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Textbase and situation model representations as educational constructs

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ABSTRACT

The distinction proposed by Walter Kintsch and colleagues between textbase and situation model representations has had a profound influence on theory and research in discourse processing over the past four decades. However, this distinction also has implications for education that have been less widely recognized. We describe a number of practical applications that can be adopted by college instructors and students alike to enhance learning outcomes. We describe how these two levels of mental representation relate to college and university instruction, studying, and assessment. We also consider how certain topics and study strategies that align with this distinction are easier for students to grasp if this framework is already in place.

As a field, we learned from Walter Kintsch and colleagues that texts are mentally represented at multiple levels. Explained most fully in Van Dijk and Kintsch (1983), the surface structure refers to memory for the exact wording of the text and decays quickly (Kintsch et al., 1990). The textbase refers to the memory representation of concepts described in the text as organized by the text structure. In essence, language in the text is a set of instructions to tell the reader what sort of mental representation to build. However, readers often create memories that are not exactly what the text said. They bring varying amounts and types of prior knowledge to the reading situation (McCarthy & McNamara, 2021). Readers also vary in their goals, motivation, and general cognitive ability (Britt et al., 2018; Kintsch, 1998). As a result, they also create a mental representation of the broader meaning of the text, known as the situation model. The situation model can vary depending on reader characteristics and reading contexts and can differ from what the text says specifically. Textbases and situation models are well studied in the literature on discourse processing. But while Kintsch was for a long time interested in the educational applications of this theoretical framework (Kintsch et al., 1993), this work is underappreciated in relation to college instruction. We describe how the textbase–situation model distinction can help instructors frame teaching and assessment and can help students classify study strategies and evaluate their effectiveness.

Implications for instructors

Creating effective lectures

Although interactive demonstrations, group projects, and so forth contribute to learning in uniquely important ways, lectures are an essential component of many courses. Reading and listening comprehension depend on the same basic processes (Kintsch & Kozminsky, 1977), so the textbase–situation model distinction has implications for how lectures should be structured and presented. To begin, the construction of a textbase in real time is subject to the capacity and duration constraints of working

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memory (Van Dijk & Kintsch, 1983). These constraints run up against the common temptation of instructors to cover as much material as possible in a single class period. Ideally, instructors should deliver their lectures at a relaxed pace and focus on the most-central concepts from the assigned readings along with an assortment of associated examples, particularly when the information is less familiar (Davis, 1976).

Moving to the situation model, instructors should consider what students are likely to think about during each section of a lecture. Crucially, students will create rich and resilient memories of lecture material only to the extent that they wind up thinking deeply about the material (Willingham, 2021). Instructors can ask frequent "why" questions of the class (Pressley et al., 1988), guide students in connecting current material with previous material from the current or other courses, and use other methods to encourage elaboration in terms of relevant prior knowledge. Allowing a few moments for such reflection and discussion is also important since constructing a situation model that is both rich and accurate takes time.

Finally, instructors should remind themselves that while they understand the deep structure and terminology of their course content, their students often do not. Consistent use of unfamiliar terminology and a cohesive structure can enhance textbase construction by making it easier for students to link concepts across sentences (Britton & Gülgöz, 1991; McNamara et al., 1996). If students are unable to easily discern a structure in which concepts can be meaningfully related to one another, a lecture may seem like little more than a long list of isolated facts—a surefire recipe for shallow thinking. One solution is to make the organization of information explicit by (a) introducing the topic with a fundamental question to be answered or problem to be solved (b) offering periodic summaries throughout, and (c) concluding by showing how the concepts just covered relate to one another and the initial problem or question (McKeachie & Svinicki, 2013). Somewhat more ambitiously, lectures can be delivered as stories, capitalizing on humans' tendency to impose familiar story structures on unfamiliar sequences of events (Boyd, 2009; Gottschall, 2012). Whenever a lecture begins with an overarching question or problem, that lecture can unfold as a mystery or a quest.

Assessing and utilizing students' prior knowledge

True comprehension of readings and lectures involves not just the construction of a textbase but also a situation model, which draws on the background knowledge of the reader or listener (Kintsch, 1994). Thus, it is useful to take stock of the knowledge students bring to the classroom and how they apply it. Finding the right balance between familiar and unfamiliar ideas results in an optimal *zone of learnability* for a class (Wolfe et al., 1998) and is dependent on what students already understand. But assessing and utilizing such prior knowledge has many nuances.

