The effects of stimulus words' positions and properties on response words and creativity performance in the tasks of analogical sentence completion

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ABSTRACT

This study used four types of analogical sentence completion to examine the effects of stimulus words' positions and properties on the words subjects responded with and their creativity performance. The research design was a mixed-design ANOVA model with position as a between-subjects variable and property as a within-subjects variable. Major findings are as follows. A significant directionality existed in simile sentences. Typical analogies led to higher creativity performance but atypical analogies could significantly explain the variance of creativity performance over and above typical analogies. No matter whether stimulus words are concrete or abstract or whether they are placed in the target or in the base of sentence completion items, participants were inclined to respond with concrete words. Abstract stimulus words placed in the target position with concrete words answered in the base position had the highest incidence of all combinations. However, participants did not necessarily tend to respond to concrete stimulus words in the base with abstract words. The directionality of typical analogies and the strong proclivity for responding with concrete words are two factors that affect participants' performance.

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1. Introduction

Analogies are not just figures of speech but are actually central to our thinking (Gentner & Kurtz, 2006). Instances of analogy are abundant in every sector of our lives, such as education, business, art, science and technology. In education, using prior experiences to solve new problems encountered, enhancing comprehension via comparison and contrast, and employing case methods in business-related courses are all important examples of analogy (Kao, 2014). According to Goldwater and Gentner (2015), the structural alignment in analogy can help learners recognize key relational patterns across different phenomena, which is beneficial for the development of expertise. Analogy can thus be considered a powerful tool for learning. Because of the great effect analogy has on learning, we need to choose analogs appropriately so that flawed analogies do not lead to fallacious inferences and inaccurate knowledge (Gentner & Smith, 2013). Also due to its effect on learning, analogy is of great value to our instructional activities. This research study is intended to apply activities of analogical sentence completion in the classroom context, in order to examine how students respond to stimulus words and how they express their creativity.

1.1. Analogical asymmetry

Analogy can be regarded as a process of establishing alignment and mapping between two domains based upon their relational commonalities (Gentner & Bowdle, 2008; Gentner & Kurtz, 2006). Of the two domains, the more concrete and familiar one is called the base, whereas the less concrete and familiar one is the target (Gentner & Smith, 2012). Once the common relational structure between the base and target has been identified through alignment, candidate inferences may be projected from the base to the target (Bowdle & Gentner, 2005). According to Gentner (2010), the candidate inferences are propositions linked to the common relational structure in one domain, but still missing in the other. Alignment and projection are considered two major mechanisms in analogy (Bowdle & Gentner, 2005; Sagi, Gentner, & Lovett, 2012; Wolff & Gentner, 2011). The projection of candidate inferences is obviously indicative of analogical asymmetry. Empirical studies have demonstrated directional asymmetry in analogy (Gentner & Bowdle, 2008). Two of the factors that may influence the direction of projection are the concreteness and familiarity of the domains aligned, for candidate inferences are projected from the more concrete and familiar domain (usually the base) to the less concrete and familiar domain (usually the target). The factor of familiarity is more subjective than the factor of concreteness because each individual has different experiences, which contributes to different levels of familiarity with a certain domain. In contrast, the factor of concreteness is comparatively

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more objective because concrete words are generally regarded as the name of something that can be experienced through the five senses—namely, sight, hearing, smell, taste, and touch. Of the two factors, familiarity is given more attention since "familiar," in comparison with "concrete," is closer to such common analog-modifiers as "complete" or "well-understood" (Gentner, 2010). This study was thus intended to examine whether the factor of concreteness can significantly affect the directionality of analogy in the form of simile sentences.

1.2. Analogies and creativity

Analogy plays a key role in many theories of creativity (Kao, 2014), such as Mednick's (1962) associative theory, Koestler's (1978) bisociation, and Gordon's (1961) synectics. Mednick's (1962) associative theory points out that creativity entails a particular sort of response, bringing together seemingly irrelevant or remote ideas. As described earlier, analogy is a process of establishing correspondences between different domains or represented situations. "Bringing together" can be seen as establishing correspondences and "irrelevant or remote ideas" can be viewed as different domains or represented situations (Kao, 2014). Similarly, to delineate creative thinking processes, Koestler (1978) put forward the term bisociation—"perceiving a situation or event in two mutually exclusive associative contexts" (p. 130). He believed that the supreme level of creative achievement is embodied by "the endeavor to bridge the gap between the two planes" (p. 146). "To bridge the gap" can be regarded as establishing mapping and "two planes" as two domains or represented situations (Kao, 2014). The two suggestions proposed by synectics, making the strange familiar and making the familiar strange (Starko, 2005), correspond to typical and atypical analogies, respectively. As noted earlier, typical analogies have a concrete and familiar base and an abstract and unfamiliar target. In contrast, atypical (or reversed) analogies have an abstract and unfamiliar base and a concrete and familiar target. These suggestions may thus imply that both types of analogies can facilitate creativity. The present study was designed to investigate whether typical or atypical analogies are more conducive to creativity performance.

