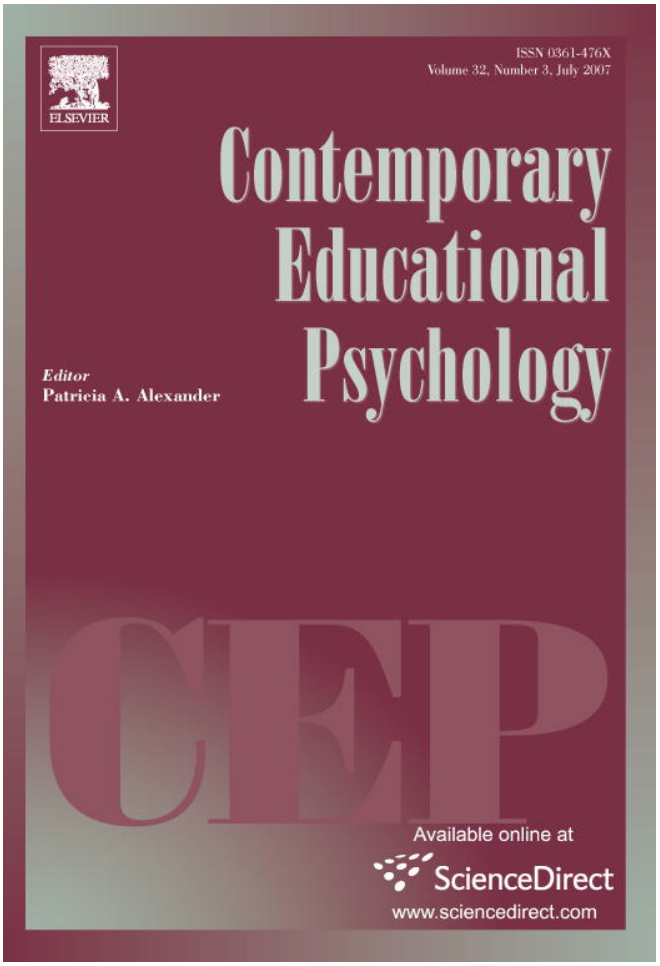

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The role of need for cognition and reader beliefs in text comprehension and interest development

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Abstract

This study was an attempt to integrate motivation into reading comprehension, with active knowledge construction as a linkage. The study examined two motivational constructs, need for cognition and reader's beliefs, in terms of their role in text comprehension and interest development. The results of the study provided empirical evidence for the independent contributions of the two variables to reading comprehension. Furthermore, the results suggested that effects of these variables on comprehension cut across expository and narrative genres. The study further explored direct and mediated effects of need for cognition and transaction belief on topic interest and the possible mediational role of comprehension. Strong effect sizes of relations found between these variables support the notion of motivational processes as an integral part of effective text comprehension, and suggest the dynamic interplay of reader characteristics, comprehension activity, and interest development.

Keywords: Text comprehension; Intrinsic motivation and interest; Individual differences; Text genres

1. Introduction

Reading involves a complex interplay between reader and text characteristics (Rand Reading Study Group, 2000). Cognitive models of reading comprehension tend to focus on formal properties of reading, such as propositional knowledge representation, the nature of inferences in comprehending narrative versus expository texts, or the idea density and coherence (e.g., Graesser, Gernbacher, & Goldman, 1997; Graesser, Singer, & Trabasso, 1994).

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When individual differences are concerned, cognitive models tend to focus on information processing constraints, such as working memory capacity (e.g., Just & Carpenter, 1992). These models in general tend to be ignore active engagement on the part of the reader, which is typically addressed in the motivation literature. Reading research has witnessed a major shift in the last decade or so toward broadening the definition of reading and the related research agenda (Kamil, Mosenthal, Pearson, & Barr, 2000). The role of motivation in reading comprehension becomes one of the foci (Guthrie & Wigfield, 1999). This trend reflects changes inside the reading research community as well as in the larger context of educational reform. Goldman (1997) pointed out that the educational reform efforts "emphasize active knowledge construction by the learner" (p. 357). This emphasis coincides with emergent theories of text comprehension as involving a more active role of the reader (e.g., Kintsch, 1998) than previous theorists thought. The foregrounding of the role of motivation in reading comprehension becomes a corollary.

The present study was concerned with two reader characteristics, need for cognition and reader beliefs, which have distinct motivational underpinnings. Need for cognition (NFC) refers to "an individual's tendency to engage in and enjoy effortful cognitive endeavors" (Cacioppo, Petty, Feinstein, & Jarvis, 1996, p. 197). Reader beliefs are individual's implicit models of reading that directly related to one's motivation to read, and goals and strategies one adopts in reading (Schraw & Bruning, 1999). Our choice of the two variables was motivated by a growing body of evidence indicating the important roles they played in cognitive endeavors, including learning from text and comprehension (Cacioppo et al., 1996; Kardash & Howell, 2000; Schommer, 1993; Schommer, Crouse, & Rhodes, 1992). Besides their potential impact on comprehension, in keeping with a broader agenda of reading research to include not only learning and comprehension but also interest as desirable goals (Alexander, 2004), we were also concerned with how these characteristics interacted with the text in developing the reader's interest in what was being read. Therefore, the purpose of this study was to examine how individual differences in need for cognition and reader beliefs as two motivational forces influenced the comprehension of narrative and expository texts and the reader's interest.

