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Abstract

Readers' understanding of a task guides processing decisions during reading, and higher task awareness should correlate with better task performance. Task awareness arises from a reader's task model, but what supports task model construction? Strategies that support comprehension (paraphrasing, bridging and elaborative inferences) may influence performance indirectly by supporting task model construction. The goal of this study was to explore the hypothesis that task awareness partially mediates the relationship between comprehension strategies and literacy outcomes.

Keywords: Task Awareness, College Readers, Task Oriented Reading, Self-Regulated Learning

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Introduction

Tasks affect reading comprehension in a variety of ways. They influence attentional allocation and memory (e.g., McCrudden & Schraw, 2007), the inferences that readers' generate (e.g., van den Broek, Lorch, Linderholm, & Gustafson, 2001), and comprehension outcomes (Bråten & Strømsø, 2009, Wiley & Voss, 1999).

How do tasks influence how readers engage in comprehending texts? When reading for a specific purpose, readers must adapt their strategies to the demands of the task in order to construct a mental representation of the texts(s) that supports task performance. To regulate their learning readers must maintain an awareness of these task demands. Frameworks of task-oriented reading propose that readers construct and maintain mental representations of tasks which help guide reading processes (Britt, et al., 2018). The task model includes the reader's understanding of what the task outcome(s) should look like (goal-states), sub-goals and plans and strategies for obtaining them (Britt et al., 2018; Winne & Hadwin, 2008). The task model then guides decisions and actions throughout reading (e.g. selective attention, processing decisions, strategy deployment) as readers construct a mental representation of a text (i.e., a situation model). Readers also utilize their understanding of the task (task awareness) to monitor and evaluate progress toward their represented task outcome. As a result of these evaluations they may engage in additional actions (e.g., additional effort, strategy changes). Importantly, the task model may be continually updated during reading (Britt et al., 2018, Winne & Hadwin, 2008). As readers obtain new information, their awareness of task demands may be refined, and the task model updated. Readers' task awareness should be dependent upon the extent to which their task model accurately reflects task demands.

Reader's understanding of task demands and the extent to which they can accurately represent and access this during reading likely differentiates between more and less successful comprehenders (Britt et al., 2018, Schellings & Broekamp, 2011). There are many reasons why students may have difficulty constructing a task model that accurately reflects task demands. Reader's propensity to utilize strategies that support mental model construction may play an important role in constructing and updating a task model. Comprehension theories assume several processes to be important (McNamara & Magliano, 2009). For example, bridging inferences establish how ideas are semantically related, and elaborative inferences incorporate readers' background knowledge. Paraphrasing helps readers translate statements into familiar words that function as retrieval cues to help them activate knowledge (McNamara, 2004). Readers' propensity to engage in these processes may have important implications for successfully representing task demands and maintaining task awareness during reading. Interpreting task demands involves activating knowledge to decipher and interpret instructions and context cues, to assess the relevance of activated knowledge and then to integrate this information to represent one's end goal and plans. (Schellings & Broekamp, 2011). Differences in readers' propensity to engage in these processes can directly affect comprehension by influencing the mental representation of the text(s) they construct but may also affect comprehension indirectly via task awareness. The higher the level of task awareness a reader has, the more effectively they should be able to deploy strategies in helping shape a situation model that supports task performance.

Little is known about how the task model affects processing and how it is related to comprehension strategies that have been shown to support comprehension (paraphrasing, bridging inferences, and elaborative inferences). The goal of this study was to explore these potential relationships, and specifically a hypothesis that task awareness partially mediates the relationship between comprehension strategies and literacy outcomes.

Overview of the present study

RQ1 focused on confirming the assumption that readers' propensity to engage in paraphrasing, bridging and elaboration would predict better performance on an academic literacy task, which has been demonstrated in prior studies (e.g., Magliano, Millis, et al., 2011)

RQ2 assessed different possible relationships between strategies, task awareness and literacy task performance. An independence hypothesis assumes that the best characterization of these relationships is that of independent, unrelated effects. Alternatively, a task awareness mediation hypothesis, assumes that the relationship between strategies and performance is partially mediated by task awareness. We also explore the stability of the proposed associations across two assessment periods.

Method

Participants

Participants were 353 undergraduate students from a large Midwestern university who were enrolled in a 'College Reading and Study Strategies' course. The majority were first year

students and included 223 participants enrolled in a program for students who did not meet the traditional university admissions requirements.

Measures

Strategy use. Strategy use was assessed at both times with the Reading Strategy Assessment Tool (RSAT; Magliano et al. 2011). Participants read texts on a computer and produce typed "think aloud" responses at pre-selected sentence. RSAT uses computational tools to provide measures of the propensity to engage in paraphrasing, bridging and elaboration processes.

