The use of metaphors in academic communication: traps or treasures

Dehui Zhou & Edgar Heineken
University Duisburg-Essen (Germany)
zytsmum@hotmail.com & edgar.heineken@uni-due.de

Abstract

The rationalists and the empiricists in the 17th century once argued that metaphor is an inferior device to convey objective truth and should be replaced by literal statements. On the one hand, this article shares Lakoff and Johnson's (1980 & 1999) view that metaphor is useful to pursue experiential truth and explains why "metaphors are necessary and not just nice" (Ortony, 1975: 45). On the other hand, it reports a cognitive psychological experiment, which shows that metaphor comprehension can be greatly influenced by people's pre-existing conceptual knowledge and the context, in which the metaphor appears. The authors advocate a conscious use of metaphors in academic communication with full awareness of the factors that may influence metaphor comprehension.

Keywords: metaphor comprehension, scientific communication, teacher metaphors, Self-Assessment Manikin, two-mode network analysis.

Resumen

El uso de metáforas en la comunicación académica: trampas o tesoros

Los racionalistas y los empiristas del siglo XVII argumentaron que la metáfora es un medio débil para expresar verdades objectivas y que debería ser sustituida por expresiones literales. Por un lado, el artículo está de acuerdo con Lakoff y Johnson (1980 y 1999) en que la metáfora es útil para alcanzar y expresar verdades y explica porque "metaphors are necessary and not just nice" en la communicacion académica (Ortony, 1975:45). Por otro lado, el artículo presenta los resultados de un experimento psicologico cognitivo que demuestra que la comprensión de la metáfora está condicionada por los conocimientos conceptuales de la gente y por el contexto en el cuál la metáfora aparece. Los autores abogan por un uso consciente de la metáfora en la comunicacion académica teniendo en cuenta los factores que puedan influir en el entendimiento de la metáfora.

Palabras clave: comprensión de metáforas, comunicación científica, metáforas del docente, *Self-assessment Manikin*, análisis de redes bimodales.

Introduction

In this article, academic communication refers to the knowledge-based scientific communication (Leydesdorff, 1997) in the form of scientific publications and other scholarly activities including presentations in academic conferences and lectures at universities. Distinguished from other forms of communications, academic communication mainly aims at facilitating the creation and the spreading of knowledge and is expected to be factual, objective and direct.

When the first scientific journal was published in the seventeenth century (Ornstein, 1928), rationalists and empiricists at that time were enthusiastic in discussing what kind of language should be used for academic writings. Motivated by the goal of pursuing the plain truth and aesthetic simplicity, they regarded metaphor as an additional or superfluous rhetoric device and claimed that metaphor had nothing to do with the course of capturing things-in-themselves and should be excluded from scientific communication. Hobbes (1588-1679) argued, "[m]etaphors, and senseless, ambiguous words, are like *ignes fatui*; and reasoning upon them, is wandering amongst innumerable absurdities" (Hobbes, [1651] 1996: 36). Ortony (1979) summarized the condemnatory view of metaphor in scientific communication.

> They are fuzzy and vague, inessential frills, appropriate for the purpose of the politician and of the poet, but not for those of the scientists, who are attempting to furnish an objective description of physical reality. (Ortony, 1979: 2)

Two claims are attributed to this condemnation view of metaphors. One claim is that metaphor is unable to reveal objective truth. The other claim is that metaphor can be paraphrased in a neutral literal way without losing its meaning. This article presents Lakoff and Johnson's (1980 & 1999) experiential view to deal with the first claim and rejects the second one through emphasizing the irreplaceable functions of metaphor in academic communication. However, not only the question of whether metaphor can

encode truth and knowledge shall be involved in the discussion of metaphor usage in academic communications but also the question of whether metaphor can be well decoded, or in other words, well comprehended. The focus of this study is to deal with the latter from a cognitive psychological perspective.

Metaphor and experiential truth

Lakoff and Johnson (1999) took an embodiment approach to tackle the issue of metaphor and truth. They questioned the existence of an absolute objective and advocated an experientialist account of truth. According to them, people's experiential interaction with the world can provide a stable basis for their knowledge. Meaning is based on understanding, which is largely structured by people's embodiment and their imaginative process. Metaphor is regarded as a chief vehicle for people to achieve such an understanding, as it enables them to map their experiences in one domain onto another domain. For instance, people may use their concrete experience with "plants" to talk about abstract "ideas" by saying MATHEMATICS HAS MANY BRANCHES (Lakoff & Johnson, 1980) or even use "water current" to create one of the basic electronic terms, "(electric) current". A statement, whether in the form of a literal or metaphorical utterance can express experiential truth so far it is coherent with people's basic-level perception and accepted by the scientific communities (Stambuk, 1998).

The irreplaceable position of metaphor

Metaphor is not decorative, but omnipresent in language (Richards, 1936). It can not be simply replaced by literal statements. Ortony (1975) employed three hypotheses to support his assertion that "metaphors are necessary and not just nice" (1975: 45). These are:

- The "inexpressibility hypothesis" suggests that metaphors can express ideas, which are otherwise not easy or even impossible to express in literal language.

- The "compactness hypothesis" emphasizes the direct and concise form of a metaphor to capture the essence of a particular experience.

