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Abstract

This study reports analyses of constructed responses that students generated while reading expository texts. We examined how comprehension strategy use varied across tasks and populations, using six datasets comprised of over 1,500 students. Community college and developmental undergraduate students relied on bridging and elaboration, while high schoolers and undergraduates relied on paraphrasing and bridging. At the task level, other- and self-explanations had a higher frequency of paraphrasing and bridging, with think-alouds displaying more even strategy use.

Keywords: Adult readers; reading comprehension; constructed response strategies

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Introduction

Reading comprehension strategies provide valuable insights into cognitive processes underlying comprehension (e.g., McNamara, 2009). These strategies include comprehension monitoring, paraphrasing (restating text content), bridging (connecting text content), and elaboration (introducing extratextual ideas; McNamara, 2004). One approach to examine comprehension strategy use is asking readers to generate constructed responses while reading (e.g., self-explanations, think-alouds). After collecting readers' constructed responses, comprehension processes and strategies can be identified via qualitative analyses (Singer et al., 1992).

Constructed response research has revealed that comprehension processes vary across readers and tasks. Research suggests skilled readers tend to incorporate bridging and text-relevant elaborations (Chi et al., 1989; Magliano et al., 2020; McCrudden et al., 2021). By contrast, less skilled readers tend to rely on less effective strategies (e.g., paraphrasing, tangential elaborations) and are more prone to textual misunderstandings (Carlson et al., 2014; Long et al., 1999; McNamara, 2004). Strategy use is also biased by constructed response task instruction. Prompting students to *self-explain* supports more inferential processes (bridging, elaboration) as compared to thinking aloud (McNamara, 2009; Magliano & Millis, 2003).

While there is a growing body of constructed response research exploring strategy use across tasks and reader populations, it is often difficult to generalize across studies due to variations in constructed response scoring. Additionally, although previous research explores strategy co-occurrence at an aggregate level (McNamara, 2004), no such work examines strategy co-occurrence across instructional prompts or populations.

We address these limitations by examining multiple datasets scored on the same rubric. We leverage descriptive analyses to address the following questions: 1) How does task instruction (other-explain, self-explain, think-aloud) impact the use of comprehension strategies in combination or in isolation? 2) How do different populations, defined by education level, differ in their use of comprehension strategies in combination or in isolation?

Method

Datasets

The study used six archival datasets containing 22,706 constructed responses produced by 1,579 students as they read science texts (**Table 1**). Constructed responses were produced in the context of the Reading Strategy Assessment Tool (RSAT; Magliano et al., 2011) or iSTART (McNamara et al., 2007). Students were assigned one of three constructed response prompts: other-explain (explain the text to an imagined "other"), self-explanation (explain the text to yourself), or think-aloud (produce whatever thoughts come to mind on the text).

Table 1

Summary of datasets

Dataset	N	Population	Task(s)	Texts	Tool
1	257	High school	Self-explanation	2	iSTART
2	274	4-year undergrad	Self-explanation	1	iSTART
3	146	4-year undergrad	Self-explanation; Other explanation	2	iSTART
4	153	4-year undergrad	Self-explanation	1	iSTART
5	158	4-year undergrad	Think-aloud	4	RSAT
6	591	Community college*, 4-year undergrad*	Think-aloud	2	RSAT

*includes Developmental Education designations

Scoring and Analysis Plan

Expert raters scored individual constructed responses based on the Self-Explanation Rubric (McCarthy et al., 2021). Focal strategies included paraphrase, bridging, and elaboration,

but monitoring was included to capture metacognitive aspects and misconceptions were included to denote textual inaccuracies or incorrect statements (**Table 2**).