1.3. Simile, metaphor, and analogy

Similes (A is like B) and metaphors (A is B) exemplify verbal expressions that embody the essence of analogy because they both involve establishing a correspondence between two domains (Bowdle & Gentner, 2005; Gentner & Bowdle, 2008). This study was intended to examine the relations between analogy and creativity via subjects' verbal expression. Therefore, it is edifying to investigate how similes and metaphor differ from each other and how they relate to creativity performance. Similes and metaphors can be viewed as two variants of analogy and share many similarities. Nonetheless, the metaphor form is not as flexible as the simile form though the former appears stronger and more profound (Zharikov & Gentner, 2002). This is because the nature of structural alignment is different in similes and metaphors despite their close relation. The simile form invites comparison, a horizontal alignment between the target and the literal base concept. In contrast, the metaphor form invites categorization, in which the target is seen 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. Based on the description above, both conventional and novel bases can be used in similes because both of them, after all, have a literal meaning, which can be horizontally aligned with the target concept. However, only conventional bases can be properly applied to metaphors. Metaphoric statements with a novel base (or novel metaphors) are difficult to process since there is no metaphorical abstraction associated with the novel base. Such statements can lead hearers or readers to an improper comprehension path—namely, searching for metaphoric categories that are in fact nonexistent. Reinterpreting the statements, which costs additional time and effort, is thus needed (Bowdle & Gentner, 2005;

Gentner & Bowdle, 2008; Gibbs, 2015; Wolff & Gentner, 2011; Zharikov & Gentner, 2002). In other words, novel bases can be only suitable for similes. Nonetheless, conventional bases can be used in both similes and metaphors. This inference is further supported by a study conducted by Bowdle and Gentner (2005), which demonstrated that research participants did not favor either the metaphor form or the simile form while expressing figurative statements with a conventional base term (conventional figuratives). This outcome arises because a conventional base term has both literal (domain-specific) and metaphoric (domain-general) senses, which makes conventional figuratives suitable to be processed either as comparisons or as categorizations.

From another perspective, all metaphoric expressions can still take the simile form. For instance, "Life is a journey" can be changed into "Life is like a journey," since the conventional base (journey) used in the metaphoric expression, as pointed out earlier, has not only a metaphoric category but also a literal meaning that can be applied in the simile sentence. However, not all simile expressions can take the metaphor form. For instance, "A museum is like a uranium mine" cannot appropriately be changed into "A museum is a uranium mine," since the novel base (uranium mine), unlike the conventional base (e.g., gold mine), does not have a metaphoric category that can be used in the metaphoric sentence. Based on the description above, the simile form arguably allows more freedom. This is further supported by the fact that writers generally have a stronger preference for similes over metaphors when trying to express unusual relations between targets and bases (Gentner & Bowdle, 2008). In addition, similes in comparison with metaphors are more likely to highlight implicit similarities between the target and base and to cover a greater spectrum of potential commonalities (Bowdle & Gentner, 2005). Succinctly stated, similes facilitate sense creation whereas "metaphors invite sense retrieval" (Bowdle & Gentner, 2005, p. 199). This spontaneous retrieval unfortunately leads test-takers to reach an impasse and to come up with hackneyed ideas. Concerning creativity tests, test-takers should be provided with as felicitous contexts as possible for creation. This research hence employed the simile sentence structure in the analogy tasks.

The current research employed four types of simile sentence completion to examine the effects of stimulus words' positions and properties on the words subjects responded with and their creativity performance. It is interesting to investigate how test-takers respond to different types of simile sentence completion. Do they have a tendency to place concrete words in the base position of sentence completion items with abstract stimulus words in the target position? Do they have a tendency to place abstract words in the target position of sentence completion items with concrete stimulus words in the base position? Do they produce reversed analogical sentences? How do they respond to different types of simile sentence completion to express their creativity? Is there an interaction between the property and the position of stimulus words in their responses? These questions guided the research project, pioneering the investigation of simile asymmetry and relations between analogy and creativity.

2. Pilot studies

In the first pilot study, 34 college students were recruited to participate in the research. The research design was a 2 by 2 factorial of stimulus words' position (target or base) and their property (concrete or abstract). The instrument used in this study included four tasks of simile sentence completion and tested for four types of simile sentence completion, with concrete stimulus words presented in the target position (A mirror is like _____ because _____.), abstract stimulus words in the target position (Courage is like _____ because _____.), concrete stimulus words in the base position (_____ is like a leaf because _____.), and abstract stimulus words in the base position (_____ is like friendship because _____.). The results were erratic and no patterns were found. As mentioned earlier, this research tried to examine the effects of the property and position of stimulus words on test-takers' responses in