- The "vividness hypothesis" suggests that intangible complex and relational aspects of ideas are more communicable through metaphors.

In scientific communication, metaphors can communicate abstract scientific ideas, conceptualize scientific problems and influence the ways in which the problems are approached (Huber, 2005). The "model of atom" proposed by Niels Bohr (1885-1962) uses the "structure of the solar system" to explain "the structure of the atom". In the field of communication, the transmission metaphor underlies Shanon and Weaver's (1949) mathematical model. Draaisma (1999) collected abundant metaphors that have permeated the history of psychological memory studies, for instance, "memory" as PHOSPHOR, MICRO COSMOS, CONSCIOUS PHOTOGRAPHY, PHOTOGRAPHY, COMPUTER, NETWORK, HOLOGRAM, and so on. Stambuk (1998) pointed out that metaphor can use existing language structure to create new conceptual categories in communicating new knowledge.

> In order to communicate new knowledge in any field of human experience, including areas of science and technology, we need language structure which can express new conceptual categories (…) One of the ways of creating new language structures by means of existing ones is a metaphorical use of the language. (Stambuk, 1998: 373)

Why is metaphor so important to communicate new knowledge? Again, the embodiment hypothesis provides a good explanation. Due to people's common embodiment, experiences and imaginative capacities, many concepts and basic forms of reasoning can be shared, which is vital for academic communication. Lakoff (1993) argued that metaphor can greatly facilitate people's abstract thinking because it allows them to project structure from well-structured sensorimotor domains to less structured domains. In his original words, "[m]etaphor is the main mechanism through which we comprehend abstract concepts and perform abstract reasoning" (Lakoff, 1993: 244). Through this mechanism, people are enabled to access a new idea or new experience more easily through retrieving their former relevant experience. In this sense, metaphors can hardly be replaced by literal statements in academic communications.

The problem of metaphor comprehension

Motivated by the flourishing of metaphors in various academic disciplines, numerous studies have been conducted to demonstrate the vital position of metaphor in economics and management (Morgan, 1986; Inns, 2002), in psychology (Roediger, 1980; Sternberg, 1995), in media communication (Forceville, 1996), in political science (Mio, 1997), in computer science (Carroll, Mack & Kellogg, 1991) and so on.

By contrast, ambiguity or misunderstanding in academic communication resulting from the misinterpretation of metaphor has been vastly neglected. One of the few studies concerning this issue is Littlemore's (2001) examination of metaphor usage in lectures at a British university. This study showed that the students often misunderstood the main points of lectures and they misinterpreted the lectures' stance toward the topic of the lectures because they were unable to comprehend the prevalent metaphors frequently used by the lecturers.

There are a number of cognitive linguistic and cognitive psychological studies concerning metaphor comprehension. According to the standard pragmatic model of metaphor processing (Grice, 1975), metaphor comprehension involves several stages, including first the recognition of incompatible truth after attempting literal interpretation, and then the reconstruction of possible meaning and proper interpretation of the utterance (Miller, 1979).

However, a large number of empirical work refutes the assumption that literal processing is necessary and obligatory prior to metaphorical processing (Keysar, 1989). Gibbs's (1994) direct access model (1994) suggests that metaphors are interpreted directly and the cognitive understanding processes of metaphorical and literal language are essentially the same. Moreover, other empirical studies also suggest that metaphors do not have to take longer to comprehend than literal statements when sufficient context is provided (Glucksberg, 1998).

Coulson and Van Petten's (2002) continuity claim suggests that both literal and metaphorical language processing "occur in the same course and involve the same processing mechanism" (Coulson & Van Petten, 2002: 959). However, they strongly rejected the view that metaphorical sentences are no more difficult to comprehend than literal language. In their opinion, metaphorical language requires more cognitive effort for processing,

although both literal and metaphorical language may take the same amount of time to comprehend.

Moreover, Giora (1997) argued that the comprehension of metaphors, in comparison to the literal statements may involve different processes (direct/ parallel/ sequential) that depend on different types of metaphors.

Several factors have been identified that can affect metaphor comprehension. First, a number of empirical studies suggest that "context" greatly facilitates metaphor comprehension (Gibbs, 1994; Glucksberg, 1998). Second, Jones and Estes (2006) agreed with Bowdle and Gentner (2005) that the "conventionality" of a metaphor affects how people comprehend it. Jones and Estes (2006: 23) defined conventionality as "the extent to which the concept is associated with a figurative meaning", whereas Bowdle and Gentner (2005) suggested that conventionality is closely related to whether a domain-general category is available through the base term (vehicle). Third, Chiappe, Kennedy and Chiappe (2003) argued that aptness is an important factor that affects metaphor comprehension. They defined aptness as "the extent to which the statement captures important features of the topic" (Chiappe, Kennedy & Chiappe, 2003: 97).

In this cognitive psychological study of metaphor comprehension, the authors combine the factors affecting metaphor comprehension and draw the following hypothesis: the comprehension of metaphor can be greatly influenced by the pre-existing conceptual knowledge as indicated by the conventionality and the aptness of the metaphor in question and the context in which that metaphor appears.