1.1. Need for cognition and reader beliefs

1.1.1. Need for cognition

Need for Cognition belongs to the generic category of intrinsic motivation, but with a specific reference to cognitive efforts (and cognitively demanding tasks) as a source of enjoyment rather than deterrence, and individual differences in this regard (Cacioppo et al., 1996). Need for Cognition has been shown to affect people's cognitive engagement and processing in many ways. It was found, for example, that individuals high in NFC were inclined to obtain first-hand information, that is, they "seek, acquire, think about and reflect back on information to make sense of stimuli, relationships, and events in their world" (Cacioppo et al., 1996, p. 198). In contrast, individuals low in NFC were more likely to experience their world with second-hand information; that is, they "rely on others (e.g., celebrities and experts), cognitive heuristics, or social comparison processes" for opinions and decisions (Cacioppo et al., 1996, p. 198).

Need for cognition in the context of reading is expressed as a reader's tendency to engage in deep understanding of the text, build a well-integrated situation model, and enjoy the processes and outcomes of the cognitively demanding comprehension activity.

Deep cognitive engagement with the text facilitates activation of prior knowledge, elaborative processing, integrated mental representations, and causal inferences (Guthrie & Wigfield, 1999). Therefore, NFC should be positively correlated with reading comprehension. Kardash and Scholes (1996) reported that when reading a text with conflicting views, students with higher NFC were more likely to draw conclusions that reflected the inconclusive nature of the mixed evidence they read. Moreover, individuals high in NFC tended to use elaborative processing—"approaching or scrutinizing information from a deeper semantic-associative level of processing" (Kardash & Noel, 2000, p. 320). These findings suggested that individuals high in NFC should better comprehend a variety of kinds of texts, expository or narrative. Although NFC is positively related to intellectual functioning, Cacioppo et al. (1996) have provided evidence that NFC could be distinguished from intellectual ability, of which reading comprehension is often considered a component: there was a modest positive correlation between NFC and various measures of intelligence, ranging from .24 to .26 (p. 215).

1.1.2. Reader beliefs

While the construct of NFC reflects a general motivational disposition for, and enjoyment of, cognitive engagement, other motivational constructs of more contextual specificity have been proposed to explain individual differences in cognitive engagement and levels of comprehension. Reader beliefs (RB) are postulated as significantly influencing the way one approaches a text (Schraw & Bruning, 1999).

Schraw and Bruning (1999) defined reader beliefs as implicit models of reading. They assumed that (a) every reader would bring some implicit model to the task of reading, (b) one could bring multiple implicit models, and (c) implicit models are directly related to one's motivation to read, and goals and strategies one adopts in reading. They did initial research and found that implicit models of reading could be distinguished from other constructs such as self-efficacy, goals, and attributions. Theoretically, they traced the origins of the construct of implicit models of reading to two sources: reader response theory, and implicit theory of intelligence. From the former, they identified two main implicit beliefs, transaction beliefs (TA) and transmission beliefs (TM).

The transmission model (TM) views reading as a one-way, linear process whereby information is presented by the author and received by the reader (Schraw, 2000). Thus, learning from text is an objective process of knowledge transmission. Individuals holding transmission beliefs will expect the meaning of a text to be unambiguously conveyed. By contrast, the transaction model (TA) views reading comprehension as a more dynamic process wherein the reader actively organizes information and constructs new meaning based on personal experiences and purposes. The information flows in "a reciprocal network among the reader, text and the author" (Schraw, 2000, p. 96). Thus, reading is an active process of knowledge construction and transformation. Using Kintsch's (1998) model of reading comprehension, individuals high in TA will comprehend the text by constructing a situation model based on prior knowledge, personal understanding, interpretation and experiences. Schraw (1998) found that readers with high TA generated more thematic and critical responses, more thematic inferences, and more holistic interpretation than those with low TA. Furthermore, Schraw and Bruning (1996) found that propositional recall was correlated positively with TA but negatively with TM.

1.1.3. Differences and similarities of NFC and Reader Beliefs

The two constructs come from different theoretical and research traditions; yet they share a family resemblance that warrants theoretical and empirical scrutiny. Reader beliefs as implicit models work somewhat like cognitive scripts of reading (Kintsch, 1998), which lead to specific anticipations about reading experiences and motivate effort expenditure and strategy use based on these anticipations. Conceptually, NFC as a motivational disposition should be more congenial to TA than TM. Therefore, we expected a positive correlation between NFC and TA (but not TM).

In terms of theoretical predictions concerning text comprehension, the two constructs converge in many ways. Transaction beliefs are conceptually similar to NFC in its tendency toward active engagement and ownership of the task at hand; in other words, both should enhance intrinsic motivation and deployment of deep processing strategies. Consequently, both constructs afford theoretical predictions that people with high NFC or high TA (but not TM) should achieve higher levels of comprehension compared to those low in NFC or TA. Moreover, just as NFC inherently implies a more likelihood of developing an interest in what is being or has been read, particularly when the reading task is cognitively demanding, transaction beliefs are also seen as facilitating interest (Schraw & Bruning, 1999). A few empirical studies (e.g., Dai, 2002; Kardash & Scholes, 1996; Schraw, 2000) documented the unique contributions of need for cognition and reader beliefs to reading comprehension. However, there are few, if any, studies connecting NFC and reader beliefs to interest development.

