



Analogy's straddling of analytical and creative thinking and relationships to Big Five Factors of personality



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ABSTRACT

This research study examined how the analogy test items in both the multiple-choice and the non-multiple-choice forms related to analytical thinking, creative thinking, and the five major personality domains. Five hundred eighty-two 6th graders were recruited from 12 public elementary schools located across Taiwan. Both ready-made and self-constructed instruments were used in this study. The major findings are shown as follows. The three analogy subscales in the multiple-choice form were all significantly correlated with analytical and creative thinking, with their correlations with analytical thinking stronger than those with creative thinking. In contrast, the analogy subscales in the non-multiple-choice form, the simile sentence completion, had a much stronger correlation with creative thinking than that with analytical thinking. The traditional analogical-verbal items in the multiple-choice form and the analogy test items in the form of simile sentence completion could significantly predict creative thinking independent of analytical thinking and also significantly predict analytical thinking independent of creative thinking. In addition, the simile sentence completion, openness to experience, and analytical thinking could significantly explain the variance of creative thinking. Discussions of the findings, with a special focus on the two types of novel analogy items, were presented in the context of the existing literature.

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1. Introduction

Analogy plays a critical role in human cognition (Gentner & Kurtz, 2006; Gentner, 1983, 2010; Green et al., 2008; Hofstadter, 2001). Analogical processing is pervasive in diverse realms of human activities, such as everyday language, literature, arts, business, science, and so forth (Gentner & Bowdle, 2008; Gentner & Markman, 1997). As implied by the list of examples, analogy can be found in mundane activities like use of common languages or high-level activities like technological innovations and creation of artworks. Despite the prevalence of analogy, its significance is not adequately appreciated. In the context of education, analogy is of great value for teaching and learning (Gavetti & Rivkin, 2004; Hanson & Phillips, 2006; Kao, 2014). It is meaningful to explore how analogy relates to analytical and creative thinking, two crucial abilities regarded as the key to success in modern competitive environments and increasingly emphasized by instructional programs. As pointed out by many previous studies, creative thinking is associated not merely with cognitive factors but also with non-cognitive factors, especially personality traits (Batey & Furnham, 2006). The present study thus tried to examine the subtle relationships between analogy, analytical and creative thinking, and important personality traits.

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1.1. Major features of analogy

Analogy involves establishing correspondence between two represented situations (or analogs) mainly based upon relational commonalities and deriving further inferences from these commonalities (Gentner, 2010). Whereas analogies differ vastly in their content, appearance, and usage (Gentner & Smith, 2012), many of them are characterized by some features. Their four major features are retrieval, mapping, evaluation, and abstraction.

Retrieval refers to accessing potential analogs in long-term memory given an analog present in working memory (Gentner & Smith, 2012). While two analogs or domains are juxtaposed in working memory, relational mapping takes the central stage. Succinctly stated, analogy is relation-oriented cross-domain mapping (Bowdle, & Gentner, 2005; Gentner & Bowdle, 2008; Lakoff, 1992). Mapping requires aligning two domains or analogs based on their structural commonalities. As a corollary of alignment, candidate inferences are projected from the better-structured, more complete analog (usually the base) to the less complete analog (usually the target). The candidate inferences are propositions linked to the common relational structure in one analog, but still missing the other. They occur spontaneously to enrich the less complete analog (Gentner, 2010). After inferences and the common relational structure are established, the analogy will be evaluated. The criteria for evaluation are the size and depth of the common relational structure, factual correctness, goal-relevance in problem-solving situations, the amount of new knowledge generated, and so forth (Gentner & Kurtz, 2006). Abstraction means that a common relational structure is extracted during analogical thinking and possibly used again in the future. The common relational structure extracted may later turn into a general schema, which enhances performance on subsequent parallel situations and facilitates knowledge transfer from one domain to another (Gentner & Smith, 2012).

1.2. Analogy's spanning analytical and creative thinking

The ability to identify and generate analogies is considered a sign of intelligence. The four-term analogy test items are frequently used by conventional intelligence tests (Gentner & Markman, 1997). Questions in conventional intelligence tests are primarily used to measure analytical thinking abilities (Sternberg, 2003). Therefore, it can be argued that analogical thinking and analytical thinking have overlapping components. On the other hand, analogical thinking plays a critical role in many scientific inventions and discoveries (Gentner & Markman, 1997; Gentner et al., 1997). Analogy is also central in many important creativity theories (Kao, 2014), such as Mednick's (1962) associative theory, Koestler's (1978) bisociation, and Gordon's (1961) synectics. In his study of 287 6th graders living in Taiwan, Kao (2014) found that the analogical-verbal subscale score could significantly explain the variance of creative thinking, independent of analytical thinking. Moreover, in the study the subscale scores of the four different types of analogies were found to significantly explain the variance of analytical thinking, independent of creative thinking. These results demonstrated that analogy straddled analytical and creative thinking. However, the four types of analogies used in the Kao's study were all in the multiple-choice form with a definite answer (e.g., Please choose a word that goes with the third underlined word in the same way that the first two go together. Arc is to sphere, as right angle is to _____. A. circle B. square C. cube D. geometry). It is interesting to see whether the same results will be obtained if the analogical items in the non-multiple-choice form (e.g., Please fill in the blanks to make a meaningful sentence. Happiness is like _____ because _____) are substituted for those in the multiple-choice form.

1.3. Simile, metaphor, and creative thinking

In the field of language arts, similes (A is like B) and metaphors (A is B) embody the essence of analogy (Gentner & Smith, 2012), since both of them can be interpreted through the perspective of cross-domain mapping (Bowdle & Gentner, 2005; Lakoff, 1992). Despite their close relations, the nature of structural alignment is different in similes and metaphors because of their disparate linguistic forms. The simile form, with the assistance of "like" or "as," invites comparison, a horizontal alignment between the target and the literal base concept. On the other hand, the metaphor form invites categorization, treating the target as a member of an abstract metaphoric category associated with the base term. The categorization process is a vertical alignment between the target and the abstract metaphoric category. The horizontal alignment is more computationally costly and mentally demanding than the vertical alignment because on-line active interpretation is required for processing the horizontal alignment, which involves more inconsistent predicates. In contrast, the vertical alignment is relatively easier and faster to process because it involves automatic retrieval of a stored meaning, an abstract metaphoric category (Gentner & Bowdle, 2008). The relatively fast or even automatic processing of metaphor is very likely to make test-takers stuck in a rut and prime them to come up with trite ideas, which is detrimental to creative thinking.

It has been pointed out that writers usually have a stronger preference for similes than for metaphors when trying to express an unusual relation between the target and base (Gentner & Bowdle, 2008). Simile serves as a more felicitous lab for writers to experiment with the new combination of words. According to Zharikov and Gentner (2002), people hold a more conservative view toward using metaphors than using similes. The conservative attitude is inimical to risk taking and openness to experiences, two affective factors conducive to creative thinking. Therefore, the simile sentence structure has more potential to be used in creativity measures than the metaphor sentence structure.

Furthermore, the most serious problem for using the metaphor form in creativity-related activities is its being grammatically identical to literal class-inclusion statements ("Crime is a disease" and "Flu is a disease"), which may result in response

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