Academic Literacy Task. Academic reading was assessed at both times using different forms of the Global, Integrated, Scenario-based Assessment (GISA). (Sabatini et al., 2013). In GISA, items are grounded in an academically authentic task (e.g., the need to correct a wiki on a historical topic). GISA scenarios involve simulated teacher and student agents and provide a realistic, domain-specific purpose for reading a collection of materials. This allows for the measurement of higher-level comprehension skills including integration of information in service of completing a goal GISA (Sabatini et al., 2013). Two forms were counterbalanced across participants and times. The scenario in one version involved updating and correcting an inaccurate wiki about the Mona Lisa (it only presented one of many theories about the identity of the person depicted in the Mona Lisa). The second form involved a study group reading to prepare for an exam covering 'problems associated with invasive species and potential solutions for dealing with them'.

Task Awareness. GISA included an open-ended question that was coded for a measure of task awareness. The question posed by a character agent, asked why the students have been given a specific text (e.g., "Why do you think Dr. Henson gave us this text to read?"; "Why do you think Andrea wanted us to read this excerpt?"). The text was available to the student while they responded. To answer the question, participants needed to be able to express how the text content was related to the overall task. In one form the text provided an alternate theory for the identity of Mona Lisa relevant to correcting the wiki. In the other form, the text was a report on the implementation of a solution to invasive species that was relevant to the goal to study to understand problems and solutions related to invasive species.

Task awareness was scored on three levels A score of 2 was given for a direct mention of the specific task or an indirect statement revealing how the text related to the task (e.g., "It provides another theory about the identity of the Mona Lisa:). A score of 1 was given if they indicated a more general task such as information gathering without explaining the purpose of gathering information (e.g., "So we can learn more additional information"). Responses were given a score of 0 on task awareness if they did not mention any task information or were uninformative (e.g., "To confuse us" , "to read"). For the two forms, interrater reliability was acceptable (Form 1: κ =.82; Form 2: κ =.83).

Procedure

Students participated during class time at two points in the semester. All measures were computer based. Sessions began with the RSAT followed by the GISA SBA. Measures were completed within a class period (75 minutes).

Results

Descriptives are shown in Table 1 and correlations in Table 2 .

Table 1

Measure Descriptives

	T1 Mean	T1 Std. Dev	T2 Mean	T2 Std. Dev
GISA	1020.78	73.05	997.69	67.71
Task Awareness	1.07	0.72	0.98	0.65
Paraphrase	1.17	0.57	1.12	0.6
Elaboration	2.83	1.51	2.25	1.31
Bridge	1.56	0.9	1.33	0.85

Table 2

Correlations at T1 and T2

T1 Correlations

		1	2	3	4	5
1	GISA	--				
2	Task Aware	.39**	--			
3	Paraphrase	.22**	.11	--		
4	Bridge	.15**	.02	.67**	--	
5	Elaboration	.17**	.12*	-.01	.25**	--

T2 Correlations

		1	2	3	4	5
1	GISA	--				
2	Task Aware	.37**	--			
3	Paraphrase	.21**	.29**	--		
4	Bridge	.17**	.24**	.72**	--	
5	Elaboration	.31**	.23**	.12*	.24**	--

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

RQ1

To confirm the assumption that propensity to engage in comprehension strategies would predict academic literacy task performance regression analyses were conducted at each time point. Analyses were conducted with each strategy as a predictor in separate models as well as in a model with all three strategies as simultaneous predictors of comprehension. When tested as separate equations, paraphrasing, bridging, and elaboration positively predicted reading comprehension at both time periods (see Table 3 for estimates). In the simultaneous model, paraphrasing and elaboration were significant predictors but bridging was not, suggesting that the part of bridging that contributes to reading comprehension is shared with the other reading strategies. These patterns were also found at T2.

Table 3

Regression estimates for separate and simultaneous predictor models at two time points.

	Time 1			Time 2		
	Estimate (SE)	*p*	Model R^2	Estimate (SE)	*p*	Model R^2
Separate Models						
Paraphrasing	28.49 (7.09)	<.001	0.05	23.67 (6.98)	<.001	0.04
Bridging	11.96 (4.50)	0.008	0.02	13.22 (4.93)	0.008	0.02
Elaboration	8.42 (2.80)	0.003	0.02	16.51 (3.17)	<.001	0.09
Simultaneous Model			0.08			0.11
Paraphrasing	36.17 (9.67)	<.001	---	23.60 (9.67)	0.02	---
Bridging	-7.31 (6.29)	0.246	---	-4.35 (6.92)	0.53	---
Elaboration	9.62 (2.93)	0.001	---	15.72 (3.23)	<.001	---

RQ2

To examine the task mediation hypothesis and the independence hypothesis, indirect effects analyses were conducted at each time point with strategies combined in a simultaneous model (see Figure 1 and Figure 2 for estimates at T1 and T2). Analyses were conducted using the psych package mediation function in R (Revelle, 2019). Task awareness was a significant predictor of academic literacy task performance at each time. At T1 there were significant direct effects of paraphrasing and elaboration on academic literacy and significant indirect effects through task awareness. For bridging, the direct and indirect effects were not significant .

