AC 2012-5352: PICTORIAL METAPHORS IN TYPHOON FORECAST CHARTS: AN ANALYSIS BASED ON THE THEORIES OF CONCEPTUAL METAPHOR AND CONCEPTUAL BLENDING

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Pictorial Metaphors in Typhoon Forecast Charts: An Analysis Based on the Theories of Conceptual Metaphor and Conceptual Blending

Abstract

This paper studied the pictorial metaphors in typhoon forecast charts announced by the Central Weather Bureau in Taiwan. Our analysis was based on the theory of conceptual metaphor and conceptual blending. The instruments included a self-development questionnaire "The Pictorial Metaphors Test of Typhoon Forecast Charts" and semi-structured interviews. The questionnaires were distributed to thirty 3rd pupils in Taiwan. Six of them for interviewed. The conclusions show that metaphors may affect pupils' comprehension of typhoon forecasts charts. We argued that typhoon forecast charts were meaningful, coherent, and helpful to scientific thinking. However, typhoon forecast charts might also result in misconceptions and negative effects. Implications are provided for the instruction to promote pupils' meteorological literacy and placed importance on the critical role of metaphors in comprehension of science-related typhoon forecast charts.

Background and Purpose

An average of six to seven typhoons per year influenced Taiwan in summer or autumn . Three or four of them hit Taiwan area directly (http://www.cwb.gov.tw/). Sometime, these strong typhoons might destroy Taiwanese property and life. For example, the 2009 Moral typhoon caused Taiwan 673 departure and 26 missing. For this reason, even elementary pupils should be able to understand the typhoon forecast warning and make preparations to defense the typhoon with their parents.

Some studies have argued students' alternative conceptions of weather, and especially the text of weather were concerned (Dove, 1998; Henriques, 2002; Spiropoulou, Kostopoulos, & Jacovides, 1999; Stepans & Kuehn, 1985). But few studies explored the alternative conception of pictorial symbol on typhoon forecast charts. Therefore the main findings of this paper will portray the meaningful implications to enhance pupils' understanding of meteorological concepts.

Research Rationale

Lakoff and Johnson (1980) have developed the theory of conceptual metaphor on their book "Metaphors we live by." They proposed metaphors as cognitive instruments. Metaphor is a mapping across conceptual domains, from source domain to target domain. Conceptual metaphors typically employ a more abstract concept as target and a more concrete concept as their source. We can understand the mapping relation of source domain and target domain

with the sentence “Thought As Food”. See table 1.

Table 1. The mapping relationship of the conceptual metaphor “Thought As Food” (Su, 2000: 419 Figure 6).

Source domain (Food)	Mapping (As) →	Target domain (Thought)
ingredient	The content of thought as the ingredient of food.	content
taste	Quality of thought as flavor of food.	quality
preparation	Creation of thought as preparation of food.	formation
Digestion	Compression of thought as digestion of food.	comprehension

The theory of conceptual blending addressed by Fauconnier & Turner (2002). There are four mental spaces with two input spaces, generic space, and blend. Composition, completion, and elaboration lead to emergent structure (rectangle in the Blend) in the blend; the blend contains structure that is not copied from the inputs. See figure 1. This is a minimal network. There is partial matching, represented with solid lines, between input spaces. Conceptual integration networks can have many input spaces and even multiple blended spaces. However, the theory of conceptual metaphor only discussed source domain and target domain. This paper integrated Input Space I_1 as source domain, Input SpaceI_2 as target domain.

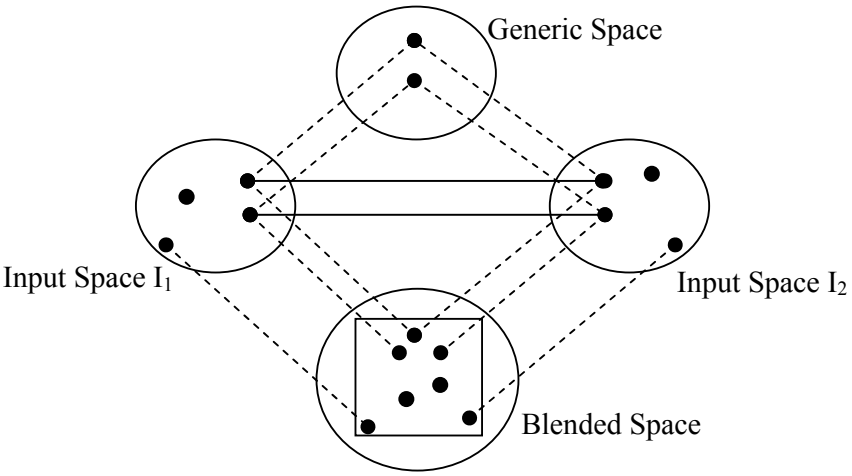

Figure 1. The basic diagram of conceptual blending (Fauconnier et al., 2002: 46 Figure 3.6)