It is common in introductory-level courses for instructors to begin by asking students how familiar they are with to-be-covered material. However, McCarthy and McNamara (2021) suggest that prior knowledge can be conceptualized according to four dimensions: *amount* (how many concepts a person knows), *specificity* (how related these concepts are to the topic), *accuracy* (how correct the knowledge is), and *coherence* (how interconnected the knowledge is). This framework implies that instructors should consider the amount of domain-relevant content knowledge students possess but also the structure and factual basis of students' prior knowledge. For example, students taking introductory psychology courses may already believe a host of popular psychological myths (e.g., "people are either left-brained or right-brained") and pseudoscientific claims (e.g., "manifesting can cure anxiety and depression"; Lilienfeld et al., 2009; Stanovich, 2019). To the extent that such inaccurate prior knowledge is not uncovered and addressed early on, these beliefs may interfere with the comprehension—and even the acceptance—of factual material presented later. Identifying and refuting misconceptions can help decrease their persistence (Sinatra & Broughton, 2011).

As students progress to upper-level courses in a discipline, their accurate, domain-relevant prior knowledge will increase and instructors can take advantage of this when teaching new material. For example, although advance organizers are typically helpful, the challenges presented by less cohesive presentations, such as lectures that do not strictly follow the order and structure of assigned readings, can assist in the construction of enduring situation models (Mannes & Kintsch, 1987). And the benefits of such challenges are greatest for students with higher levels of domain-relevant knowledge (McNamara et al., 1996).

In addition to course-relevant knowledge, students come to class with a wealth of prior knowledge that lies outside the discipline at hand but that can potentially enhance relevant situation models. Care must be taken, though, in trying to tap into such background knowledge. For example, analogies and metaphors (e.g., "an atom is like a solar system") can help students conceptualize unfamiliar or abstract target concepts by relating them to familiar or concrete base concepts; however, if some students lack knowledge of the base domain, then analogies and metaphors may interfere with their learning (Braasch & Goldman, 2010). Likewise, making course material personally relevant by inviting students to connect what is being taught with their own lived experiences can increase engagement with the material. However, doing so in an unsupervised fashion can encourage *person-who reasoning* (Stanovich, 2019). Every lived experience is unique, and some experiences will be outliers relative to the statistical trends uncovered by research in the social sciences. If left unaddressed, some students may come to treat their personal anecdotes as refutations of the course material.

Introducing difficulty into practice and homework problems

Coherence is important in lectures, but more challenge is often optimal for homework and practice problems. Research in math learning addresses strategies that foster long-term retention and transfer of skills to new problems. For some topics, such as calculating angles and side lengths of triangles, students must develop a rich, integrated situation model of multiple related formulas so they can choose appropriately for a particular problem. Across a number of studies, when different practice problems were grouped by type, or *blocked*, performance on those problems was strong. However, when the order of the problems was mixed up, or *interleaved*, performance was better on new and different (transfer) problems or after delays of a week or more (Rohrer et al., 2015; Taylor & Rohrer, 2010). Thus, blocking practice facilitates memorization, but in a rather fragile way, analogous to a textbase. Interleaving practice slows initial acquisition, but allows students to create an integrated understanding of which formula is appropriate for which type of problem. Comparable effects have been found for classroom-based problems in math (Rohrer et al., 2020) and science (Sana & Yan, 2022), as well as motor coordination skills such as hitting a baseball (Hall et al., 1994).

Assessing students' learning

In addition to memorizing important facts and concepts, the learning objectives of any course should include the abilities to explain, evaluate, synthesize, and apply the content that has been covered. While exceptions can and do exist, essay questions and open-ended, short-answer questions are often better suited for assessing situation model representations; whereas, multiple-choice, true/false, and fill-in-the-blank questions are often better suited for assessing the textbase. We recognize that the latter types of question are easier to grade than the former. And, perhaps not surprisingly, many students strongly prefer multiple-choice questions over short-answer and essay questions (Kaipa, 2021). Students are more likely to use deep-learning strategies when studying for essay tests than when studying for multiple-choice tests (Scouller, 1998) and to gear their study strategies toward what is required by tests (Jensen et al., 2014). Including at least one integrative essay question on major exams should be considered best practice in most circumstances.

Implications for students

In appropriate psychology or education courses, it is useful to explain the textbase–situation model distinction to students. Once in place, students can think of study strategies not just as a list of options to choose from but as categories based on the type of memory representation they strengthen. In a survey (Karpicke et al., 2009), university students listed rereading as the most frequently used strategy, followed by practice problems, flashcards, and rewriting notes. Highlighting is also popular (Gurung et al., 2010; Miyatsu et al., 2018). Other than practice problems, all these strategies are geared toward developing and strengthening a textbase. Gurung et al. (2010) found that textbase-focused strategies such as looking over notes, highlighting, and reviewing the chapter after class were negatively correlated with exam scores. Situation model strategies such as answering questions on a study guide, using practice exams, and explaining a problem using the material, were all positively correlated with exam grades.