This pattern of relationships was consistent between time periods except that the direct effect of paraphrasing was no longer significant at T2 (p=.055). The indirect effects of paraphrasing and elaboration were both significant at T2. The results suggest a strong case for task awareness as an indirect route for the effect of paraphrasing and elaboration on comprehension. Paraphrasing and elaboration had significant positive relationships with task awareness at both times. However, at T1 bridging had a significant negative relationship with task awareness, but a non-significant relationship at T2. This effect of bridging at T1 may be a suppression effect.

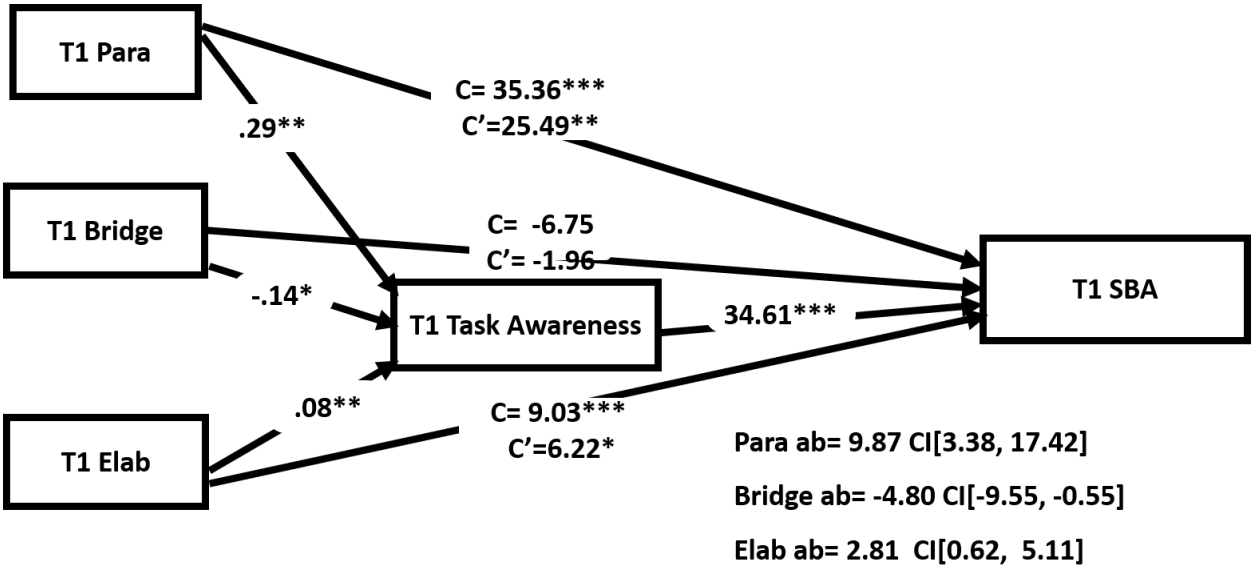

Figure 1. Time 1 Mediation

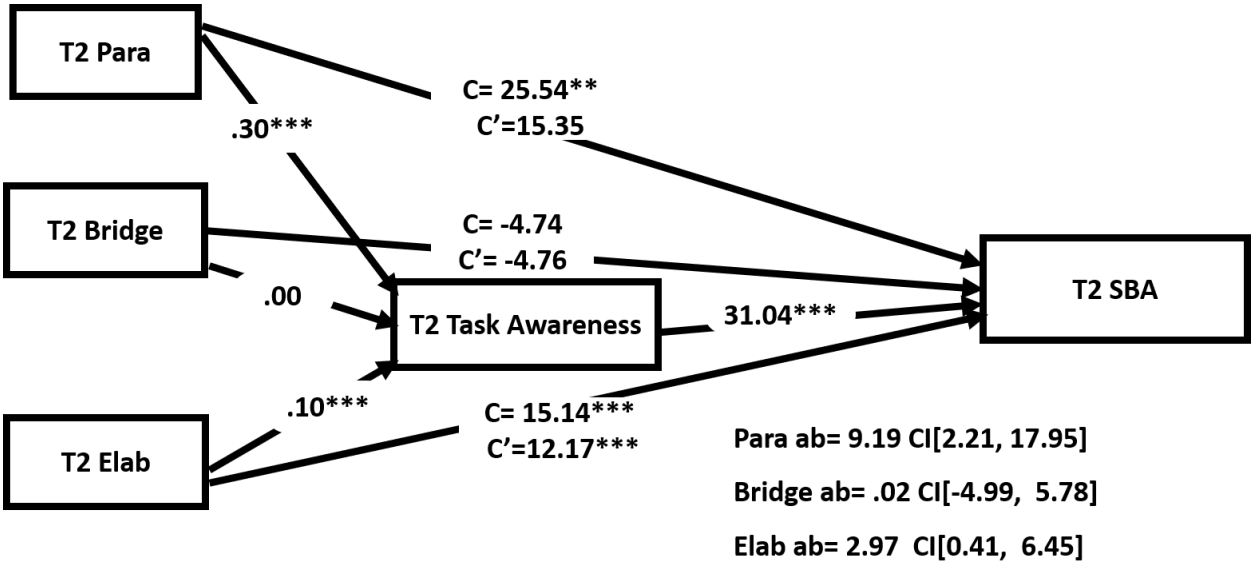

Figure 2. Time 2 Mediation

Table 3

Mediation Model estimates for T1 & T2

	Time 1 (Model R^2=.19)			Time 2 (Model R^2=.20)		
Estimate	Estimate	SE	*p* val or CI	Estimate	SE	*p* val or CI
Paraphrasing (c')	25.48	8.55	0.003	15.35 .	-7.96	0.055
Bridging (c')	-1.96	5.56	0.725	-4.76	-5.59	0.394
Elaboration (c')	6.22	2.49	0.013	12.17	-2.57	<.001
Task Awareness	34.61	4.95	<.001	31.04	-5.24	<.001
Paraphrasing (a)	0.29	0.09	0.002	0.3	-0.08	<.001
Bridging (a)	-0.14	0.06	0.019	0	0.06	0.991
Elaboration (a)	0.08	0.03	0.002	0.1	-0.03	<.001
ab1 (paraphrase)	9.87	sd=3.67	[3.03, 17.41]	9.19	(sd=3.9)	[2.32, 17.65]
ab2 (bridge)	-4.8	sd=2.28	[-9.44 -0.47]	0.02)	(sd=2.62	[-4.87, 5.62]
ab3 (elaboration)	2.81	sd=1.16	[0.56 5.21]	2.97)	(sd=1.53	[0.44, 6.42]

Conclusions

Analysis suggest support for the task mediation hypothesis rather than the independence hypothesis. Specifically, task awareness partially mediated the relationships between readers' propensity to engage in paraphrasing and elaboration and performance on the SBA at two time points. These results indicate that these comprehension strategies support task awareness and partially explains why the propensity to engage in these strategies is positively correlated with performance. Collecting data at two different time points provided an assessment of the stability of the relationships between comprehension strategies, task awareness, and comprehension performance over time.

It is important to note that the majority of students enrolled in this course were deemed not ready to read for college based on performance on the Accuplacer reading assessment. It is