1.2. Generality of effects of NFC and Reader Beliefs across text genres

Zwaan (1994) suggested that the reader mentally represent and process texts differentially, depending on the genre of the text involved and their related expectations and schemas. For example, expository passages are viewed as more difficult to process than narrative passages (see Zabrucky & Moore, 1999). Furthermore, expository texts are less cohesively organized by temporal and causal connections, thus demanding more explicit logical inference. Narrative texts, on the other hand, are typically more ambiguous and open to different interpretations than expository texts (Zwaan, 1994), thus inviting personal participation and meaning interpretations. A theoretical question is whether reader beliefs are sensitive to text genre.

One of the potential differences between NFC and Reader Beliefs is the generality of their motivational impact across different types of text. For example, Schraw and Bruning (1999) suggested that, in general, TA should be more conducive to comprehension than TM because of the deployment of deep processing strategies. Transaction beliefs, but not transmission beliefs, have been found to be associated with deeper processing and more integrated comprehension of narrative text (Dai, 2002; Schraw, 2000). However, Schraw (2000) also suggested that positive effects of reader beliefs may vary depending on text genre. His research indicated that TA better facilitated meaning construction than TM in narrative texts, because the comprehension of narrative texts is presumably enhanced by the vivid mental representation of what the text conveys, and by affective engagement and incorporation of personal experiences. However, he pointed out that the conclusion could not be generalized to expository texts, because readers of expository texts normally follow the information provided by the text.

In contrast, a bulk of research evidence reviewed by Cacioppo et al. (1996) indicated that the impact of NFC on reading comprehension cuts across text genres. In a narrative model, individuals with high NFC were found to be better at capturing the metaphorical meaning of a story (Dai, 2002). In an expository or analytic mode, they recalled more message arguments and extract more information from the passage (Cacioppo, Petty, & Morris, 1983), and were more likely to detect inconsistency and engage in issue-relevant thinking (Cacioppo et al., 1996), make deliberate judgments based on merits of arguments on controversial issues (Kardash & Scholes, 1996), and engage in information search with greater breath and depth (Lewin, Huneke, & Jasper, 2000). Therefore, it can be concluded that NFC as a motivational disposition does not discriminate text genres, as long as they provide intellectual challenges, novelties, and complexities.

While pervasiveness of the effects of NFC regarding text genres seems to be well established, whether the effects of TA and TM on reading comprehension carry across different text genres remains an empirical question. Theoretically speaking, Kintsch's (1998) construction–integration model, which stresses reading as a process of active construction, should in principle apply to both narrative and expository text comprehension. To the extent that expository text also entails an active interpretative role on the part of the reader, TA could be facilitative of comprehension, just as TM could be detrimental. It is important to compare the effects of reader beliefs on both narrative and expository texts.

1.3. Comprehension and interest

Interest is important for educational research and practice because students' interest has a positive motivational impact and leads to positive learning outcomes (Hidi, 1990; Tobias, 1994). Interest can take two forms, situational interest and individual interest (Alexander, Kulikowich, & Schulze, 1994; Hidi, Renninger, & Krapp, 2004). Situational interest, elicited by arousal aspects of situation, is more transient; while individual interest is relatively enduring, deep-seated involvement in different topics, tasks, or contexts. Developmentally, one may develop situational interest first and gradually it becomes individual interest, reflecting deeper understanding of a topic or a domain in question (Alexander, 2004; Hidi et al., 2004).

Although both constructs of NFC and TA afford theoretical predictions that NFC and TA should have positive effects on comprehension and interest, there is a relative lack of research using interest as an outcome variable compared to that using interest as a predictor variable. Researchers have documented cognitive causes of interest (Alexander et al., 1994; Tobias, 1994). For example, Alexander et al. (1994) reported that prior knowledge predicted interest: the more proficient knowledge the students had, the stronger the correlation between knowledge and interest. As students achieved more comprehension in an area, with deeper and more extensive knowledge, their topic interest was also expected to increase. In short, better comprehension and command of knowledge lead to higher interest (see Tobias, 1994).

Similarly, Iran-Nejad (1987) documented the cognitive and affective causes of interest, emphasizing the role of comprehension in the creation of interest. Iran-Nejad suggested that post-reading interest depend on the processes of incongruity resolution, for example, the coherence of the conclusion information with (or without) a resolved ending. To be specific, the incongruity-unresolved endings included outcome information, but not answers to explain the outcome, which restrained reader's comprehension. It was found

that readers showed higher levels of post-reading interest to resolved endings than unresolved endings, which were critical to their reading comprehension. In short, the finding indicates positive effects of comprehension on post-reading interest.

Sadoki, Goetz, and Rodrinuez (2000) instructed college students to read passages of varying genres, topics and lengths, and constructed a path model to investigate the causal relationships of topic familiarity, text concreteness, comprehensibility and interest. Participants rated the comprehensibility and interest on 7-point Likert scale, comprehensibility 1 (very hard for me to understand) to 7 (very easy for me to understand), and interest 1 (not interesting to me) to 7 (very interesting to me). They reported a direct path from self-perceived comprehensibility to interest.

In summary, both experimental and correlation studies support the notion that comprehension may exert a positive influence on interest; therefore, comprehension and interest may have a reciprocal relationship. The present study was interested in how NFC and TA may also positively mediated the development of interest in the passage being read, and how comprehension levels may further contribute to post-reading interest besides NFC and TA by partially mediating their effects.