Students benefit from understanding when and how to assess their own learning. In comprehension-monitoring research, students' judgments of their own understanding of material tend to be inaccurate. However, comprehension-monitoring judgments can be improved by triggering a situation model assessment rather than a textbase assessment. For example, adding a time delay between study and monitoring judgments improved the accuracy of judgments (Thiede et al., 2003). The delay is beneficial because the textbase fades faster from memory than the situation model (Kintsch et al., 1990), making delayed judgments more situation model dependent. Improved monitoring judgments can also come from students who naturally tend to assess their general understanding of material (Thiede et al., 2010) or when students expect a situation model-based assessment (Wiley et al., 2016). Better comprehension-monitoring judgments also lead to better decisions about what to study and ultimately to greater learning (Thiede et al., 2003).

Conclusions

The distinction between textbase and situation model representations can provide educators a theoretically grounded means of categorizing somewhat disparate aspects of the student experience. Activities that involve building referential coherence, or remembering information similar to how it was learned fall into the textbase category. Activities that encourage incorporating prior knowledge, generating novel examples, and transferring knowledge to new situations fall into the situation model category. Thanks to Walter Kintsch and colleagues, these constructs provide a practical framework through which to improve teaching and learning.

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References

Boyd, B. (2009). *On the origin of stories: evolution, cognition, and fiction*. Belknap Press.

Braasch, J. L. G., & Goldman, S. R. (2010). The role of prior knowledge in learning from analogies in science texts. *Discourse Processes*, *47*(6), 447–479. https://doi.org/10.1080/01638530903420960

Britt, M. A., Rouet, J.-F., & Durik, A. (2018). *Literacy beyond text comprehension: A theory of purposeful reading*. Routledge.

Britton, B. K., & Gülgöz, S. (1991). Using Kintsch's computational model to improve instructional text: Effects of repairing inference calls on recall and cognitive structures. *Journal of Educational Psychology*, *83*(3), 329–345. https://doi.org/10.1037/0022-0663.83.3.329

Davis, J. R. (1976). *Teaching strategies for the college classroom*. Westview Press.

Gottschall, J. (2012). *The storytelling animal*. Houghton Mifflin Harcourt.

Gurung, R. A. R., Weidert, J., & Jeske, A. (2010). Focusing on how students study. *Journal of the Scholarship of Teaching and Learning*, *10*(1), 28–35.