possible that the structural relationships would be different for students who do not need supplemental support for readiness to read in college. This does imply, however, that variability in task awareness is related to performance on a complex literacy task within struggling college students. The results of this study suggest that task awareness may be an effective target for intervention.

These results help to understand relationships between readers propensity to utilize basic comprehension strategies and comprehension by showing that this relationship was partially explained by task awareness. However, a stronger exploration of this phenomenon would include not only a measure of propensity to utilize these strategies, but also a situated measure capturing use of these strategies during engagement in the same task in which task awareness and comprehension outcomes are obtained. This could provide a greater understanding of how readers adapt their strategies in relation to task demands. Additionally, as readers can dynamically update their understanding of the task throughout reading, measuring task awareness at different points in reading can help to better understand how this process unfolds.

Task awareness is an important construct implicit in theories of purposeful reading (Britt et al., 2018; McCrudden & Schraw, 2007) and SRL (e.g., Winne & Hadwin, 2008) . These theories propose that readers construct a mental representation of a task that guides self-regulation and comprehension processes. Task awareness reflects the understanding a reader has available in their task model at a given point in reading. Further research is needed to better understand the factors that influence task awareness and how it is utilized in reading and how that relates to comprehension. Measures of task awareness are important to understanding these relationships. Task Awareness has previously been explored by having participants think aloud while selecting task relevant text (e.g., Schellings & Broekamp, 2011). Here we utilized an

open-ended question intended to prompt students to access their task representation and utilize it to provide a response revealing their awareness of task demands. However, task awareness is a multidimensional construct and measures that tap different aspects of readers understanding of tasks in different contexts can help to better understand the role of task awareness in learning from texts.

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