Table 2

Simplified Constructed Response Scoring Rubric

Coding Category	Score	Significance
Misconception	0	Not present
	1	Includes information contradictory to that presented in the text up to that point
Monitoring	0	Not present
	1	Includes comprehension monitoring (questions, metacognitive framing of explanation or thoughts)
Paraphrase Presence	0	Not present
	1	Partial paraphrase attempt, with up to half of the target sentence idea units conveyed
	2	Full paraphrase attempt, with a majority of the target sentence idea units conveyed
Bridging Presence	0	Not present
	1	One-word bridges, anaphoric references
	2	Full but vague bridged idea(s)
	3	Full and unambiguous bridged ideas
Elaboration Presence	0	Not present
	1	One-word elaborative terms (nouns or verbs only)
	2	Text-relevant ideas not found in (or deducible from) the text

During analysis, data were collapsed into the presence and absence of both singular and combined strategies. In one set of analyses, we examined frequency of strategies separately. In a second set of analyses, each constructed responses was categorized as exhibiting one of eight strategies (based on the focal strategies of paraphrase, bridging, and elaboration): none of the focal strategies ("None"); exclusively paraphrase ("Para Only"); exclusively bridging ("Bridge Only"), exclusively elaboration ("Elab Only"); paraphrase and bridging ("Para-Bridge");

paraphrase and elaboration ("Para-Elab"); bridging and elaboration ("Bridge-Elab"); or all three focal strategies ("All").

Results

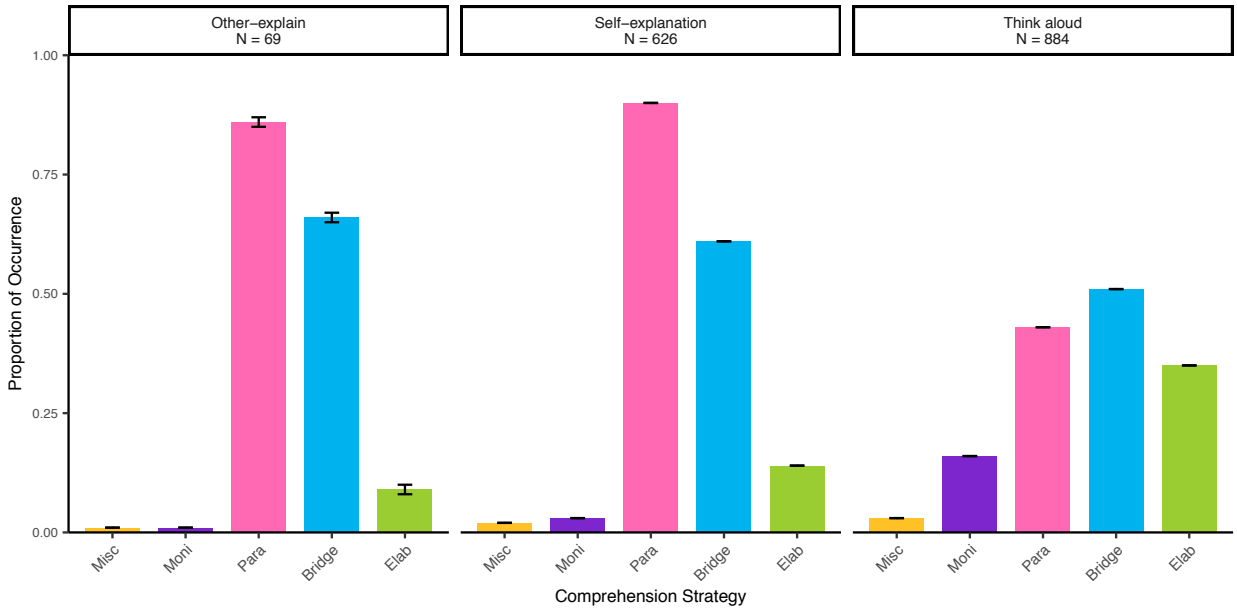
To facilitate comparisons of strategy use across tasks and populations, we calculated the proportion of protocols that included a given strategy or combination. Thus, in Figures 1-4, any category can range from 0 (strategy absent in all protocols) to 1 (strategy present in all protocols).