An online experiment on comprehending teacher metaphors

In order to test the hypothesis raised above, a cross-cultural online experiment was conducted through exploring pre-service teachers' comprehension of three teacher metaphors (Bullough, 1994). Two cultural groups, Chinese and German participants were involved because it is a convenient way to obtain two experimental groups, whose estimation of the conventionality and aptness of a metaphor may differ from one another to a considerable degree. The experiment was conducted in participants' native language. The original text was written in German and translated into

Chinese. The whole experiment was designed in internet format and implemented at the virtual experiment laboratory, Lab.OR, developed by Heineken, Schulte and Ollesch (2003). To explore how subjects understood three teacher metaphors, both the affective impression and the conceptual representation of the metaphors were explored.

Subjects

Ninety Chinese students at Wuhan Jianghan University and Nanjing University and ninety German students at the University of Duisburg-Essen and the University of Dortmund completed this experiment. All of them were sophomores engaged in their pre-service teacher education. They were informed about this online research and the corresponding URL addresses[1] either by their lecturers or by the experimenter during the lectures at their corresponding universities. After the lectures, they participated in the experiment through the Internet on a voluntary basis without the presence of the experimenter.

Material

The metaphors used for the experiment were selected on the basis of a pilot study, in which 30 Chinese and 30 German students at the University of Duisburg-Essen were asked to list out three teacher metaphors and rate how conventional (familiar) and apt (appropriate) those metaphors appeared to them on a scale of 1 (very novel) to 5 (very familiar). As a result, the following three metaphors were selected:

1) The teacher is a candle, which was estimated by the Chinese as a very conventional and very apt metaphor but by the Germans as novel and inapt;

2) The teacher is a shepherd, which was estimated by the Germans as conventional and apt but by the Chinese as less conventional and less apt; and

3) The teacher is a captain, which was estimated by both the Chinese and the Germans as a less conventional but apt teacher metaphor.

In order to evaluate the affective impression of the metaphors, this experiment adopted the so-called Self-Assessment Manikin (SAM) devised by Lang (1985). The SAM (see Figure 1) is a five-point likert pictorial scale,

allowing for direct ratings of "dominance dimension" (from a very small figure representing a feeling of being controlled to a very big figure representing in-control), "pleasure dimension" (from a frowning unhappy figure to a smiling happy figurer) and "arousal dimension" (from a sleepy quiet figure to a very excited figure).
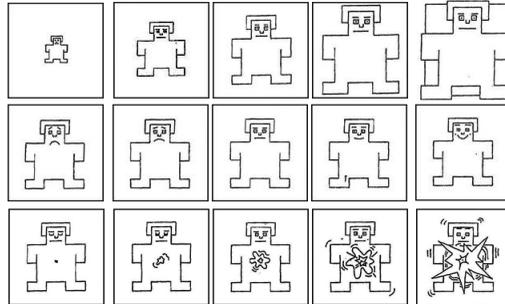

Figure 1: The self- assessment manikin (see Morris, 1995: 64).

The graphic SAM is adopted in this study for two reasons. First, the SAM is as reliable as the classic method, the semantic differential (SD) (Osgood, Suci & Tannenbaum, 1957), for measuring affective meanings. Lang (1985) found that there were positive correlations between the scores obtained using the SAM and those from the SD for dominance (.66), pleasure (.94) and arousal (.94) in his study. Morris and Bradley (1994) used the SAM to re-evaluate 135 emotion adjectives that were factor analyzed by Russell and Mehrabian (1977) and obtained similar results. Second, compared with the SD, the SAM is argued to be a culture-free and language free measure that costs less time to complete and causes less respondent wear-out (Bradley & Lang, 1994).

In order to explore the conceptual representation of the metaphors, thirty-three features[2] were rated in the experiment according to their suitability to the teacher metaphor. Those features were generated by the Chinese and the German participants of a pilot study as the most important features of the source concepts (CANDLE, CAPTAIN and SHEPHERD) or the target concept (TEACHER).

Procedure

After the participants entered their personal information, the experiment started. First, they were asked to imagine a teacher according to a specific

teacher metaphor (THE TEACHER IS A CANDLE, THE TEACHER IS A SHEPHERD or THE TEACHER IS A CAPTAIN). The participants with the same metaphor were randomly led to one of the three conditions set by the computer, namely, no role play, positive role play, negative role play. In the role play, participants were asked to play the role of a new class teacher at a virtual middle school for a complete school year. They were required to behave in keeping with the teacher image that they were presented. For every quarter of a school year, they received a timely class report. Each report appeared on the screen for only 60 seconds.

The text of each class report included twelve items in three aspects: class situation, pupils' behaviour, and parents' opinions. In each aspect, four items were presented. Three items reflected three metaphorical teacher images and the other one was formulated in a neutral way, free from the influence of any metaphorical teacher image. For instance, the parents' opinions in one of the class reports included the following items: 1) The teacher protects the pupils carefully (SHEPHERD image); 2) The pupils' parents are satisfied with the teacher (neutral expression); 3) The teacher's authoritarian attitude was found to be appealing (CAPTAIN image); 4) The selfless engagement of the teacher is meritorious (CANDLE image).