The typhoon forecast charts with concise text and image integration provided the people for understanding the typhoon information and doing well prevention of typhoon to protect our property and life. In the meanwhile we can’t ignore that the typhoon forecast charts will also form unexpected alternative conception.

Method and Design

The total participants in this study were 30 students selected from third-graders of one primary school in Taiwan. The self-designed instrument “The Pictorial Metaphors Test of Typhoon Forecast Charts (acronym as PMTFC)” was adopted to exam students’ conceptions of typhoon forecast charts. The PMTFC consisted of three pictorial questions with regard to the Fanapi Typhoon (September 17～20) and Meranti Typhoon (September 09～10) Warning (see figure 2 and figure 3) announced by the Central Weather Bureau (2010). After that, we interview six students (3 boys, 3 girls) by random sampling with the same instrument "PMTFC". By the analysis of students' performance of PMTFC, we could obtain the quantitative data about students’ conceptions. Meanwhile, the quality data was analyzed by the protocol of semi-interview.

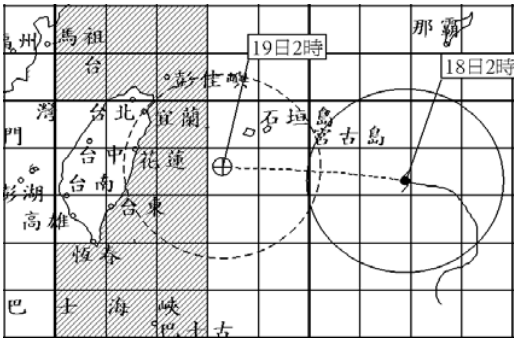

Figure 2. the Fanapi Typhoon

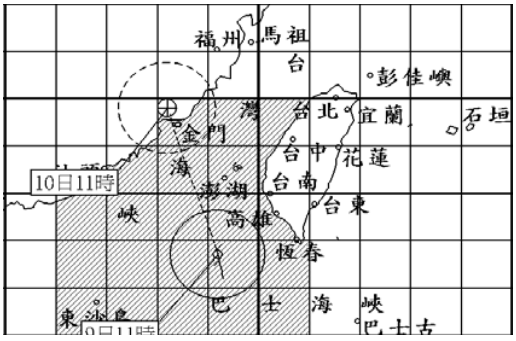

Figure 3. the Meranti Typhoon

Result

The following will divide into two parts of discussions. The first part showed the quantity result of the PMTFC questionnaire. The second part indicated the quality result of the PMTFC interview.

Table 2 presented the percentage of each choice. The question was designed to probe what pupils’ conceptions were. In the following tables, the correct choices were given in bold face.

Table 2. The quantity results of the PMTFC

	Question	Multiple-choice	Population (%)
1.	Where was the domain of typhoon now (figure 4)?	(A) Within the dotted line scope (----).	13 (43%)
		(B) Within the solid line scope (──).	**5 (17%)**
		(C) At the ⊕.	5 (17%)
		(D) At the 🌀.	5 (17%)
2.	What’s the meaning of ⊕ and 🌀 (figure 4)?	(A) ⊕ is the present position. 🌀 is the future one.	7 (23%)
		(B) ⊕ is the future position. 🌀 is the present one.	**9 (30%)**
		(C) ⊕ is a larger strength typhoon.	1 (3%)
		(D) 🌀 is a larger strength typhoon.	12 (40%)
3.	The typhoon circle was	(A) the typhoon scope was wider and wider, the typhoon strength was larger and larger.	25 (83%)

bigger and bigger (figure 6). It meant that	(B) the typhoon scope was wider and wider, the typhoon strength was weaker and weaker.	3 (10%)
	(C) the typhoon scope was narrower and narrower, the typhoon strength was larger and larger.	0 (0%)
	(D) None of the above.	**1 (3%)**

First discusses the Question 1. The scope of dotted line represented the typhoon's future location by the typhoon forecast charts announced by CWB. The scope of solid line indicated the typhoon's present location. The symbol ⊕ or 🌀 meant the typhoon center. However, thirteen (43%) pupils held alternative conceptions that the dotted line scope represented the present location of typhoon (see figure 5). Ten (34%) pupils held alternative conceptions that the symbols ⊕ or 🌀 was the domain of typhoon. Only then did five (17%) pupils give the right answer. In fact, pupils could understand symbols at the legend below the typhoon forecast chart but they didn't. According to interview data, pupil S1, S2, S5 and S6 (alias) represented the dotted line as unfinished, unconfirmed, changeable, and on-going metaphors. They seemed only to paid attention to the image of symbols.

