From Non-Experimental to Experimental: A Discussion on Semantics Research Method: Scientific Discussion Paper

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ABSTRACT

Though having a substantial foot hold on the present-day understanding of meaning in language, semantic theory founded upon the Conceptual Metaphor paradigm has been frequently criticized as not having proper empirical grounding. The current paper shows that the flaw lies in not being in compliance with the epistemological principle of falsification. For contrast, several experimental-based works are reviewed, demonstrating how semantics research can be carried out with adequate scientific rigor. The paper concludes that student researchers in the graduate as well as the post graduate level should depart from customary practices of intuitive-based analysis and resort to experimentation in order to arrive at notions that can be proven either accurate or inaccurate.

Keywords: semantic theory, Conceptual Metaphor paradigm, empirically grounded, falsifiability, experimentation

Introduction

A substantial portion of present-day set of semantics theoretical knowledge has been contributed by Conceptual Metaphor theory that has undeniably extended our understanding of how language works in terms of word meaning. Much of this theory claimed to have an explanation as to how we construct meaning of our experiences since infancy. Not long after its induction, the theory became mainstream research in modern linguistics. However, the introspection-based technique of analysis on which Conceptual Metaphor theory was founded upon has attracted suspicion regarding its accuracy in depicting the semantic processes that takes place in the human mind. Because of this, McGlone (2007) challenged the methodological foundation of this stream of research by criticizing that it lacks empirical quality. According to McGlone, the claims that were made were merely based on an analysis of thematic coherences between expressions and so they represent textual tendencies but not necessarily mental tendencies. This presents Conceptual Metaphor theory's major weakness, i.e., that it relied on nothing more than the researchers' own intuitions.

The current paper demonstrates the major downside of early Conceptual Metaphor paradigm of using intuition-based analysis. The paper then provides an overview of several semantics research which makes use of experimental methods, enabling them to produce solid and acceptable findings. Lastly, the paper gives recommendation to the use of the Lexical Decision task as an efficient but highly effective experimental method in conducting research in semantics.

Review of non-experimental and experimental methods

Introspection-based analysis

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The first example used by Lakoff and Johnson (1980, p. 6) was the phrase ARGUMENTS ARE WARS. A list of metaphorical expressions relating to argument with war-related terms (bold typed) is given below.

Your claims are **indefensible**.

He **attacked** every weak point in my argument.

He **shot down** all my arguments.

Based on this, it was concluded by way of induction that the underlying metaphorical concept is ARGUMENT IS WAR[1]. The theorists explain that this particular manner of conceptual structuring is derived from the many expressions relating to arguments with war-related terms. They state that, "the fact that we conceptualize arguments in terms of battle systematically influences the shape arguments take."

Because Conceptual Metaphor theory remains somewhat speculative though it enjoyed reception by enthusiasts from around the world, unless concrete empirical evidence is provided, the theory can only be considered as 'helpful', but not accurate. On the basis of this, Boroditsky (2000) emphasized a need for a more rigorous empirical treatment of metaphorical representation for three purposes: 1) to propose a detailed account of how abstract concepts are learned, represented and reasoned about; 2) to provide psychological evidence in support of this proposal; and 3) showing that the current evidence is not consistent with plausible non-metaphoric accounts.

The theory was inspired by the work of Eleanor Rosch (1973) on categorization which revealed the property that information in the mind is organized based on Salient Features, allowing for economy and efficiency. A study on the perception of focal colors (such as blue, black, red, green) compared to non-focal colors (turqoise, maroon, crimson, etc.) revealed that it is more difficult for our minds to memorize the non-focal color terms compared to focal ones. Rosch (1975) also discovered that our minds have a tendency to select particular items that serve to exemplify a category. Among these exemplars, the mind prefers one to serve as the best example compared to the rest.

It is still beneficial to take some positives from Conceptual Metaphor theory provided that researchers move on to incorporating more effective methods of investigation to produce accurate representation of the reality of meaning processing in the mind. Boroditsky (2000, p. 112) suggests 3 types of concepts which directly arise out of physical experience, namely, 1) spatial relations; 2) physical ontological concepts; and 3) basic experiences, while "all other concepts that do not emerge directly out of physical experience must be metaphorical...structured through metaphorical mapping". Another positive is the notion that of a modal representations underlying concepts; the mind has abstract representations known as a modal representations (Boroditsky & Prinz, 2008).

Experimental-based Semantics Studies

Experimental methods allow compliance to the scientific requirement of falsification (Popper in Shea, 2016). Falsification refers to the principle that there must be a systematic way of determining whether a notion is correct or incorrect. If a person proposes that a notion is correct, there must be no possibility left that it is incorrect. Therefore the person must provide an acceptable method that can be used to prove the notion is wrong. However, when that the proposition has been determined to be not

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incorrect, then everybody's skepticism has been satisfied. Without this fair method, a notion can only be proposed as correct, but there is still probability that it is incorrect. This was the problem with Lakoff and Johnson's (1980) propositions on how the human mind works. Though these propositions carry some explanatory power, there is still a vast probability space that they are incorrect.

Presented in this section are several studies implementing experimental approaches that provides convincing grounding for semantic theory. We begin with a study done by Thibodeau & Boroditsky (2011) on the role of metaphors in human reasoning.

Thibodeau & Boroditsky (2011): The role of metaphors in reasoning

In Thibodeau & Boroditsky (2011), empirical evidence is given to show that the way we think or the way we reason can be metaphorical. Different groups of participants were asked to read a text on the issue of crime in a particular city and afterwards, the participants were asked to suggest appropriate strategies to solve the issue of crime in that city. The groups were given virtually the same text except that a different metaphor was inserted in each group's text. The result was that participants suggested strategies that cohere with the particular metaphor given in their text.