Based on the literature review, the following research questions were formulated for the study:

(1) Do Need for Cognition (NFC) and Reader Beliefs, namely, Transaction (TA) and Transmission (TM) Beliefs, make independent contributions to text comprehension?
(2) Do the effects of NFC, TA and TM on text comprehension cut across narrative and expository texts?
(3) Do NFC and TA have effects on interest as measured after the reading tasks? Do resultant comprehension levels partially mediate the effects of NFC and reader beliefs on post-performance interest?

2. Method

2.1. Participants

The 243 participants in the study were recruited from a large public university, located in the Northeast United States., The participants were informed of the purpose of the study and their rights as participants, and were recruited on the voluntary basis. One hundred and forty-nine (63%) of the participants were female, while 88 (37%) were male. Participants ranged in age from 18 to 57 years ($M = 21.6$, $SD = 4.69$, median age = 20 years). The majority of the participants were undergraduate student, with 64% identified as freshmen and sophomores. Specifically, the sample comprised 74 freshmen (24%), 78 sophomores (26%), 55 juniors (18%), 20 seniors (7%), and 5 graduate students (2%). Of all participants, 79% (191 participants) majored in humanities, and 12% (47 participants) in sciences. In regard to ethnicity, 78% of the participants were Caucasian, 10% African American and 7% Hispanic. Because of the missing data, the actual sample size for statistical analyses was 233.

2.2. Instruments

Need for cognition was measured by the *Need for Cognition Scale*, developed by Cacioppo and Petty (1982). The 18-item NFC scale measures individuals' responses to various

situations that require cognitive efforts, with responses anchored on a 9-point Likert scale from −4 (very strong disagreement) to +4 (very strong agreement). A sample item reads "I would rather do something that requires little thought than something that is sure to challenge my thinking abilities." (negatively keyed). Cacioppo and Petty (1982) conducted four studies to develop and empirically validate the NFC scale, and reported adequate reliability, as well as predictive validity of the scale. For the sample of the present study, the measure yielded an alpha reliability of .89.

Transaction (TA) and transmission (TM) beliefs were measured using the *Reader Belief Inventory* (RBI), developed by Schraw and Bruning (1996). The RBI includes 16 statements, eight items each on the transmission and transaction beliefs. A sample item of Transmission Beliefs reads "Good readers remember most of what they read verbatim." A sample item of Transaction Beliefs reads "I enjoy interpreting what I read in a personal way." Participants are instructed to describe themselves with these beliefs on a 5-point scale, from "strongly disagree" (1) to "strongly agree" (5). In subsequent studies, Schraw (2000) used 12 of the 16 items that showed a better fit in terms of factor structure. The RBI has been empirically validated for factor structures and item-to-factor loadings, and documented to have acceptable validity and reliability (Schraw & Bruning, 1999). We conducted a factor analysis on the 12 items used by Schraw (2000), imposing a two-factor structure on data rather than using eigenvalues to determine number of factors, and varimax totation to make the two factors orthogonal. The two-factor solution yielded a factor structure with items falling to where they conceptually belonged, with no cross-loadings. Factor 1 (TA) seemed to have a better fit, with loadings ranging from .77 to .53, accounting for 24% of the variance; for Factor 2 (TM) loading ranges from .74 to .39, accounting for 18 percent of the variance. The Cronbach's alpha coefficients obtained from the current data set were slightly lower than those reported by Schraw and Bruning (1999), .77 for the transaction scale, and .68 for the transmission scale.

The reading material consists of three passages: one narrative and two expository texts (geology and biology). We included a sample of narrative text used by Schraw (e.g., Schraw, 2000) for replication purposes. We set up three criteria for selecting expository texts: (a) reasonably challenging (moderate to high difficulty levels), (b) comparable lengths to facilitate comparison and for practicality (all can be done in one sitting), and (c) carrying scientific topics. We were only able to use two shorter expository texts, as we were not able to locate an expository text of comparable length. The narrative text was an 870-word story entitled *Book of Sand* (cited and used in Schraw, 2000). This story was selected because it affords multiple interpretations beyond its surface meaning, thus taking some active engagement on the part of the reader to yield coherent meaning at a deep, symbolic level (see Schraw, 2000). A total of 21 multiple-choice questions (Schraw, 2000) were included as a measure of comprehension for this narrative text. The coefficient alpha based on the current data were .75. The two expository passages, both dealing with abstract topics and using objective and neutral tone, were selected from GRE sample tests. They were passages that provided facts and theories about specific scientific topics: one (525 words) on geological plate movement (8 items, alpha coefficient = .58), and the other (769 words) on biological evolution (7 items, alpha coefficient = .65). The 15 multiple-choice questions for the above geology and biology texts were combined to form a composite score for *expository* text comprehension. The alpha coefficient of the aggregate comprehension scores was .80. Since there were three passages, instead of counterbalancing, we used a slightly different procedure, mixing expository and narrative texts (in the order of

expository, narrative, and expository) to achieve a similar goal of diluting any possible order effect.

Post-performance interest was measured using the instruction "Please rate the interesting levels of the three passages," followed by an interest rating for each of the three texts on a 10-point Likert scale, from "extremely interesting" (10) to "not interesting at all" (1).

2.3. Procedures and data analysis

Subjects were tested in groups. Each subject received the same booklet containing the instructions, the instruments of the *Reader Belief Inventory* and the *Need for Cognition Inventory*, the three reading passages presented in the invariable order of the geology passage, the narrative passage and the biology passage, and the three interest-level scales respectively for each passage. The instructions asked participants to (1) assess themselves on the scale of the reader belief and the need for cognition, (2) read the three passages carefully for comprehension and then answer questions, and lastly (3) rate their interest level for each piece upon completing reading and answering questions.

