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Revved up or turned off? How domain knowledge changes the relationship between perceived task complexity and task interest☆

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ABSTRACT

This correlational study examined the relationship between perceived task complexity and task interest for individuals with varying levels of domain knowledge and/or individual interest. Forty-five college student participants (46% women) reported their knowledge and individual interest in biology before learning about the biology of fungus. Following the task, participants rated the complexity and their understanding of the material. Participants took a quiz on the material and reported their interest in fungus and willingness to return for another session. A significant Biology Knowledge×Perceived Complexity interaction emerged on task interest and willingness to return for another session, *ps*<.05. Perceived complexity predicted positive task outcomes for high-domain-knowledge individuals but negative task outcomes for low-domain-knowledge individuals, suggesting that domain knowledge and individual interest can help explain individuals' diverse responses to learning activities.

1. Introduction

Imagine two students beginning a detailed lesson on sea turtles. One student values the complexity in the lesson and digs into the material whereas the other student is overwhelmed and reluctantly begins. As this example suggests, some students are revved up and others are turned off by complex material. We set out to examine these divergent reactions, testing whether they relate to differences in students' domain individual interest and knowledge.

A consistent positive correlation emerges between individual interest and domain knowledge (Alexander, Kulikowich, & Jetton, 1994; Benton, Corkill, Sharp, Dowrey, & Khramtsova, 1995; Bergin, 1999; Gottfried, 1985, 1990; Hidi, 1990; Kintsch, 1980; Murphy & Alexander, 2002; Rathunde, 1993; Tobias, 1994); however, the direction of causality is less clear. Research suggests that individual interest can fuel knowledge acquisition (Hidi & Renninger, 2006; Kintsch, 1980; Krapp, 2002; Rathunde, 1993; Renninger, 2000; Rheinberg, Vollmeyer, & Rollett, 2000; Schiefele, 2001), and also that prior knowledge can fuel individual interest (Alexander, 1997; Hidi & Renninger, 2006; Kintsch, 1980; Renninger, 2000). Domain knowledge can promote individual interest because knowledge allows learners to work with difficult material, readily absorb new information, and generate curiosity questions (Hidi & Renninger, 2006).

1.1. Task complexity

Task complexity is likely to play a role in how and when prior knowledge will contribute to task interest. Theorists have argued that perceived complexity is critical to judging a given stimulus as interesting (Silvia, 2001). In this vein, more complex stimuli have been evaluated as more interesting than less complex stimuli (Berlyne, 1963, 1971; Silvia, 2001). However, the tasks used in prior research linking complexity and interest have been relatively simple perceptual tasks leaving unclear how the complexity-interest link generalizes to conceptual tasks. In one sense, complex material affords greater opportunities for learning; thus it could facilitate interest development more than simple learning material (Schraw, 1997). However, greater complexity may instead make comprehension difficult and lead to task disengagement (Deci & Ryan, 1985; Schraw, Bruning, & Svoboda, 1995; White, 1959; Wigfield & Eccles, 1992). Consistent with this, individuals report higher task interest when approaching moderately challenging tasks than tasks that provide either too little or too much challenge (Csikszentmihalyi & Nakamura, 1989; Silvia, 2005). Thus, complex material might fuel task interest because it has greater potential for knowledge acquisition, but it might undermine task interest because it can overwhelm learners and cause them to disengage.

Domain knowledge may be critical for determining how perceived complexity relates to task interest within a learning context. We reasoned that perceived task complexity would positively predict task interest among individuals with high domain individual interest and knowledge. Such learners are motivated to acquire knowledge and have an existing framework into which they can incorporate new information (e.g., Arbuckle, Vanderleck, Harsany, & Lapidus, 1990; Bransford &

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Johnson, 1972; Pearson, Hansen, & Gordon, 1979; Shapiro, 2004; Willoughby, Waller, Wood, & Mackinnon, 1993). Therefore, the extent to which these individuals would find the material interesting would be positively related to the perceived complexity of the material.

In contrast, greater complexity is likely to have the opposite effect on task interest among people with low domain knowledge regardless of individual interest in the domain. Being less prepared for a high level of complexity, these individuals might withdraw from complex tasks (Bandura, 1986; Deci & Ryan, 1985; Reeve, 1989; Silvia, 2003; White, 1959; Wigfield & Eccles, 1992). Even if they have high individual interest, individuals who have low domain knowledge might not find the material as interesting if they perceive it to be highly complex.