Task Instruction

Data was compiled to compare differences in strategy use across those prompted to other-explain (n = 69), self-explain (n = 626), or think-aloud (n = 884). As shown in **Figure 1**, other-explanation and self-explanation are similar, whereas think-aloud is markedly different. The majority of other-explanations and self-explanations included paraphrasing, with bridging as the second most commonplace strategy. Elaboration was sparse but was more frequent than misconception and monitoring. Think-alouds included varied use of strategies, with bridging being the most common. This was closely followed by paraphrasing and elaboration. The frequency of misconceptions was low across all tasks, but there was a greater frequency of comprehension monitoring among think-alouds than other-explanations and self-explanations.

Figure 1

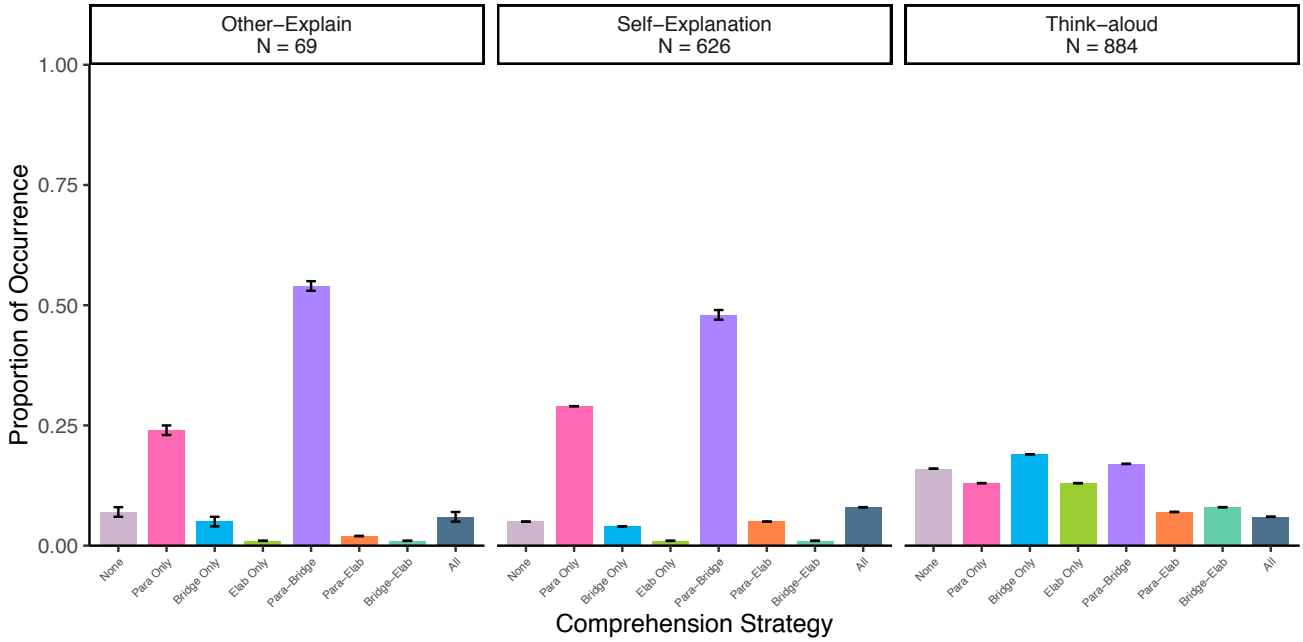
Comprehension strategy use across constructed response by task



Combined comprehension strategy use per task provides more detail on strategy co-occurrence (**Figure 2**). Other-explanations and self-explanations included Para-Bridge in a majority of constructed responses, with Paraphrase Only accounting for the second most used strategy. Think-alouds included an even distribution of strategy use. Bridge Only occurred slightly more frequently than Para-Bridging, followed by None, Paraphrase Only, and Elaboration Only. The remaining strategy combinations accounted for less than 10% of the think-alouds, as strategies were used in isolation more so than in other-explanations and self-explanations.