Prior to the administration of the protocol, participants were instructed to read the passages at their own pace without time limits. In an effort to ensure consistency, the same site and the same protocol administrator were used for protocol administration. Hierarchical regression analyses were used as a main method to tease apart independent contributions of NFC and TA or TM to comprehension, and whether the effects cut across text genres. A set of regression analyses was performed to test the mediational model of direct and indirect (via comprehension) effects of NFC and TA or TM on post-performance topic interest.

3. Results

Means, standard deviations, and zero-order correlations of relevant measures are presented in Table 1. Mean differences between Transaction Beliefs (TA) and Transmission Beliefs (TM) indicated that participants on average rated higher on TA ($M = 3.94$, $SD = .66$) than TM ($M = 2.44$, $SD = .52$). The NFC ratings were also a little skewed in the positive direction. Post-performance topic interest ratings indicated that topic interest was the highest for the narrative text *Book of Sand* ($M = 7.94$, $SD = 2.00$), followed by the biology passage ($M = 5.40$, $SD = 2.42$), with the geology passage receiving the lowest rating ($M = 3.94$, $SD = 2.49$). Most correlations were consistent with theoretical predictions, but effects sizes were stronger than expected. The consistent negative correlations between TM and the three comprehension measures suggested that transmission beliefs were not neutral with respect to comprehension and the effects cut across text genres.

A preliminary analysis of correlation patterns among NFC, TA and TM indicates that NFC had a moderate positive correlation with TA ($r = .42$, $p. < .01$) and a negative correlation with TM ($r = -.26$, $p. < .01$). Moreover, NFC's positive correlation with TA held ($r = .39$, $p < .01$) after controlling for TM; and its negative correlation with TM also held ($r = -.25$, $p < .01$) after controlling for TA. Thus, NFC was significant correlated with both TA and TM, though individual differences in NFC may increase the probability for one to adopt TA and decrease the probability to endorse TM. Consistent with the earlier research (Dai, 2002; Schraw, 2000), the correlation between TA and TM were not statistically significant ($r = -.16$, $p > .10$). The first research question was addressed.

Table 1
Means, standard deviations, and zero-order correlations of need for cognition (NFC), Transaction (TA) and Transmission (EM) Beliefs, comprehension of three texts and respective topic interest ($N = 233$)

	1	2	3	4	5	6	7	8	9	10
1. NFC	**.89**									
2. TA	.42**	**.77**								
3. TM	−.26**	−.16	**.68**							
4. Narr-Comp	.49**	.49**	−.33**	**.75**						
5. Geo-Comp	.47**	.53**	−.38**	.43**	**.58**					
6. Bio-Comp	.58**	.32**	−.25**	.58**	.48**	**.65**				
7. Exp-Comp	.58**	.43**	−.46**	.74**	.93**	.93**	**.80**			
8. Narr-Interest	.33**	.58**	−.01	.57**	.33**	.35**	.45**			
9. Geo-Interest	.12	.18**	−.03	.43**	.23**	.25**	.25**	.19**		
10. Bio-Interest	.39**	.57**	−.11	.58**	.48**	.47**	.49**	.58**	.55**	
Mean	1.17	3.94	2.44	13.01	4.22	4.01	8.0	7.94	3.94	5.40
SD	1.17	.66	.52	4.42	1.94	1.90	3.68	2.00	2.49	2.42

Note: On the diagonal line are reliability coefficients. NFC, need for cognition (score range: −4 to +4); TA, transaction beliefs; TM, transmission beliefs (on a 5-point Likert scale); Narr-Comp, comprehension of the Book of Sand (21 items); Geo-Comp, comprehension of the geology passage (8 items); Bio-Comp, comprehension of the biology passage (7 items); Narr-Interest, topic interest in Book of Sand; Geo-Interest, topic interest in the geology passage; Bio-Interest, topic interest in the biology passage (all topic interest ratings are on a 10-point scale, from "not interesting at all" to "extremely interesting."

** $p < .01$.

A hierarchical regression analysis was conducted to address the first and second research questions as to whether NFC and TA or TM made independent contributions to the variance in text comprehension and whether effects tend to cur across the text genres. The overall results are supportive of the theoretical conjectures (see Table 2).

To address the second research question of whether the effects of NFC, and TA or TM on text comprehension cut across the text genres, hierarchical regression analyses were carried out, with NFC as a predictor entered in the first block and TA and TM in the second. For this analysis, a composite score of expository text comprehension that combined both biology and geology scores was used, in comparison with comprehension of the narrative text *Book of Sand*. Hierarchical regression analyses were run separately with each text genre.

Table 2
Hierarchical multiple regression analyses of effects of need for cognition (NFC), and transaction (TA) and transmission (TM) beliefs on comprehension of narrative and expository texts, respectively ($N = 233$)

	β (step 1)	R^2	β (step 2)	R^2	R^2 change
NFC	.49**	.24	.29**		
TA			.37**		
TM DV = Narrative			−.20**	.40	.16**
NFC	.58**	.34	.42**		
TA			.27**		
TM DV = Expository (composite score)			−.19**	.44	.10**

Note: NFC, need for cognition; TA, Transaction Beliefs; TM, Transmission Beliefs; DV, dependent variable.