1.2. Hypotheses for the current study

This study had two purposes. First, we explored the hypothesized positive relationship between domain individual interest and knowledge. Second, we tested how domain individual interest and knowledge predicted interest in and performance on a domain-related learning task. We hypothesized that domain knowledge and individual interest would moderate the effects of perceived complexity on task interest. Specifically, we expected that perceived complexity would positively predict task interest among individuals with high domain knowledge and individual interest. However, we predicted a negative relationship between perceived complexity and task interest among individuals with low domain knowledge and/or low domain interest. Finally, we tested these relationships while controlling for perceived understanding of the material, given that feelings of competence are consistently positively related to task interest (e.g., Bandura, 1986; Deci & Ryan, 1985; White, 1959; Wigfield & Eccles, 1992).

2. Method

2.1. Participants

Participants in this study were undergraduate students from a large Midwestern university who participated in exchange for course credit. Three participants were excluded because they did not follow directions, leaving 45 participants (53% men), who were European-American (51%), African American (22%), Asian-American (4%), Native-American (2%), Hispanic (4%), and from an unlisted ethnic category (16%).

2.2. Materials

The learning program consisted of 35 slides containing information about fungal structure, classification, and growth. All slides appeared in black and white and contained a limited number of diagrams. The learning program and all measures were administered to participants on a laptop computer via MediaLab (Jarvis, 2004). Participants rated self-report items from 1 (*strongly disagree*) to 7 (*strongly agree*) unless otherwise noted.

2.3. Measures

2.3.1. Biology individual interest (BI) and knowledge (BK)

The measure of BI had three items (alpha = .84, e.g., "I find biology interesting."). Seven multiple-choice items assessed participants' BK (alpha = .60). Items included topics such as lung structures, meiosis, RNA translation, cells, and immune system functioning. Thirteen items were administered and six items were removed to increase reliability. The omitted items appeared to be idiosyncratic.

2.3.2. Perceived understanding and perceived complexity

Two items assessed perceived understanding of the program (e.g., "I understood the material in the program," alpha = .62). Two items were developed to assess perceived complexity ("The material in the program was complex." and "The program was basic."). Because the items did not correlate highly with each other, only the first item was used.

2.3.3. Fungus program quiz

Task performance was measured with a multiple-choice quiz about material in the program (e.g. "In lower fungi, septae __"), each with five response options. Four items were removed from the original 10-item quiz to maximize the scale's reliability (alpha for seven items = .73). Three of the omitted items were likely to have reduced reliability because they had little variability (most participants answered them correctly).

2.3.4. Interest in fungi

Four items assessed task interest (alpha = .84, e.g., "I think fungi are interesting."). One item was removed to obtain higher scale reliability. Participants' behavioral intention to re-engage with the material was measured with a single item: "If we conduct a follow-up study that provides further information about fungi, would you be interested in taking part?" Participants responded either "yes" or "no."

2.4. Procedure

BI and BK were assessed at the beginning of the session. Participants then completed the learning program and rated their perceived complexity and understanding of the program. Next, participants took the fungus program quiz, and reported their interest in fungi (task interest) and willingness to return for another session.

3. Results

Table 1 contains bivariate correlations among all variables. Not surprisingly, BK was positively correlated with fungus quiz score, lending validity to our measure of BK. Second, BI was positively correlated with fungus interest and marginally correlated with willingness to return. Preliminary analyses indicated that the dependent variables did not vary by gender and therefore gender was excluded from further analyses.

3.1. Domain individual interest and domain knowledge

A positive correlation emerged between BI and BK. Moreover, the scatterplot of these variables revealed an intriguing pattern (see Fig. 1). With the exception of one individual, no one who reported low BI had high BK. However, a full range of BK scores emerged among individuals who reported high BI.

Further analyses were conducted to explore the characteristics of individuals with different high/low patterns of BI and BK. We divided the sample into groups depending on individuals' BI and BK scores and conducted a series of one-way three-group ANOVAs to compare

Table 1
Zero-order correlations for all variables

	1	2	3	4	5	6
1. Biology individual interest						
2. Biology knowledge	.35*					
3. Perceived understanding	.42*	.30*				
4. Perceived complexity	−.39*	−.15	−.37*			
5. Interest in fungus	.48*	.26^{+}	.48*	−.25^{+}		
6. Willingness to return	.28^{+}	.13	.07	.12	.36*	
7. Fungus quiz score	.15	.36*	.49*	−.21	.45*	.36*

Note. Biology individual interest, perceived complexity, perceived understanding, and fungus interest could range from 1 (*low*) to 7 (*high*); biology knowledge could range from 0 (*low*) to 7 (*high*); and fungus quiz score could range from 0 (*low*) to 6 (*high*). Participants' willingness to return for another session was coded 0 (*unwilling to return*) and 1 (*willing to return*).
$^{+}p < .10$. $^{*}p < .05$.