Figure 2

Combined comprehension strategy use across constructed responses by task



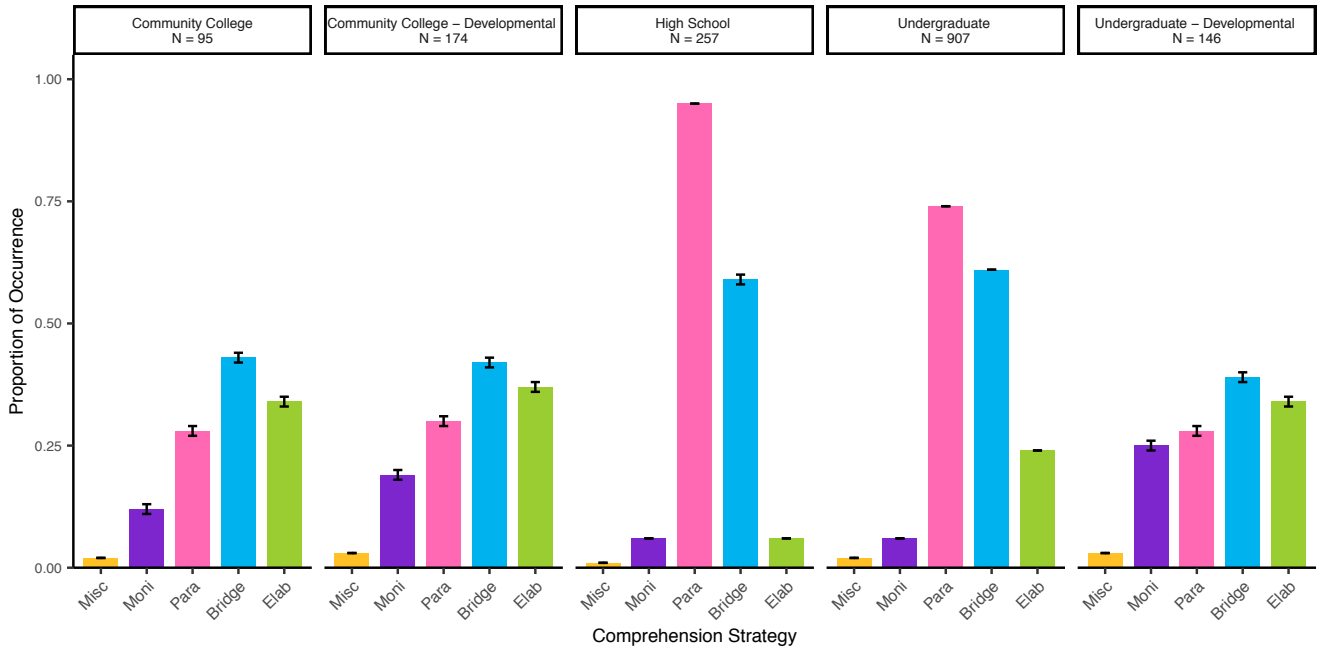
Populations

To examine differences across populations, we categorized the data into high school, community college, and 4-year undergraduate students. In addition, we further separated the community college and undergraduate students based on whether they were enrolled in developmental education programs ("Developmental") (**Figure 3**). The students enrolled in developmental education programs, regardless of whether they were community college or undergraduate students, were similar in strategy use. They used bridging most frequently followed by elaboration and paraphrasing. They also had higher levels of comprehension monitoring relative to high school and undergraduate populations not enrolled in developmental education programs. High school and undergraduate students were alike in their use of paraphrasing in a majority of their constructed responses, followed by bridging. High school students generated a much smaller proportion of elaboration compared to undergraduates'

constructed responses. Both populations had comparably low frequencies of comprehension monitoring. Misconceptions were negligible across groups.