* $p < .05$.

** $p < .01$.

As shown in Table 2, for the narrative text, NFC accounted for 24% of the variance in comprehension. TA and TM, when entered into the equation, accounted for an additional 16 percent of the variance. For the expository text comprehension, NFC accounted for 34% of the variance in comprehension. TA and TM combined accounted for an additional 10% of the variance. Need for Cognition had positive effects on both narrative ($\beta = .29$, $p < .01$) and expository ($\beta = .42$, $p < .01$) comprehension when TA and TM were statistically controlled. Likewise, TA had positive effects on both narrative ($\beta = .37$, $p < .01$) and expository ($\beta = .27$, $p < .01$) comprehension, while TM had negative effects on both narrative ($\beta = -.20$, $p < .01$) and expository ($\beta = -.19$, $p < .01$) comprehension, when the other two variables were statistically controlled. Taken together, the results suggested strong effects of both NFC and reader beliefs (TA and TM) on comprehension across genres. Also, effects of NFC and TA were consistently positive, and effects of TM were consistently negative across the text genres.

To address the third research question of whether comprehension mediates the effects of NFC and TA or TM on respective topic interests, we decided to adopt a classical approach of using a set of multiple regression analyses (Baron & Kenny, 1986). Both regression analyses and structural equation modeling (SEM) can be used to model mediation. However, SEM is typically run under more stringent assumptions, and the regression method seems more versatile in dealing with different circumstances (e.g., Hoyle & Kenny, 1999), and thus has become the most commonly used statistical approach (MacKinnon, 2000; see also Frazier, Tix, & Barron, 2004; Holmbeck, 1997 for discussion). Fig. 1 presents a diagram of a mediation model.

In order to establish mediation among a set of variables, several conditions need to be satisfied. The first consideration is whether three relations can be established: the predictor–outcome relation (Path C), the mediator–outcome relation (Path B), and the predictor–mediator relation (Path A). We examined the correlation patterns and found that, when TM and topic interests are concerned, the predictor–outcome correlation is virtually non-existent. This was consistent with the theoretical underpinnings of transmission beliefs versus transaction beliefs: When interest is concerned, whether one holds transaction beliefs is more relevant than whether one holds transmission beliefs. Therefore, for both theoretical and empirical reasons, TM was excluded from the mediational analyses. Another issue concerns whether to combine two expository texts to form a composite measure of comprehension of expository text and corresponding interest, or to keep the two texts separate in the mediation analysis. As our focus was on comparison of narrative and expository texts, we decided to use composite scores, with a caveat that such an analysis might obscure the differences between the contents and processes of two expository texts. We decided to focus on NFC and TA as two predictors, and comprehensions of narrative and expository texts, respectively, as partially mediating respective interests. Therefore, two expository comprehension scores and two interest scores were combined to form composite measures of expository comprehension and interest in expository texts.

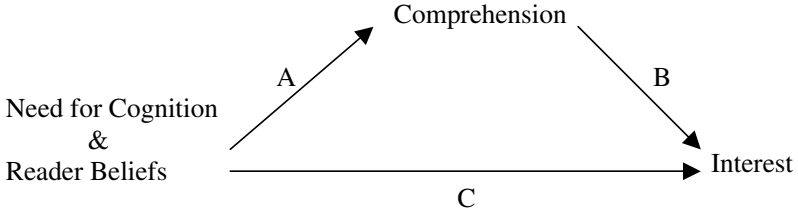

Fig. 1. A mediational model of effects of cognitive motivation (Need for Cognition), reader beliefs, and levels of comprehension on interest.

In addition, temporal ordering of predictors, mediators, and outcomes should also be established in order to infer causality (Frazier et al., 2004). We assumed that NFC and TA are relatively stable individual differences that theoretically lead to higher interest levels; that is, those with high NFC or transaction beliefs were hypothesized to be more likely to develop interest in specific passages (Path C). In this sense, both can be seen as measures of the reader's tendency to develop an interest in what is being read. Comprehension in this mediational analysis can be seen as product as well as process (which, of course, can only be inferred from the product). Comprehension was shown in the previous analysis to be influenced by NFC and TA, and thus Path B can be easily established. The temporal ordering of comprehension and topic interest was established by measuring topic interest after responding to the related multiple-choice questions as a reaction to the passage the respondent had just read.

Theoretical and empirical justifications for using interest as an outcome instead of predictor or mediator variable was based on grounds that interest could be an outcome variable as well as predictor or mediator variable. In this study, focus was on interest as an outcome variable for reasons stated in the literature review. Although the determination of the causality or the direction of causality cannot be made, given the correlational nature of the data and the absence of measures of interest prior to or during reading, the procedure used to measure interest *after* rather than *before* reading was theoretically justified, and the prediction about the influence of comprehension on interest is empirically defensible (e.g., Iran-Nejad, 1987). Granted that, empirically, part of variations in the measures of post-performance interest might well have been formed *during* rather than *after* reading, which may have affected text comprehension processes and outcomes, thus confounding the interpretation of effects of comprehension on the measure of interest as causal. This concern, however, was somewhat alleviated when the effects on interest of NFC and TA, both of which are theoretically tied to intrinsic motivation to read and an interest in what is being read, were statistically controlled when the mediational effects of comprehension on post-performance interest were assessed.