In order to control the primacy-recency effect, the neutral items and the items reflecting the metaphorical teacher image appeared in an order randomized by the computer system. The class teacher was given four minutes to write an email message[3] to his/her class in keeping with the class report. After four minutes, the email page disappeared and the participants were automatically led to the next task. By positive role-play condition, the participants constantly received positive feedback, whereas the others received negative feedback under the negative role play condition. A participant would encounter a positive or a negative role play (randomized by the Lab. OR system), independent from the participant's email writings.

After the role play, the pictorial dominance dimension of the SAM first appeared on the screen. Participants were asked to select one of the five pictorial manikins that best suited their impression of the provided teacher image. After their click, they would be led to the estimation of the pleasure and the arousal dimension. Then participants were asked to rate how suitable the thirty-three features could be used to describe the provided teacher image in separate pages.

Design

This empirical study has a three-factorial design with "cultural group", "metaphor" and "context" as the three factors. The factor "cultural group" has two levels (1: Chinese; 2: Germans), the factor "metaphor" three levels (1: CANDLE; 2: CAPTAIN; 3: SHEPHERD) and the factor "context" three levels (1: no role play; 2: positive role play; 3: negative role play).

Results and discussion

The SAM ratings were submitted to a three-factorial multivariate analysis of variance. The feature ratings were submitted to the network analysis.

1) Analysis of the SAM ratings

According to the three-factorial multivariate analysis of variance, not only the factor "metaphor" ($F(6,290)=3,34$, $p<.01$) but also the factor "context" ($F(6,290)=16,18$, $p<.001$) had a significant effect on the SAM ratings of their impression of TEACHER. Although the factor "cultural group" did not seem to exert a main factor effect ($F(3,144)=,424$, $p> 0.5$), a significant interaction between the factor "cultural group" and the factor "metaphor" ($F(6,290)=6,31$, $p<.001$) was available.

Figure 2 shows how the Chinese and the Germans rated the SAM according to their affective impression of the concept TEACHER in three different TEACHER metaphors. When the metaphor THE TEACHER IS A CANDLE was provided, the Chinese impression on the concept TEACHER turned out to be more powerful, more pleasant and more active than that of the Germans. The error bars of the Chinese ratings on the three SAM dimensions were shorter than those of the German ratings. This shows that the Chinese had a stronger congruence in their ratings than the Germans. By contrast, the Germans rated the dominance dimension, the pleasure dimension and the arousal dimension according to their impression on the concept TEACHER higher than the Chinese when the metaphor THE TEACHER IS A SHEPHERD was provided. Under the condition of the metaphor THE TEACHER IS A SHEPHERD, the error bars of the German ratings on the three SAM dimensions were shorter than those of the Chinese ratings. This suggests that the Germans had a stronger congruence in their ratings of the concept TEACHER in the metaphor THE TEACHER IS A SHEPHERD than the Chinese. The figure also

shows that the Chinese and the German impression profiles of the concept TEACHER in the metaphor THE TEACHER IS A CAPTAIN did not differ so much from each other as under the condition of the other two teacher metaphors. However, the German subjects seemed to have a more pleasant impression on the concept TEACHER in the metaphor THE TEACHER IS A CAPTAIN than the Chinese subjects.
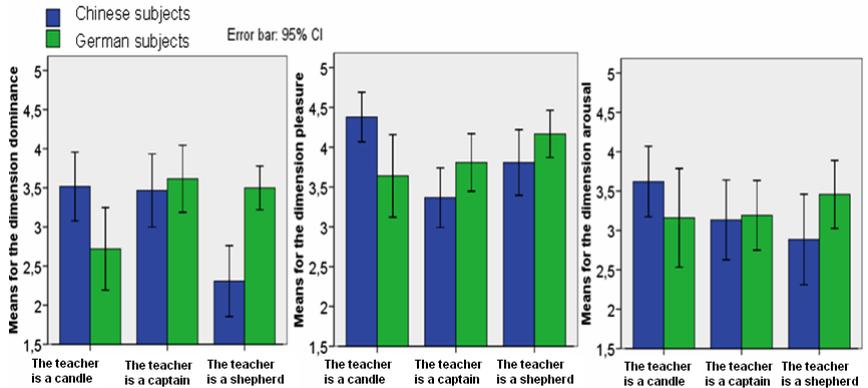

Figure 2: The Chinese and the German SAM ratings of the concept TEACHER under the conditions of different teacher metaphors. (The three SAM dimensions: dominance, pleasure, and arousal).