Figure 3

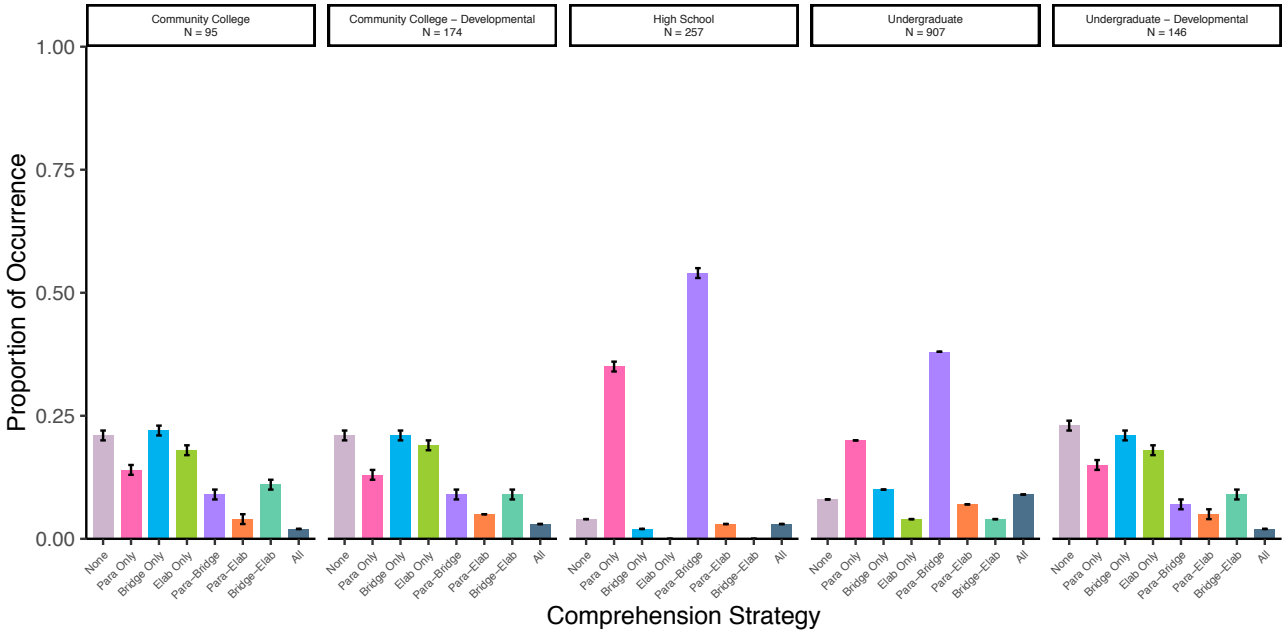
Comprehension strategy use across constructed responses by population



In the combined strategies analysis (**Figure 4**), the community college and developmental education undergraduate students had more varied strategy use relative to high school and undergraduate populations. Para-Bridge followed by Paraphrase Only were overwhelmingly used by high school and undergraduate students, with Para-Bridge used in about half the constructed responses by both groups. By contrast, community college and developmental education undergraduate populations displayed no strategy combinations in half the constructed responses. Bridge Only and None were most commonly seen in these populations, followed closely by Elaboration Only and Paraphrase Only.

Figure 4

Combined comprehension strategy use across constructed responses by population



Discussion

This study addressed two research questions. First, how do task instructions impact comprehension strategy use in isolation or combination? Although descriptive, these analyses reveal clear trends. Instructions to explain elicited similar strategies focused on paraphrasing in combination with bridging, whereas thinking-aloud elicited various strategies largely in isolation.

Second, how do different populations differ in their use of comprehension strategies in isolation or combination? High school and undergraduate readers predominantly used paraphrase and bridging. However, community college and developmental education undergraduate students had a tendency to use singular strategies or combinations that may be less beneficial for comprehension.

One limitation is that the high school population was only prompted to self-explain, while all community college students and undergraduates enrolled in a developmental education

program were only prompted to think-aloud. This difference between populations may have resulted in differences in strategy use observed across task instructions.

This study provides an initial description of this rich dataset, to better understand how strategy use varies across populations and instructional contexts. Our future work will further examine potential effects of individual differences (e.g., reading skill, prior knowledge) and how they explain and predict comprehension strategy use.

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