Based on Baron and Kenny (1986; see also Frazier, 2004), three regression analyses were run: first, Interest was regressed on NFC and TA to establish predictor–outcome relations (Path C), so that there was an effect to be mediated. Second, Comprehension of the narrative (or expository) text was regressed on NFC and TA to establish predictor–mediator relations (Path A). Finally, Comprehension was entered as a predictor to see whether predictor-outcome relations between NFC and TA on the one hand, and topic interest on the other, were significant reduced; that is, entering Path B significantly reduced the effect size of Path C. Theoretically, if the predictor–outcome relation is reduced to zero, mediation is the strongest. If there is a residue significant relation, then partial mediation is likely. Results of mediational analyses are presented in Table 3.

As shown in Table 3, when comprehension was entered into the equation in Step 3, the significant effect of NFC on topic interest in Step 1 was reduced to statistical non-significance, while effects of TA in Step 1 were only slightly reduced. This pattern held across both the narrative and expository texts, suggesting a stronger mediation from NFC via Comprehension to Topic Interest than from TA via Comprehension to Topic Interest.

To test the significance of mediation, a product of Paths A and B was calculated as the mediated effect, divided by a standard error term based on a formula (the square root of $b^2sa^2 + a^2sb^2 + sa^2sb^2$), yielding a z score of the mediated effect (Baron & Kenny, 1986; Frazier et al., 2004). To facilitate this test, NFC and TA were linearly combined in order to

Table 3
Mediational analyses using need for cognition (NFC) and Transaction Beliefs (TA) as predictors, comprehension as a mediator, and topic interest as an outcome variable

	Step 1 (Path C)	Step 2 (Path A)	Step 3 (Paths B and C)
IV\DV	Topic Interest	Comprehension	Topic Interest
Narrative Text			
NCF	.12* (.22/.11)	.33** (1.26/.22)	.01 (.01/.10)
TA	.53* (1.62/.18)	.38** (2.57/.39)	.39** (1.18/.18)
Comprehension			.25** (.17/.03)
Biology Expo			
NCF	.20** (.43/.13)	.46** (1.41/.17)	.07 (.16/.14)
TA	.49** (1.80/.22)	.28** (1.48/.30)	.41** (1.51/.22)
Comprehension			.28** (.19/.05)

Note: Refer to Fig. 1 for Paths A, B, and C. IV, independent variable; DV, dependent variable; both standardized regression coefficients and unstandardized regression coefficient/standard error (in parentheses) are presented.
* $p < .05$.
** $p < .01$.

generate a single Path A coefficient. The z score of the mediated effect for the narrative text was 3.51 ($p < .01$), and the z score of the mediated effect for the expository text was 3.48 ($p. < .01$). Thus, mediated effects via Comprehension were statistically significant on topic interest in both narrative and expository texts.

4. Discussion

One major shift in reading research in the past decade has been a close examination of what the reader brings to reading situations, and how reader characteristics interact with text features to engender varied but tractable reading processes and outcomes (Kamil et al., 2000; Rand Reading Study Group, 2000). This study brought together two lines of research on reading as a motivated act, wherein the reader's disposition and implicit beliefs are theorized to play an important role in both processes (goals and strategies deployed) and outcomes (i.e., comprehension and interest). The results in general support these theoretical propositions and conjectures. Transaction beliefs as implicit or explicit mental model of reading may have prompted the reader to incorporate personal experiences and world knowledge while deciphering a story (e.g., associating the *Book of Sand* with Satan's seduction and plot) or making sense of a theory (e.g., mutation of genes). High need for cognition, on the other hand, is likely to facilitate cognitive engagement, enhance the need for comprehension, and make the reading tasks enjoyable and what is being read interesting.

One of the goals of the present study was to examine the additive predictive effects of need for cognition and reader beliefs on comprehension and interest. The results show that they accounted for unique variance in reading comprehension and topic interest. On the other hand, the results also support the claim of theoretical convergence of the two constructs in that there were empirical connections between the two constructs, with need for cognition positively associated with transaction beliefs and negatively with transmission beliefs. One explanation is that the two constructs represent two interrelated psychological realities: individuals with high NFC tend to be more cognitively and affectively involved,

and thus are more likely to espouse transactional belief as an implicit model of reading; conversely, individuals with low NFC more likely to endorse transmission beliefs. From this point of view, need for cognition is likely an antecedent of reader beliefs, as it is considered a more general, pervasive disposition than reader beliefs which are specific to reading, although the correlational nature of the data does not warrant any conclusion on the relationship. This explanation stresses realism in that it implies that both need for cognition and reader beliefs are *real* psychological entities. Alternatively, one could argue that the correlations between NFC and TA or TM represent slightly different ways of carving the mind, with these two constructs sharing *conceptual space*; that is, they are conceptually overlapped, hence the empirical correlations. This is a more instrumentalist explanation, as it emphasizes the role of differing theoretical lenses in creating slightly different interpretations and explanations of the same processes and outcomes. Either way, the fact that these constructs made independent contributions to the variance in text comprehension suggests the viability and utility of differentiating them as separate constructs, with differing theoretical underpinnings.