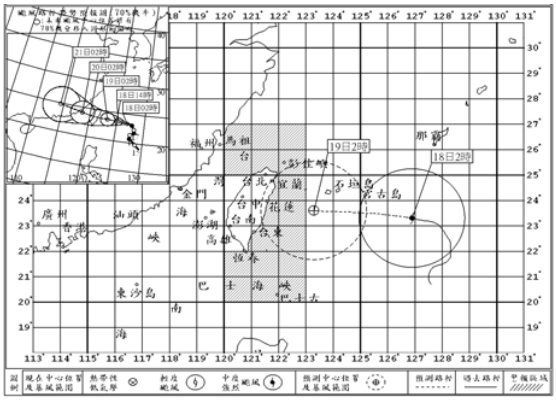

Figure 4. Fanapi Typhoon Forecast Chart

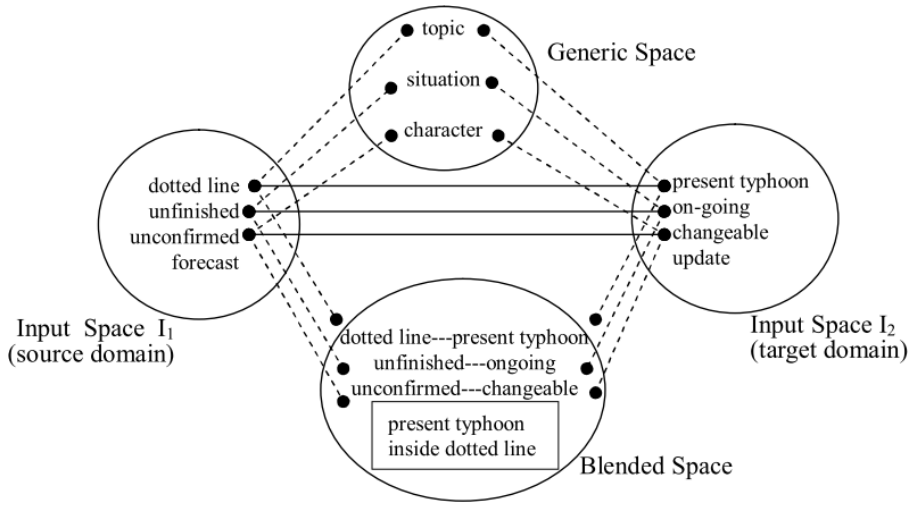

Figure 5. Conceptual integration network: *The typhoon scope as the dotted line scope*.

Next discusses the Question 2 answer choice (A) and (B). The symbol ⊕ represented the typhoon's future location. The symbol 🌀 indicated the typhoon's present location. There were seven (23%) pupils gave the wrong answer choice (A). Moreover, 13 (43%) pupils took the symbol ⊕ or 🌀 to show the strengh of the typhoon. Only then did nine (30%) pupils give the right answer. According to interview data, pupil S1, S2, S5 and S6 (alias) represented the symbol 🌀 as electric power symbol, whirlpool, nonstop, unrestricted, and on-going metaphors. the symbol ⊕ as confirmed, static, restricted, and finished metaphors. They interpreted the image of symbols as the typhoon location yet.