Taking the factor "role play" as the focus, Figure 3 shows how the Chinese and the German subjects rated the SAM according to their affective impression of the concept TEACHER in various teacher metaphors under the different role play conditions. Under the positive role-play condition, both the Chinese and the Germans rated all the three dimensions of the SAM according to their affective impression on the concept TEACHER higher than under the condition of no role play or the negative role play. Under the conditions of the role play with the negative development, the Chinese and the German impression profiles of the concept TEACHER were less powerful, less pleasant and less active than under the condition of the positive role play. This shows that the factor "role play" plays an important role in affecting the Chinese and the Germans' affective impression on the concept TEACHER in various teacher metaphors.
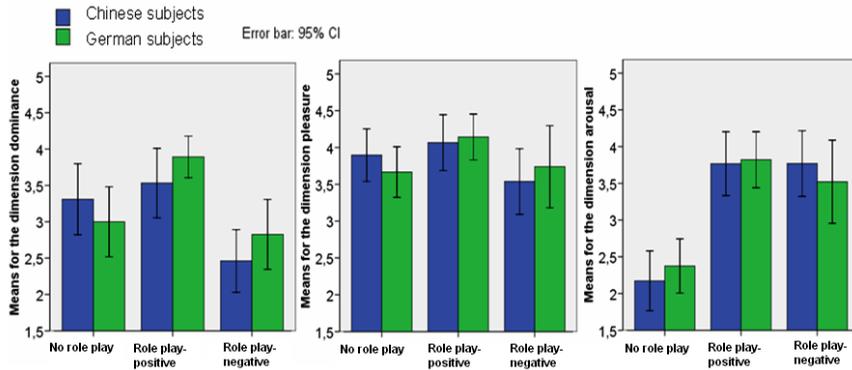
Figure 3: The Chinese and the German SAM ratings of concept TEACHER under the different role-play conditions. (The three SAM dimensions: dominance, pleasure, and arousal).

2) Analysis of the feature ratings

In this study, the two-mode network analysis was used to compare how the Chinese subjects and the German subjects rated the suitability of the thirty-three features in describing three metaphors. The two-mode network analysis involves actor-by-event or case-by-affiliation data sets (Doreian, Batagelj & Ferligoj, 2004). In this study, "events" referred to the ratings of the 33 features; "actors" referred to the subjects under the correspondent experimental condition. To express it in a more mathematical way, the bipartite networks N= (V_1, V_2, E) actually had their vertex V set partitioned into two subsets V_1 (actors, Chinese subjects or German subjects) and V_2 (events, the ratings of the 33 features).

For the quantities description of the networks, two network measures, namely the "network degree centralisation index" and the "density" of the networks were calculated through the UCINET 6 software package (Borgatti, Everett & Freeman, 2002). For each experiment condition, there were ten German subjects and ten Chinese subjects. Since the networks constructed under all conditions shared the identical numbers of the vertices (V_1:10 subjects and V_2:33 features), the "network degree centralisation index" and the "density" can be employed for the comparison between the correspondent bipartite networks constructed according to the Chinese and the Germans' feature ratings under various experimental conditions.

The network degree centralisation is related to a compactness property of a network. The "network degree centralisation index" is a number between 0 and 1. The index is 0 when all vertices have equal centrality value, and 1

when one vertex completely dominates all others. In this study, the "network degree centralisation, C_D" (Freeman, 1977) was calculated according to the following measure:

$$C_D = \frac{\sum_{x \in E}(C_D^* - C_D(x))}{n-2}$$

where C^*_D is the highest value of selected vertex degree centrality measure C_D (x).

Like the C_D, the density of network also takes on a value between 0 and 1. It is a measure of connectedness of the network.

$$Density = \frac{2\sum_{i,j \in V} a_{ij}}{n(n-1)}$$

When the density of a network is closer to 1, the network is considered dense. Otherwise, it is sparse. In this case, a denser network indicates that more subjects rate the suitability of the 33 features higher than those which are involved in a less dense network.

In the bipartite networks constructed according to the feature ratings, edges with value less than 3 were removed from the network. The results are presented in Table 1. The Chinese network based on their feature ratings of the metaphor THE TEACHER IS A CANDLE without role play is both more compact (C_D: 0.4223>0.3992) and more dense (0.7553>0.4889) than that of the German network (see also Figure 3). It indicates that the Chinese agreed with each other more than the Germans did in their ratings and the Chinese rated those features much higher than the Germans. After the positive role play, the C_D raised to 0.4125 and the density to 0.6375 according to the Germans' feature ratings, which resulted in a decrease of the difference between the Chinese and the Germans. In contrast, the negative role play produced less high ratings and less congruence among the subjects in their ratings.

By contrast, the German network of the metaphor THE TEACHER IS A SHEPHERD under the condition of no role play is more compact (C_D: 0.4532>0.3965) and more dense (0.7054>0.6262) than that of the Chinese

network. After the role play with the positive development was provided, the C_D of the Chinese network increased to 0.4084, and the density increased to 0.6694 in comparison of the no role-play condition. This shows that the positive role-play context produced higher ratings and more congruence among the subjects in their ratings.

Compared with the two metaphors mentioned above, THE TEACHER IS A CAPTAIN did not exert as much obvious cultural differences. Under each role-play condition, both the C_D and the density of the networks constructed according to the Chinese ratings were slightly higher than their German counterparts.