A significance contribution of the present study was the finding that need for cognition and transaction and transmission beliefs have equally strong predictive efficacy with regard to comprehension of both narrative and expository texts. It extends Schraw's (2000) research and demonstrates the generality of the effects of reader beliefs on text comprehension across different text genres. The ubiquity of effects of reader beliefs on comprehension may be understood by re-examining similarities as well as differences in processing narrative and expository texts. According to Kintsch (1998), for example, the processing of expository text also requires integrating discrete elements from a textbase and building a situation model. Thus, going beyond the information given is a prerequisite not only for reading between lines in a narrative text, but also for building logical chains of arguments and detecting coherence or incoherence of the flow of ideas in an expository text. Need for cognition and transaction beliefs seem to converge at this point as significant forces that impact efforts of meaning making, regardless of text genre.

The consistent positive effects of need for cognition and transaction beliefs and negative effects of transmission beliefs on comprehension also force us to reexamine whether transmission beliefs are innocuous, sometimes even beneficial, as suggested by Schraw (2000). Although the nature of the negative correlations warrants further inquiry, we suspect that transactional and transmission beliefs may reflect different levels of cognitive sophistication that is more domain general rather than domain specific, that is, having less to do with specific types or genres of reading and more to do with cognitive complexity implied in transaction versus transmission models. Finally, the finding that effects of need for cognition and transaction beliefs on post-performance interest were at least partially mediated by comprehension is theoretically important, as it suggested a dynamic relationship between reader characteristics, comprehension activity and outcomes, and interest development. Given the correlational nature of the data, the results regarding comprehension and interest are subject to two alternative interpretations. The first interpretation is that the comprehension indeed partially mediated interest, the reason being that interest engendered prior to or during the reading task was likely partialled out when the effects of need for cognition and transaction beliefs on interest were statistically controlled. An alternative, competing interpretation is that since no pre-reading interest was measured, the measure of post-performance interest had a problematic status and potentially mediated comprehension processes and outcomes; therefore, the relationship found between

comprehension and interest should be seen as reciprocal or bi-directional. We consider both interpretations valid and plausible. At any rate, the results lend credence to the claims that interests purely based on surface features are different from those based on deeper levels of understanding (Alexander, 2004), and that having a deep grasp of the meaning of a text or object itself tends to make the text or object more interesting, as Bruner (1960) suggested decades ago.

There were several limitations in the present study that are worth discussing. First, we did not include a pre-reading or on-line measure of interest; the absence of this measure weakens the interpretation of post-performance measure of interest as an outcome variable. It is well established in the literature that interest facilitates comprehension through multiple mechanisms, such as attention and strategy use (Hidi, 1990). Therefore, a stronger design that manipulates or controls for pre-reading or on-line interest would permit stronger, more unequivocal inferences about whether comprehension indeed mediates the effects of need for cognition and transaction beliefs on interest, or whether the relationship shows a dynamic, reciprocal relationship between comprehension activity and interest development.

Second, the reading tasks only involve three passages; thus the sampling of narrative and expository texts in the study was limited. The text characteristics could potentially influence the outcomes and bias interpretations, thus weakening our generalizations about the genre effects. For example, the biology text involves a potentially emotionally charged topic, evolution, compared with the geology text, which is presumably more neutral in that regard. The difference between the mean interest levels for the two passages indicates a potential between-text effect that was not picked up by the design of this study. Future research needs to consider sampling issue when designing similar studies.

Third, some of the measures used in this study, such as transmission beliefs and two expository texts, had relatively low reliabilities, which affected the range of analyses we could run and potentially the outcomes. Although the many statistically significant results seem to indicate the benign nature of this potential measurement problem, enhancing the technical quality of instruments in future research of the kind is warranted.

Finally, the present study's focus was on products, cognitively (comprehension levels) and affectively (interest). It inferred rather than directly assessed processes (cognitive engagement, goals and strategies, etc.) that are presumed to mediate the effects of need for cognition and reader beliefs. Without evidence showing these mediational processes, theoretical explanations based on outcome measures remain tentative and inconclusive. This is a missing link in the present study that future research should attempt to build.

This study as an attempt to incorporate motivation in understanding reading comprehension also raised new questions. Since reader beliefs is a relatively new construct in reading research, the findings of the current study beg the question of where they come from, and how stable they are. Schraw and Bruning (1999) suggested that one of the sources of reader beliefs be instruction. Thus, we might extrapolate, based on Scheonfeld's (1988) research on mathematics instruction, that, just as mathematics teaching can inadvertently convey implicit messages about what mathematics is about (e.g., "math is little more than computation routines"), reading instruction may also convey, often inadvertently, implicit message about what reading is about, which leads to student's implicit models of reading. If reading instruction indeed has such an impact, then findings of the present study suggest there are individual differences, such as need for cognition, that may determine how

susceptible a reader will be to the implicit message conveyed by instruction. Empirically, however, we know virtually nothing about this issue.

At a more technical level, incorporating individual differences or reader characteristics also face new challenges of finding productive ways of examining these differences and their effects. In the present study as well as Schraw and Bruning's (1996; 1999; Schraw, 2000) studies, a *dimensional* approach was used to study transaction and transmission beliefs, assuming these beliefs may co-exist in different degrees. Alternatively, a typological approach is also conceivable, assuming that there are homogeneous subgroups who can be identified as strong in *transaction belief* (high, low), strong in *transmission belief* (low, high), *complex* (high, high), or *aschematic* (low, low; the term was borrowed from the gender schema research; Markus, Crane, Bernstein, & Siladi, 1982). Dimensional versus typological approaches parallel those in goal orientation research (e.g., Meece & Holt, 1993). By further exploring these methodological issues we can advance the cause of developing a more comprehensive, integrated understanding and model of reading comprehension.

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