Hall, K. G., Domingues, D. A., & Cavazos, R. (1994). Contextual interference effects with skilled baseball players. *Perceptual and Motor Skills*, *78*(3, Pt 1), 835–841. https://doi.org/10.2466/pms.1994.78.3.835
Jensen, J. L., McDaniel, M. A., Woodard, S. M., & Kummer, T. A. (2014). Teaching to the test . . . or testing to teach: Exams requiring higher order thinking skills encourage greater conceptual understanding. *Educational Psychology Review*, *26*(2), 307–329. https://doi.org/10.1007/s10648-013-9248-9
Kaipa, R. M. (2021). Multiple choice questions and essay questions in curriculum. *Journal of Applied Research in Higher Education*, *13*(1), 16–32. https://doi.org/10.1108/JARHE-01-2020-0011
Karpicke, J. D., Butler, A. C., & Roediger, H. L., III. (2009). Metacognitive strategies in student learning: Do students practise retrieval when they study on their own? *Memory*, *17*(4), 471–479. https://doi.org/10.1080/09658210802647009
Kintsch, W. (1994). Text comprehension, memory, and learning. *American Psychologist*, *49*(4), 294–303. https://doi.org/10.1037/0003-066X.49.4.294
Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. Cambridge University Press.
Kintsch, W., Britton, B. K., Fletcher, C. R., Kintsch, E., Mannes, S. M., Nathan, M. J., & Medin, D. L. (1993). A comprehension-based approach to learning and understanding. In D. L. Medin (Ed.), *The psychology of learning and motivation* (pp. 165–214). Academic Press.
Kintsch, W., & Kozminsky, E. (1977). Summarizing stories after reading and listening. *Journal of Educational Psychology*, *69*(5), 491–499.
Kintsch, W., Welsch, D. M., Schmalhofer, F., & Zimny, S. (1990). Sentence memory: A theoretical analysis. *Journal of Memory and Language*, *29*(2), 133–159. https://doi.org/10.1016/0749-596X(90)90069-C
Lilienfeld, S. O., Lynn, S. J., Ruscio, J., & Beyerstein, B. L. (2009). *50 great myths of popular psychology*. Wiley-Blackwell.
Mannes, S. M., & Kintsch, W. (1987). Knowledge organization and text organization. *Cognition and Instruction*, *4*(2), 91–115. https://doi.org/10.1207/s1532690xci0402_2
McCarthy, K. S., & McNamara, D. S. (2021). The multidimensional knowledge in text comprehension framework. *Educational Psychologist*, *56*(3), 196–214. https://doi.org/10.1080/00461520.2021.1872379
McKeachie, W. J., & Svinicki, M. (2013). *Mckeachie's teaching tips: Strategies, reasearch, and theory for college and University teachers* (14th ed.). Cengage Learning.
McNamara, D. S., Kintsch, E., Songer, N. B., & Kintsch, E. (1996). Are good texts always better? Interactions of text coherence, background knowledge, and levels of understanding in learning from text. *Cognition and Instruction*, *14* (1), 1–43. https://doi.org/10.1207/s1532690xci1401_1
Miyatsu, T., Nguyen, K., & McDaniel, M. A. (2018). Five popular study strategies: Their pitfalls and optimal implementations. *Perspectives on Psychological Science*, *13*(3), 390–407. https://doi.org/10.1177/1745691617710510
Pressley, M., Symons, S., McDaniel, M. A., Snyder, B. L., & Turnure, J. E. (1988). Elaborative interrogation facilitates acquisition of confusing facts. *Journal of Educational Psychology*, *80*(3), 268–278.
Rohrer, D., Dedrick, R. F., Hartwig, M. K., & Cheung, C.-N. (2020). A randomized controlled trial of interleaved mathematics practice. *Journal of Educational Psychology*, *112*(1), 40–52. https://doi.org/10.1037/edu0000367
Rohrer, D., Dedrick, R. F., & Stershic, S. (2015). Interleaved practice improves mathematics learning. *Journal of Educational Psychology*, *107*(3), 900–908. https://doi.org/10.1037/edu0000001
Sana, F., & Yan, V. X. (2022). Interleaving retrieval practice promotes science learning. *Psychological Science*, *33*(5), 782–788. https://doi.org/10.1177/09567976211057507
Scouller, K. (1998). The influence of assessment method on students' learning approaches: Multiple choice question examination versus assignment essay. *Higher Education*, *35*(4), 453–472. https://doi.org/10.1023/A:1003196224280
Sinatra, G. M., & Broughton, S. H. (2011). Bridging reading comprehension and conceptual change in science education: The promise of refutation text. *Reading Research Quarterly*, *46*(4), 374–393. https://doi.org/10.1002/RRQ.005
Stanovich, K. E. (2019). *How to think straight about psychology* (11th ed.). Pearson.
Taylor, K., & Rohrer, D. (2010). The effects of interleaved practice. *Applied Cognitive Psychology*, *24*(6), 837–848. https://doi.org/10.1002/acp.1598
Thiede, K. W., Anderson, M. C. M., & Therriault, D. (2003). Accuracy of metacognitive monitoring affects learning of texts. *Journal of Educational Psychology*, *95*(1), 66–73.
Thiede, K. W., Griffin, T. D., Wiley, J., & Anderson, M. C. M. (2010). Poor metacomprehension accuracy as a result of inappropriate cue use. *Discourse Processes*, *47*(4), 331–362. https://doi.org/10.1080/01638530902959927
van Dijk, T. A., & Kintsch, W. (1983). *Strategies of discourse comprehension*. Academic Press.
Wiley, J., Griffin, T. D., Jaeger, A. J., Jarosz, A. F., Cushen, P. J., & Thiede, K. W. (2016). Improving metacomprehension accuracy in an undergraduate course context. *Journal of Experimental Psychology: Applied*, *22*(4), 393–405.
Willingham, D. T. (2021). *Why don't students like school?* (2nd ed.). Josey-Bass.
Wolfe, M. B. W., Schreiner, M. E., Rehder, B., Laham, D., Foltz, P. W., Kintsch, W., & Landauer, T. K. (1998). Learning from text: Matching readers and texts by latent semantic analysis. *Discourse Processes*, *25*, 309–336. https://doi.org/10.1080/01638539809545030