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Title	**Beliefs about learning and constructive strategies in text comprehension**
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Objectives This study investigated children's beliefs about learning and their use of constructive strategies in text comprehension among elementary-school children in Hong Kong. Three objectives were included: (a) To examine children's beliefs about learning and to investigate whether they vary with age, gender, and ability, (b) To examine children's use of constructive text-processing strategies and to investigate whether they vary with age, gender, and ability, and (c) To investigate the relations between beliefs and strategies and to assess their contributions to text comprehension.

Perspectives There is now increased research evidence indicating that students' epistemological beliefs influence learning and text comprehension (Hofer & Pintrich, 1997, 2002; Schommer, 1997). Specifically, research on beliefs about learning has shown that some students view learning as understanding and *knowledge construction* whereas others see learning as memorization and *knowledge reproduction* (Bereiter & Scardamalia, 1989; Lonka, Joram, & Bryson, 1996). Differences in student beliefs are related to reflective judgment (King & Kitchener, 1994), interpretation of controversial issues (Kardash & Scholes, 1996) and conceptual change (Qian & Alvermann, 1994). In text comprehension, students holding a text-transaction model performed better on critical reading compared to others holding a text-transmission model (Shraw & Bruning, 1996). School-aged children who believed they played active roles in learning outperformed others on reading comprehension controlling for age effects (Chan & Sachs, 2001).

Central to contemporary theories of learning is the idea that students actively construct their understanding (Greeno, Collins, & Resnick, 1996). Learning from text involves more than understanding what the author says; it involves interpreting text information and constructing a situational model based on the text (Kintsch, 1983). Cognitive research has shown that constructive, meaning-driven, and problem-centred text-processing strategies including summarization (Brown & Day, 1984) explanation (Chi, 2000), questioning (McKeown, Beck, & Sandora, 1999, King, 1998), and problem solving (Bereiter & Bird, 1984) would lead to a deep understanding of a text. The extent to which children engage in deep constructive strategies is related to how much they learn from the text controlling for age and prior knowledge effects (Chan, Burtis, Scardamalia & Bereiter, 1992; Chan, Burtis, & Bereiter, 1997).

Despite much research progress in examining epistemological beliefs and cognitive strategies, these two research strands are quite separate. Thus far, few studies have examined their relations in connection with text comprehension. We propose that beliefs about learning and strategies are integrally related components of metacognitive processing that may affect students' understanding. Specifically, students' epistemological beliefs (i.e. how they view learning) would influence what constructive strategies they use and the subsequent learning outcomes. In text comprehension, if students view learning as involving meaning construction, they may be more likely to apply deep constructive strategies to process the texts more deeply. Conversely, if they believe that learning involves reproduction and memorization, they may be less likely to employ strategies to construct meaning. Accordingly, the goal of the study was to examine children's beliefs about learning and employment of constructive strategies, and to investigate their relations and contributions to text

comprehension. Three questions were addressed: (a) What kinds of beliefs about learning could be identified and were there grade, gender and ability differences on the identified beliefs? (b) Did students differ in using surface to deep constructive strategies when they learn from text, and were there grade, gender, and ability differences on the use of identified strategies? And (c) What were the relations among beliefs, strategies, and text comprehension, and specifically, did beliefs contribute to text understanding over and above the effects of age, ability, and strategies?

Method

Participants. There were 82 students in this study, 40 from Grade 5 (19 boys and 21 girls), and 42 from Grade 6 (20 boys and 22 girls). They were recruited from a larger study on text comprehension. We used standardized test scores for identifying high-achieving and low-achieving children.

Measures

Beliefs about Learning. Children were individually interviewed on the following questions: (a) What is learning? (b) What do good students do when they learn? (c) What do you find most difficult in learning? and (d) What do you usually do to help yourself learn better? Analyses indicated four levels of responses ranging from simpler to more sophisticated conceptions: (1) learning as increase in knowledge, (2) learning as meeting pragmatic/institutional goals, (3) learning as applying knowledge, and (4) learning as meaning and knowledge construction. Student responses were coded on the identified four-point scale. Interrater reliability, based on a sample of 30% of responses, was .81.

Text-Processing Strategy. Children were provided with a brief training on thinking-aloud (using modeling, explanation and practice), then they were presented with nine paragraphs of a text passage separately, one at a time, and asked to think aloud to the paragraphs. Children's thinking-aloud protocols were blind coded and scored for constructive text-processing strategies based on a framework (five-point scale) children use when learning from text (Chan et al., 1992). The five levels were (i) pre-factual confabulation, (ii) knowledge-detail retelling, (iii) comprehension, (iv) problem solving, and (v) extrapolation. Inter-rater reliability based on a sample of 30% of responses was .94.