Teacher Metaphors	Role plays	Cultural groups	network degree centralisation (C_D)	Density
THE TEACHER IS A CANDLE	No role play	Chinese	0.4423	0.7553
		Germans	0.3992	0.4889
	Role play-positive	Chinese	0.4227	0.7664
		Germans	0.4125	0.6357
	Role play-negative	Chinese	0.4560	0.6750
		Germans	0.3950	0.6179
THE TEACHER IS A CAPTAIN	No role play	Chinese	0.4383	0.7171
		Germans	0.4227	0.7011
	Role play-positive	Chinese	0.4272	0.7674
		Germans	0.4109	0.6872
	Role play-negative	Chinese	0.4832	0.7054
		Germans	0.4525	0.6833
THE TEACHER IS A SHEPHERD	No role play	Chinese	0.3965	0.6262
		Germans	0.4532	0.7054
	Role play-positive	Chinese	0.4084	0.6694
		Germans	0.4501	0.7010
	Role play-negative	Chinese	0.4262	0.6506
		Germans	0.4053	0.7243

Table 1: The C_D and the density of the bipartite networks constructed according to the 33 feature ratings.

Based on the feature ratings of different metaphors under various conditions, altogether eighteen bipartite graphs were drawn using the software "Pajek" (Batagelj & Mrvar, 2007). Here only the bipartite graph of the network obtained under the condition of THE TEACHER IS A CANDLE without role play is presented as an example.

In Figure 4, the actors (the Chinese and the Germans) and the events (ratings of the 33 features) were treated as different vertices, and lines or edges were

used to show the connections of actors (subjects) to the events (features). Actors tended to locate closer if they rated the features more similarly. Obviously, the white vertices are located in a more condensed manner than the black vertices, which shows that a stronger congruence among the Chinese in their feature ratings. On the contrary, the Germans differed greatly from each other in their ratings. This indicates the lack of a consistent view of this metaphor among the Germans.
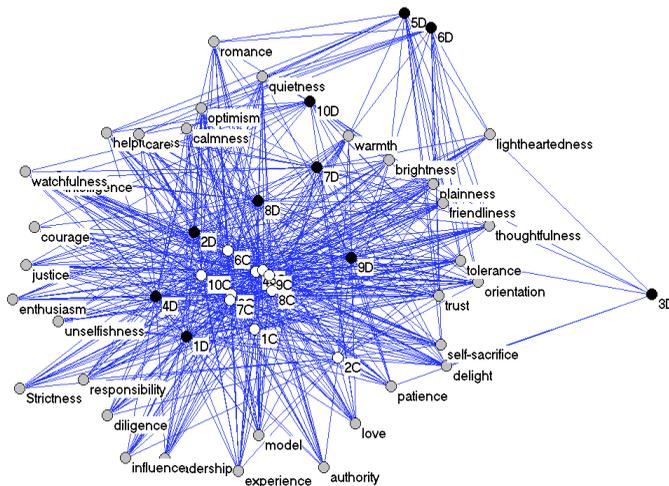

Figure 4: Bipartite graph based on the feature ratings on THE TEACHER IS A CANDLE under the condition of no role play   (C: Chinese, D: Germans).

In all, both the SAM evaluation and the network analysis of the feature ratings show that there was a stronger consensus among the Chinese in not only their affective impression but also the conceptual representation of the metaphor THE TEACHER IS A CANDLE. Conversely, the Germans affectively and conceptually agreed with each other more than the Chinese in understanding the metaphor THE TEACHER IS A SHEPHERD. As to the metaphor THE TEACHER IS A CAPTAIN, there were no obvious cultural differences. This indicates that a metaphor can be interpreted by different people differently due to the differences of their relevant pre-existing conceptual knowledge. THE TEACHER IS A CANDLE was estimated by the Chinese as a conventional and apt metaphor, because the source concept CANDLE involves a pre-existing metaphorical meaning of "self-sacrifice" and "unselfishness" in the common Chinese understanding.

This metaphorical meaning of *candle* originates from the well-known poem *Untitled* written by Li, Shangyin (813-858). Lacking this background, the Germans found it hard to access this metaphorical meaning unless it could be imported from a context. By contrast, the Germans regarded THE TEACHER IS A SHEPHERD as a conventional and apt metaphor. For them, SHEPHERD means "love" and "care" because they all know "Jesus is our shepherd" from the Holy Bible. Since most of the Chinese are free from the influence of Christianity, it is hard for them to attain this metaphorical meaning of SHEPHERD. There were no big differences between the Chinese and the German affective impression and conceptual representation of the metaphor THE TEACHER IS A CAPTAIN, because their preexisting conceptual knowledge of CAPTAIN is more or less similar.

Another important finding is that context plays an important role in metaphor comprehension. The role play with the positive development encourages the congruence of the subjects' understanding of the metaphor. The role play with the negative development causes more absurdities in understanding the metaphor. In all, this empirical study shows that the comprehension of a metaphor is related to the pre-existing conceptual knowledge of metaphor addressees, and the context, in which the metaphor appears.

Discussion

According to results of the empirical study, the meaning of a metaphor is not necessarily obvious and constant and the metaphor comprehension is not a static process, but a dynamic one. The dynamics of metaphor comprehension can be demonstrated in the following two aspects:

1) the understanding of a metaphor may vary from person to person, according to their relevant pre-existing conceptual knowledge;

2) even the same person may understand one metaphor differently in different contexts. In an appropriate context, novel metaphors can be learned.

