning by merging text-based and schema-based clues.

Readers utilize schemata to generate tentative hypotheses about text to be confirmed or rejected as reading continues (Mason & Staff, 1984). Anderson & Pearson (1984) concluded that prior knowledge improves comprehension by helping the reader make inferences, direct attention to important rather than trivial information, and plan for recall. It therefore follows that the same reader may comprehend more from a passage dealing with familiar content (e.g., computers) than with unfamiliar content (e.g., Russian literature). In addition, readers also have schemata for genre (e.g., expository), text organization (e.g., compare-contrast), and language use (e.g., sarcasm). But content-general reading assessments are insensitive to a reader's varied content, textual, and language schemata. By amalgamating the examinee's responses across the range of

passages, the composite 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 and text types.

One critic of schema theory is Carver (1992a, 1992b), who proposes rauding theory as an alternative to better explain reading. According to rauding theory, reading consists of five processes: skimming, scanning, rauding, learning, and memorizing. Rauding is defined as being "similar to the traditional concept of general reading ability" (Carver, 1992a, p. 174), which proceeds at a constant rate and involves no studying. Carver claims that prior knowledge has little effect on rauding efficiency level, which is analogous to instructional reading level. Yet Carver acknowledges that prior knowledge is used during the learning and memorizing processes. According to Carver, a reading test requires learning and memorizing if (a) the test is difficult, (b) subjects have been instructed to read carefully or reread, or (c) subjects anticipate difficult items. Carver's argument against schema theory, particularly in reference to comprehension on reading tests, may be moot, since most reading tests intended for admissions, placement, or achievement decisions present subjects with challenging material, subjects understand they must read carefully, and they can anticipate difficult questions. Reading tests therefore require to differing degrees elements of learning and memorizing, by Carver's admission dependent on prior knowledge.

Proponents of content-general testing may claim that the effects of prior knowledge are "washed out" by the variety of content areas presented. Such a claim is unfounded. In fact, composite scores from content-general tests are biased 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. To combat knowledge bias, Johnston has suggested pretesting examinees for prior knowledge and then partialling out the effects of knowledge from the comprehension score. This procedure would provide two scores: (a) level of prior knowledge, and (b) reading comprehension, independent of prior knowledge. Such a procedure is statistically possible, but would we want to use it for placement decisions? Academic reading is always rooted in specific content and academic success depends in part upon the reader's ability to utilize prior knowledge. Reading achievement in the classroom is never "independent' of prior knowledge. As McKenna & Robinson (1997) note, "Content literacy is content specific....prior knowledge of the specific topics involved is a vital variable of content literacy" (p. 10).

Construction-Integration Theory

The construction-integration theory of reading (Kintsch, 1986, 1988; Kintsch & van Dijk, 1978; Mannes & Kintsch, 1987; Moravcsik & Kintsch, 1993; van Dijk & Kintsch, 1983) also supports a discipline-specific model of reading comprehension. Construction-integration theory asserts that the reader engages three levels of text representation. Surface-level representation is explained as "processes concerned with the parsing of text" (Kintsch, 1986, p. 89). Words, phrases, and their linguistic relations are encoded into working memory. During textbase representation the reader builds

propositions to establish meaning of the text 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 domain-knowledge system. Situational representation may involve adding to an existing situation model or developing a new one. These three processes are seen as interdependent. Textbases may be formed without full parse particularly when a reader faces semantic or syntactic difficulties. Similarly, situational representations may be developed without a well-organized textbase, as when the situation is well known to the reader. 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.

Kintsch (1994) distinguishes between remembering a text and learning from text. Remembering text requires the reader to "reproduce it in some form, more or less verbatim and more or less completely, at least its gist," while learning from text requires the reader to "use the information provided by the text in other ways, not just for reproduction" (p. 294). Remembering involves superficial understanding, but learning involves deeper understanding. A text may be recalled and summarized with a textbase model. Deeper understanding, on the other hand, depends upon a situational model. According to construction-integration theory, 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 would require a sufficient textbase representation. Items that require the examinee to expand, interpret, apply, or elaborate upon stated information would require a sufficient situational representation.

In testing comprehension, we often identify comprehension items as Level 1 (on the line), Level 2 (between the lines), or Level 3 (beyond the lines) (see Behrman, 1998). Construction-integration theory implies that Level 3, sometimes called "global inference" or "scriptally implicit," depends upon situational representation. Yet it is quite possible that a situation model may be needed for Levels 1 and 2 as well. Suppose a text passage on basketball states, "The point tossed an alley-oop to the center." A comprehension item that asked, "What did the point do?" would appear to be a Level 1 question, as the answer is stated in the text. But for readers unfamiliar with basketball, even a superficial understanding of gist is troublesome without knowing the situational meaning of "point," "alley-oop," and "center." Similarly, suppose a text passage on baseball states, "The pitcher feared walking in a run." A comprehension item that asked, "How many men are on base?" would appear to be a Level 2 question, as the answer though not directly stated is implied by the text. Again, for readers unfamiliar with baseball, such an inference would be impossible. It may be that while remembering text requires a sufficient textbase, frequently the textbase itself requires a sufficient situation model.