Text understanding. Children's text understanding was assessed using the following tasks: (a) Recall- state what you remember from the text, (b) summarize –put in your own words the key ideas, (c) New Learning – explain what you have learned that you did not know before, and (d) New questions – state what other questions you have about the text passage. Children's responses were coded on a four-point scale. Inter-rater reliability were .84, .90, .92, and .82 for tasks (a) to (d) respectively for a sample of 30% of the responses.

Results

Differences on Beliefs, Strategies, and Text comprehension

To examine whether children's scores vary as a function of ability, grade, and gender, children were grouped into low- and high-achieving groups based on their standardized test scores (Hong Kong Attainment Tests), older versus younger groups (grades 5 and 6), and male versus females.

Age, Gender, and Ability Differences on Beliefs. A three-way ANOVA (grade x gender x ability) on beliefs scores (4-point scale) indicated a significant effect of ability, $\underline{F}$ (1,81)=31.25, $\underline{p}$<.001, η=.30; favoring high achievers ($\underline{M}$=2.79, $\underline{SD}$=.60) over low achievers ($\underline{M}$=2.15, $\underline{SD}$=.41). There were no main effects for grade or gender; the interaction effects were non-significant.

Age, Gender, and Ability Differences on Constructive strategies. A three-way ANOVA (grade x ability x gender) was conducted to examine the overall differences in the use of constructive strategies (5-point scale). Significant main effects were obtained for ability, $\underline{F}$ (1, 81) =52.17, $\underline{p}$<.001, η=.42; favoring the high-achieving group ($\underline{M}$=3.23, $\underline{SD}$=. 56) over the low-achieving group ($\underline{M}$=2.34, $\underline{SD}$=. 52); and for grade, $\underline{F}$ (1,81) =5.56, $\underline{p}$<.05, η=.07; favoring Grade 6 ($\underline{M}$=2.90, $\underline{SD}$=.71) over Grade 5 ($\underline{M}$=2.70, $\underline{SD}$=.65). There were no main effects for gender, and interaction effects were not significant.

Age, Gender, and Ability Differences on Text Comprehension. A three-way ANOVA (Grade x ability x gender) indicated that significant main effects were obtained for ability, $\underline{F}$ (1, 81) =61.98, $\underline{p}$<.001, η=.46; favoring the high-achieving group ($\underline{M}$=3.27, $\underline{SD}$=.61) over the low-achieving group ($\underline{M}$=2.30, $\underline{SD}$=.55); and for grade, $\underline{F}$ (1,81) =8.47, $\underline{p}$<.01, η=.10; favoring Grade 6 ($\underline{M}$=2.92, $\underline{SD}$=.80) over Grade 5 ($\underline{M}$=2.65, $\underline{SD}$=.68). There was no main effects for gender, and interaction effects were not significant.

Relationship Among Beliefs about Learning, Cognitive Strategies, and Text Comprehension

To examine the relations among beliefs, strategies, and text understanding, the four scores on text understanding were combined using principal component analyses and the factor explained 63% of the variances. Correlations indicated that text comprehension was associated with grade ($\underline{r}$ = .45, $\underline{p}$<.001), ability ($\underline{r}$ = .45, $\underline{p}$<.001), beliefs about learning ($\underline{r}$ = .79, $\underline{p}$<.001), and constructive strategies ($\underline{r}$ = .65, $\underline{p}$<.001). A hierarchical multiple regression analysis was conducted with grade and ability entered first, followed by constructive strategy, and followed by belief scores. Grade and ability contributed an $\underline{R}^2$ of .46; when strategy was entered, $\underline{R}^2$ changed to .78; and when belief scores were entered, $\underline{R}^2$ changed to .80 accounting for an additional 2% of variance. Finally, a path analysis indicated that grade and ability did not have significant direct effects on text comprehension; instead constructivist beliefs had a significant path on constructive strategies (β=. 47), which in turn showed a strong effect on text understanding (β=. 64), Taken together, these findings indicated strategies predicted text comprehension over and above age and ability, and constructivist beliefs predicted text comprehension over and above the effects of grade, ability, and strategies. Furthermore, grade and ability alone did not have direct effects on text comprehension; they exerted their effects on text comprehension mediated by constructivist beliefs and strategies.

Scientific and Educational Significance This study integrates two strands of research on epistemological beliefs and constructive strategies corroborating current findings on their roles in text comprehension. We extend current work indicating that constructivist beliefs contribute to text comprehension over and above the effects of grade, ability, and strategies. Pedagogically, it may not be enough just to teach strategies; how children view learning may affect what strategies they use and thus affect subsequent text understanding. Our findings highlight the importance of

helping children examine and reflect on their beliefs when teaching them how to use strategies. Finally, this study also provided some preliminary evidence suggesting that metacognitive processing involving beliefs and strategies examined in English reading could also be identified among Chinese children.

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