The dynamics of metaphor comprehension largely results from the complex dynamic systems of language, thinking, affect, physicality and culture, of which metaphor is a part:

> Metaphor (…) has multiple interconnected dimensions: linguistic, cognitive, affective, physical and cultural (…) All dimensions of metaphor are dynamic, i.e. they unfold continuously in real time. Metaphor, in all its manifestations, can then be seen as a part of the continuously changing and interconnected systems of language, thinking, affect, physicality and culture. (Cameron, 2006: para. 1)

With the interconnected complex dynamic systems of language, thinking, affect, physicality and culture as its frameworks, metaphor is like a brilliant cut diamond, which has many attractive facets that manifest the best play of light: Some metaphors are only used within a special community to sustain intimacy for affective purpose; some other metaphors reflect the strong influence of the bodily experiences on our language and thinking; while yet other metaphors are culturally specific; so on and so forth. As a matter of fact, the inter-weaving of all those phenomena is reflected in the complexity of metaphor comprehension.

In order to ensure the goal of creating and spreading knowledge, metaphor shall be used cautiously in academic communication to avoid unwanted misunderstanding and ambiguity. Conventional and apt metaphors are relatively safe to be used because a congruent understanding of the metaphorical meaning is easy to attain among most people. Nevertheless, most metaphors used in especially academic communication are novel metaphors or are at least used in an innovative way to communicate new knowledge or to provide a new perspective of seeing things (Stambuk, 1998). This makes it more important for metaphor users to provide their readers or audience sufficient background information in context to ensure the accessibility to that metaphorical meaning.

In conclusion, the academic usage of metaphor is no longer a to-be-or-not-to be question, as once puzzled rationalists and empiricists in the seventeenth century. When metaphors are used to conceptualize theoretical constructs or communicate new knowledge in academic communication, they should be carefully selected and presented in appropriate contexts so as to ensure that the addressees can easily derive the intended metaphorical meaning.

Acknowledgements

also like to thank Holly Berg and Kevin Berg for improving the English language in this paper.

References

Batagelj, V. & A. Mrvar (2007). "Pajek program for analysis and visualisation of large network – Reference manual*"*. URL: http://vlado.fmf.uni-lj.si/pub/networks/pajek/doc/PajekMan.pdf [30/06/07]

Bowdle, B. & D. Gentner (2005). "The career of metaphor". *Psychological Review* 112: 193-216.

Borgatti, S.P., M.G. Everett & L.C. Freeman (2002). *Ucinet for Windows: Software for Social Network Analysis*. Harvard, MA: Analytic Technologies.

Bradley, M.M. & P.J. Lang (1994). "Measuring emotion: the self-assessment manikin and the semantic differential". *J Behav Ther Exp Psychiatry* 25: 49-59.

Bullough, R.V., Jr. (1994). "Beginning teacher curriculum decision making, personal teaching metaphors, and teacher education". *Teaching and Teacher Education* 8: 239-252.

Cameron, L. (2006). *A discourse dynamics framework for metaphor*. URL: http://creet.open.ac.uk/projects/metaphor-analysis/theories.cfm?paper=ddfm [10/20/07]

Carroll, J.M., R. Mack & W. Kellogg (1991). "Interface metaphors and user interface design" in M. Helander (ed.), *Handbook of Human-Computer Interaction*, 67-85. Amsterdam: Elsevier Science Publishers.

Chiappe, D.L., J.M. Kennedy & P. Chiappe (2003). "Aptness is more important than comprehensibility in preference for metaphors and similes". *Poetics* 31: 51-68.

Coulson, S. & C. Van Petten (2002). "Conceptual integration and metaphor: An event-related potential study". *Memory and Cognition* 30: 958-968.

Doreian, P., V. Batagelj & A. Ferligoj (2004). "Generalized block modelling of two-mode network data". *Social Networks* 26: 29-53.

Draaisma, D. (1999). *Die Metaphernmaschine: Eine Geschichte des Gedächtnisses*. Darmstadt: Primus Verlag.

Forceville, C. (1996). *Pictorial Metaphor in Advertising*. London: Routledge.

Freeman, L.C. (1977). "A set of measures of centrality based on betweeness". *Sociometry* 40: 35-40.

Gibbs, R. (1994). *The politics of Mind*. Cambridge: Cambridge University Press.

Giora, R. (1997). "Understanding figurative and literal language: The graded salience hypothesis". *Cognitive Linguistics* 7: 183-206.

Glucksberg, S. (1998). "Understanding metaphors". *Current Directions in Psychological Science* 7: 39-43.

Grice, H. (1975). "Logic and conversation" in P. Cole & J. Morgan (eds.), *Syntax and Semantics: Speech Acts*, 41-58. New York: Academic Press.

Heineken, E., F.P. Schulte & H. Ollesch (2003). "Experimentalpsychologische Ausbildung im virtuellen Labor: Das Laboratorium für Online-Research (Lab.OR)" in Krampen, G. & H. Zayer (Hrsg.), *Psychologiedidaktik und Evaluation* IV, 7-20. Bonn: Deutscher Psychologen Verlag.

Hobbes, T. [1651] (1996). *Leviathan*. Edited by Richard Tuck. Cambridge: Cambridge University Press.

Huber, A. (2005). *Metaphorik und Handeln. Metaphorisches Priming am Beispiel der Vorgesetzten-Mitarbeiter-Kommunikation - eine experimentelle Untersuchung in virturellem Setting*. Unpublished doctoral dissertation. University of Essen-Duisburg, Duisburg, Germany.