Domain-Knowledge Theory

There has been a long-standing debate in cognitive psychology as to whether learning new concepts is more a function of prior domain knowledge or general

reasoning ability (Lawson et al., 1991). Two extensive literature reviews (Alexander & Judy, 1988; Byrnes, 1995) provide evidence for the efficacy of domain knowledge.

Byrnes (1995) found that in 80 percent of 33 studies from 1988 to 1994, domain-general ability was less important than domain-specific ability. Fourteen of these studies used prose memory or reading comprehension as a dependent variable. He further reported that although the existence of general ability (or "g" factor) is supported by several strands of psychological research, empirical evidence fails to identify "general capacity for learning" as a component of general ability. Rather, general ability depends upon rate of information processing, employment of strategies across tasks, and metacognition (planning and monitoring skills). Thus, high general-ability students tend to perform intellectual tasks across domains quicker, devise more effective strategies, and better assess their progress. Yet a domain-knowledgeable student may be able to perform quickly, strategize, plan, and monitor within that domain without a high level of general ability. Since high general ability, by definition, is uncommon, domain-specific success is more the rule than the exception. Byrnes (1995) summarized current contemporary views of intellectual ability as follows:

1. Conceptual (declarative) knowledge is domain-specific, but procedural knowledge may be domain-specific or domain-general.
2. Students differ in domain-specific concepts, procedures, and strategies.
3. Level of prior knowledge is a good predictor of future learning.
4. Students have uneven amounts of content-specific knowledge due to (a) environmental demands, including schooling; (b) topic interest; (c) rate of information processing; (d) preference for novelty; (e) practice; and (f) mothers who provide intellectual stimulation and hold high expectations.
5. Domain-general procedures start out as domain-specific.

Alexander & Judy's (1988) review of research between 1975 and 1988 looked at the relationship between prior declarative knowledge and strategic knowledge as it affects academic performance. Strategies may be limited to a particular content area (task-limited), to two or more specific content areas (goal-limited), or generalizable across a wide array of content areas (general strategies). Their review, though tempered by methodological and conceptual issues inherent in much of the research, offered the following hypotheses:

1. Accurate and complete domain-specific declarative knowledge is a necessary precondition for efficient use of both domain-specific and domain-general strategic knowledge.
2. Accurate and complete domain-specific declarative knowledge by itself will not lead to successful task performance unless the learner can efficiently use strategic knowledge.
3. Incorrect or incomplete domain-specific declarative knowledge may hinder task performance.
4. Domain-specific declarative knowledge allows use of efficient strategies; conversely, lack of domain-specific declarative knowledge leads to use of inefficient strategies.

5. 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 a construct definition of comprehension that is much different from that suggested by content-general tests. The ability to read with understanding would not appear to be constant across disciplines since comprehension, a critical cognitive learning activity, depends upon content-based prior knowledge, content-related strategies, and more generalized reading strategies. But some generalized strategies may be restricted to particular content areas (e.g., mathematics, physics, engineering). "General reading ability" is limited to ability to process text fluently and automatically; recognize the opportunity to use generalized strategies when applicable; and monitor reading progress. Further, application of reading strategies is enhanced by prior knowledge, so a reader who possesses "general reading ability" but lacks prior knowledge may still be unable to derive meaning from text.

Expert-Novice Studies

Overall, empirical studies that compare high-knowledge subjects (domain experts) to low-knowledge subjects (domain novices) 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, & 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, & 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. Among college students, prior knowledge has been found to influence comprehension in history (Hall & Edmundson, 1992; McNamara & Kintsch, 1996; Voss & Silfies, 1996), literature (Zeitz, 1994), psychology (Royer, Carlo, Dufrese, & Mestre, 1996), and physics (Alexander & Kulikowich, 1994; Royer et al., 1996).

Two recent studies emphasizing the important role of prior knowledge among college students are of particular interest. College students were pretested 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.

To investigate how prior knowledge was affected by complexity of cognitive task, college students were asked to read a physics or psychology text (Royer et al., 1996). In

each area experts were advanced undergraduate majors and novices were students in an introductory class. Subjects were posttested 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 a new generation of reading tests places greater emphasis on inferential thinking and problem-solving skills.