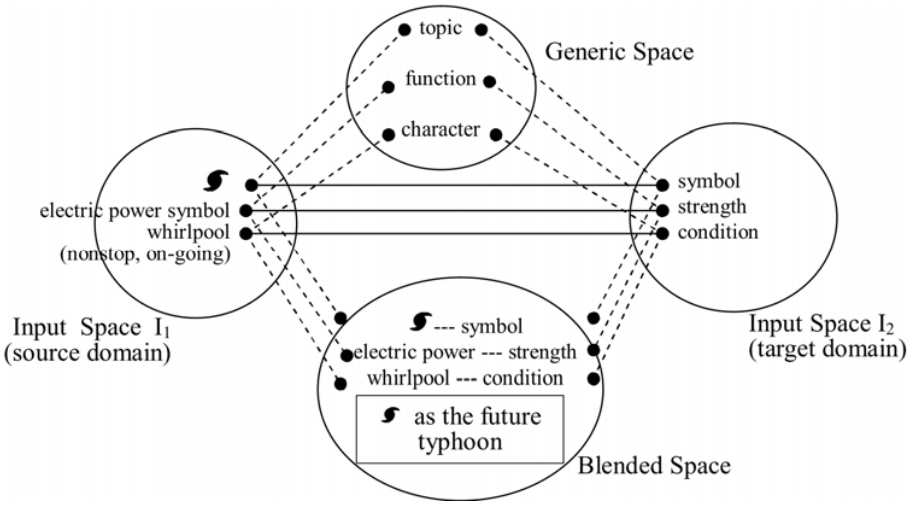

Figure 6. Conceptual integration network: *The future typhoon as the symbol* 🌀.

Question 3 showed the Tendency of Fanapi Typhoon Track (figure 7) that meant the typhoon central location had 70% chances enter the circular range with a growing. There were twenty-eight (93%) pupils described the circle size as the typhoon strength. Only one (3%) pupil gave the right answer choice. Based on interview data, pupil S1, S2, S5, and S6 expressed the bigger and bigger circle as the strength of the typhoon was increased. Pupil S3 held the opposite view that the bigger and bigger circle reduced the strength of the typhoon. The strength of the typhoon was weaker and weaker for this reason. In addition, pupil S4 reasoned that the bigger and bigger circle meant the typhoon was far away from Taiwan gradually, and then disappeared. The results showed that pupils preferred pay attention to the pictorial information rather than text information.

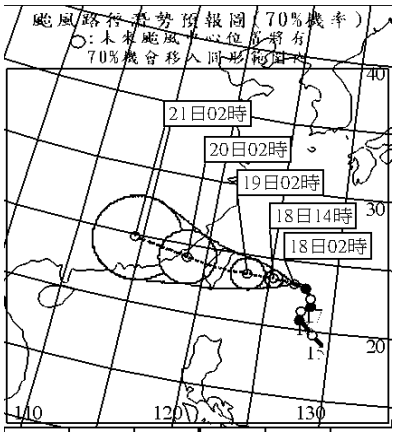

Figure 7. the tendency of Fanapi Typhoon track

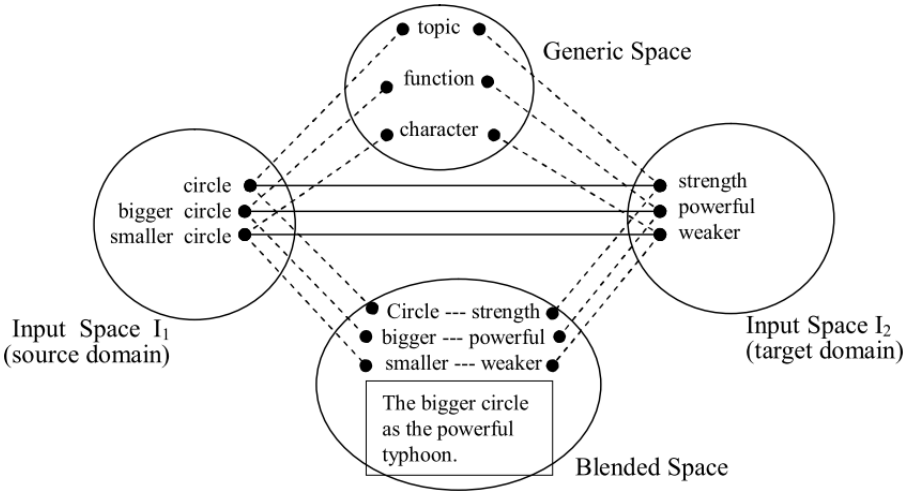

Figure 8. Conceptual integration network: *The powerful typhoon as the bigger circle*.

Conclusion and Suggestion

The results showed that pupils in reading typhoon forecast charts, they will pay attention to the pictorial information but text information. Therefore, science teachers should be aware of pictorial typhoon forecast charts helping pupils to understand the typhoon information. In the meanwhile, we couldn't ignore the typhoon forecast charts might also result in alternative conceptions and negative effects. Consequently, the results of this paper suggested that science teachers should place importance on the critical role of metaphors in comprehension of science-related typhoon forecast charts.

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