Inns, D. (2002). "Metaphor in the literature of organizational analysis: A preliminary taxonomy". *Organization* 9: 305-330.

Jones, L. & Z. Estes (2006). "Roosters, robins, and alarm clocks: Aptness and conventionality in metaphor comprehension". *Journal of Memory and Language* 55: 18-32.

Keysar, B. (1989). "On the functional equivalence of literal and metaphorical interpretations". *Journal of Memory and Language* 28: 375-385.

Lakoff, G. & M. Johnson (1980). *Metaphors We Live by*. Chicago: University of Chicago Press.

Lakoff, G. (1993). "The contemporary theory of metaphor" in A. Ortony (ed.), *Metaphor and Thought*, 2nd ed., 202-251. Cambridge: Cambridge University Press.

Lakoff, G. & M. Johnson (1999). *Philosophy in the Flesh. The Embodied Mind and its challenge to western thought*. New York: Basic Books.

Lang, P. (1985). "The cognitive psychophysiology of emotion: fear and anxiety" in A. Tuma & I. Master (eds.), 131-170. Hillsdale, NJ: Lawrence Erlbaum.

Leydesdorff, L.(1997). "Why words and co-words cannot map the development of the sciences". *Journal of the American Society for Information Science,* 48, 5:418-427.

Littlemore, J. (2001). "The use of metaphor in university lectures and the problems that it causes for overseas students". *Teaching in Higher Education* 6: 333-349.

Miller, G. (1979). "Images and models, similes and metaphors" in A. Ortony (ed.), *Metaphor and Thought,* 202-250. Cambridge: Cambridge University Press.

Mio, J.S. (1997). "Metaphor and politics". *Metaphor and Symbolic Activity* 12: 113-133.

Morgan, G. (1986). *Images of Organization*. Beverly Hills, CA: Sage.

Morris, J.D. (1995). "Observations SAM: The self-assessment manikin –An efficient cross-cultural measurement of emotional response". *Journal of Advertising Research* 35/8: 63-68.

Morris, J.D. & M. Bradley (1994). "Assessing affective reactions to emotion terms and television advertisements with (SAM) the Self-Assessment Manikin". Unpublished Working Paper. University of Florida, College of Journalism and Communication.

Ornstein, M. (1928). *Role of Scientific Societies in the Seventeenth Century*. Chicago: University of Chicago Press. Reprinted in 1963 by Archon books, London.

Ortony, A. (1975). "Why metaphors are necessary and not just nice". *Educational Theory* 25: 45-53.

Ortony, A. (1979). "Metaphor: A multidimensional problem" in A. Ortony (ed.), *Metaphor and Thought*, 1-16. Cambridge: Cambridge University Press.

Osgood, C., G. Suci & P. Tannenbaum (1957). *The Measurement of Meaning*. Urbana: University of Illinois Press.

Richards, I.A. (1936). *The Philosophy of Rhetoric*. New York: Oxford University Press.

Roediger, H.L. (1980). "Memory metaphors in cognitive psychology". *Memory and Cognition* 8: 231-246.

Russell, J. & Mehrabian, A. (1977). "Evidence for a three-factor theory of emotions". *Journal of Research in Personality* 11: 273-294.

Shannon, C.E. & W. Weaver (1949). *The Mathematical Theory of Communication*. Urbana: University of Illinois Press.

Sternberg, R.J. (1995). *In Search of the Human Mind.* Fort Worth, TX: Harcourt.

Stambuk, A. (1998). "Metaphor in scientific communication". *Meta* 43: 373-379.

Tsoukas, H. (1993). "Analogical reasoning and knowledge generation in organization Theory". *Organization Studies* 14: 323-346.

Dehui Zhou has just finished her PhD supervised by Prof. Dr. Heineken at the Department of Informatics and Cognitive science at the University Duisburg-Essen, Germany. Her doctoral research focuses on metaphor cognition and representation.

Edgar Heineken is a full professor of general and experimental psychology at the Department of Informatics and Cognitive Science, University Duisburg-Essen, Germany. He is also a member of the board of the International Research Center for magnetic resonance in medicine and cognitive sciences (Erwin L. Hahn Institute for Magnetic Resonance Imaging) at the University Duisburg-Essen.

NOTES

[1] The URL address provided to the Chinese subjects was http://heineken.uni-duisburg.de/labor/versuche/dehui1. The URL address provided to the German subjects was http://heineken.uni-duisburg.de/labor/versuche/huber1.

[2] The English translations of the thirty-three features are: thoughtfulness, responsibility, intelligence, leadership, watchfulness, lightheartedness, delight, patience, plainness, enthusiasm, model, diligence, love, orientation, authority, influence, romance, helpfulness, unselfishness, experience, calmness, courage, quietness, justice, Strictness, self-sacrifice, optimism, friendliness, tolerance, trust, warmth, brightness, and care.

[3] The analysis of the subjects' emails is not provided here, because the purpose of reporting the experiment in this article is to explore metaphor comprehension from the cognitive psychological perspective. In this sense, the examination of the affective impression and the conceptual representation of the three teacher metaphors are of the most interest here.