Discussion

Reading comprehension appears to depend on content-specific prior declarative knowledge, content-specific procedures and strategies, and content-general procedures and strategies; further, the influence of prior knowledge seems to increase as text sparseness and difficulty of cognitive task increase. Therefore, overall reading comprehension scores drawn from various content areas may have limited utility in academic placement decisions, since a student's comprehension may be variable across content areas. Even though prior knowledge biases scores on reading comprehension tests, reading comprehension continues to be measured by content-general assessment. Any efforts to eliminate or statistically control prior knowledge as a biasing factor are problematic: attempting to assess comprehension independent of prior knowledge creates a measurement construct in conflict with the current view of the reading process as integration of new information with existing information.

Content-specific reading assessment is offered as an alternative to enhance academic decision-making. Depending on the purpose of the assessment, content-specific reading assessment could focus on comprehension at the *broad domain level* (such as literature, science, or social studies); *narrow domain or discipline level* (such as British literature, geology, or ancient history); or *topical level* (such as Lord Byron, tectonic plates, or the Punic Wars). Content-specific reading assessment might contain either a single content-area test or a battery of separately scored and independently validated content-area subtests. It may include fixed-response, constructed-response, or performance items. Thus, a wide array of testing options is available. Significantly, though, what separates content-specific from content-general assessment is the inclusion of only text drawn from a defined content area and the absence of generalizing results from the defined content area to an overall comprehension score indicating generic reading ability. Text presented would be similar to that encountered by students in

academic situations and items would measure the range of comprehension activities expected in that content area.

One approach to content-specific placement testing would be to develop a battery of reading assessments relevant to the student's proposed course of study. For example, determining to place a student directly into the nursing program, or into remedial courses, could be based in part not on presumed "overall" reading ability, but ability to comprehend text in anatomy, psychology, and related subjects. In contrast to content-general assessment, content-specific reading assessment would measure comprehension in content areas to be studied. A student found deficient in the requisite content-specific reading ability could then receive content-specific remediation, with development of reading skills integrated with subject-area conceptual development. Such bridge courses could be taught by faculty from the academic departments specially trained in reading development or co-taught by faculty from the academic and developmental education departments. Remedial programs could thus foster higher-order inferential thinking and applied problem-solving in a realistic, content-specific context.

Presently, content-specific reading tests in most academic disciplines are not yet commercially available. Although the ACT Assessment reports comprehension in Arts/Literature and Social Studies/Sciences (ACT, 1997), the combined content areas are too broad to be considered content-specific. The few content-specific reading tests now on the market are used primarily in vocational training or occupational settings. For example, the Ramsay Job Skills Reading Test (Form CMB) has been used to test applicants for mechanical repair training. The five passages are titled The Drill Press, Hydraulic Systems, Safety Memo, Conveyors, and Steel (Ramsay, 1996). The Ramsay Health Care Reading Test (Form HC-1) contains passages titled Safety With Machines, Care of Patients' Belongings, Communication, CPR, and Telephone Procedures (Ramsay, 1992). The Revised PSB-Reading Comprehension Test (Psychological Services Bureau, 1993), intended for secondary and postsecondary occupational training programs, contains 11 passages, 10 related to science (see Table 2).

As content-specific reading assessment emerges from theory into practice, content-specific reading tests for academic placement need to be identified or developed, field tested, and empirically validated. Continuing research should focus on the optimal level of testing (broad domain, narrow domain, or topical) and the interaction among prior knowledge, text coherence, and task difficulty in relation to placement decisions. Surely development of content-specific tests will require a tradeoff in efficiency, since the same reading test could not be used for all purposes, but efficiency in testing must be weighed against the validity of the decision-making.

Table 1

Topics of Reading Passages Presented on APS, ASSET, and NDRT

APS (Form A)	ASSET (Form C-1)	NDRT (Form H)
Spiders	*Prose fiction*	*Homer*
Narrative essay	*Electronic mail*	*Insects*
Adolescence	*Ancient Greece*	*Gwendolyn Brooks*
Business ethics		*Jungian psychology*
Air pollution		*Compounds*
National monument		*Soil conservationists*
Moral breakdown		*Symbol classification*
Chief Justices		

Table 2

Topics of Reading Passages Presented on Ramsay JSRT, Ramsay HCRT, and Revised PSB-RCT

Ramsay JSRT	Ramsay HCRT	Revised PSB-RCT
The Drill Press	*Safety With Machines*	*Facial Features*
Hydraulic Systems	*Care of Patients' Belongings*	*pH*
Safety Memo	*Communication*	*Ozone Layer*
Conveyors	*CPR*	*Dr. Abbott, Surgeon*
Steel	*Telephone Procedures*	*19th Century Women Health Care Workers*
		Automobile Battery
		Employment Pattern
		Scientific Method
		End of the Medical "Middle Ages"
		Mental Hygienists' Views of Behavior Problems
		Speech Clinic Study

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