Prior to the actual experiment, a norming survey is performed, where 28 participants were asked to describe the best way to solve the problem as expressed in the depiction they were asked to imagine. One group was asked to imagine 'a <u>virus</u> infecting a city', while another group: 'a <u>wild beast</u> preying on a city.'

Thibodeau & Boroditsky presents the result as follows.
"Participants who imagined a 'virus infecting the city' universally suggested investigating the source of the virus and implementing social reforms and prevention measures to decrease the spread of the virus. They wanted to know where the virus was coming from, whether the city could develop a vaccine and how the virus was spreading. They also wanted to institute educational campaigns to inform residents about how to avoid or deal with the virus and encourage residents to follow better hygiene practices ... Participants who imagined a 'wild beast preying on a city' universally suggested capturing the beast and then killing or caging it. They wanted to organize a hunting party or hire animal control specialists to track down the beast and stop it from ravaging the city."

Experiment 1

In experiment 1, in addition to the metaphor in the opening sentence, a vivid verb with strong relational meaning was also placed in the middle of the report. The aim was to find out whether metaphor and framing influence the way people view or conceptualize the problem of crime by seeing that people suggested crime-fighting strategies which correspond to the way the problem was metaphorically expressed and framed in the report. The aim was to find out whether the participants notice the metaphor (or the influence of it) in the report

Group A Text Crime is a <u>virus infecting</u> the city of Addison. The crime rate in the once peaceful city has steadily increased over the past three years. In fact, these days it seems that crime is <u>plaguing</u> every neighborhood. In 2004, 46,177 crimes were reported

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compared to more than 55,000 reported in 2007. The rise in violent crime is particularly alarming. In 2004, there were 330 murders in the city, in 2007, there were over 500.

Questions:
1) In your opinion what does Addison need to do to reduce crime?
2) Please underline the part of the report that was most influential in your decision.

Group B Text
Crime is a <u>wild beast preying on</u> the city of Addison. The crime rate in the once peaceful city has steadily increased over the past three years. In fact, these days it seems that crime is <u>lurking</u> in every neighborhood. In 2004, 46,177 crimes were reported compared to more than 55,000 reported in 2007. The rise in violent crime is particularly alarming. In 2004, there were 330 murders in the city, in 2007, there were over 500.

Questions:
1) In your opinion what does Addison need to do to reduce crime?
2) Please underline the part of the report that was most influential in your decision.

In the norming study conducted during pre-experiment, respondents' suggestions for the 'virus attacking the city' situation can be likened to a reform kind of approach outlining such measures as diagnosing, treating and inoculating. Meanwhile the group given the 'beast attacking the city' situation made suggestions typified by an enforce kind of approach which entails such measures as capturing, enforcing and punishing.

Therefore, in experiment 1, solutions given by participants were coded into either one of these approaches, 'Reform' or 'Enforce'. The categories can be described further in the following table.

Table: Description of approaches

	'REFORM' **Diagnose-Treat- Inoculate**	**'ENFORCE'** **Capture-Enforce-Punish**
Participants' Suggestion	Investigating the underlying cause of the problem e.g. "look for the root cause"	Focus on the police force or other methods of law enforcement e.g. "call the national guard"
	Particular social reform to treat or inoculate the community e.g. "fix the economy" "improve education" "provide health care"	Modifying the criminal justice system e.g. "instituting harsher penalties" "building more jails"

Each participant may give any number of suggestions in the allowed time. Each suggestion is coded either 'Reform' or 'Enforce'. Each participant would contribute a value of 1 point. If all of a participant's answers fall exclusively into one approach, the value would be 1 towards that approach. If a participant gives a disproportionate ratio of suggestions, where say, one of the suggestions fall into the category of 'Reform', while two fall into the category of 'Enforce', then the category which received the larger

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number of suggestions receives 1 point towards analysis. If a participant gives the same number of suggestions for both approaches, this would contribute the value of 0.5 to each category.

The research discussions and conclusions seemed to have projected the concept of 'beast' metaphor elicits ideas of a more enforce-style strategy to solve the crime problem, whereas 'virus' metaphor influences people to a 'reform' approach of solving the problem.

Throughout the experiments, however, the respondents' predisposed choice was consistently towards the 'enforce' strategy of solving the crime problem. Though this would have been better confirmed if a control group with non-metaphoric, non lexical priming stimuli were conducted. None the less, the experiments strongly demonstrated that, to a certain extent, this predisposition can be reduced and influenced towards a more 'reform' choice of approach.

Apart from these internationally-acclaimed studies, there are also several more recent studies, such as, Tobing, Sinar, Nurlela, & Muchtar (2011) which used is an investigation into saliency as a dominating feature in meaning processing, implementing the lexical Decision task; Tobing, Panggabean & Sinar (2016) which presents an analysis of the junction between culture and cognition in ethnic speech style; and Tobing (2018) which presents an analysis being an extension from earlier quantitative-based work.

Blasko & Connine (1993): Comprehension of metaphors

Blasko & Connine (1993) conducted a study on the effects of familiarity and aptness in metaphor processing. to examine the comprehension of metaphors varying in familiarity and aptness. Five consecutive experiments were conducted, in which the number of participants ranged from 40-89 all of whom were university students. The participants heard the metaphorical sentence in audio form and they were asked to decide whether the word presented (which were either metaphorical target, a literal target or a control target) after the metaphorical sentence was relevant in meaning or not. The experiment design made sure that sentences used were ones where literal meaning was not plausible (see Table below). In the study, they also needed a norming survey to find out people's response with regards to the metaphor's familiarity and aptness, involving 44 participants aged 18-30.

Table: Metaphorical sentences and targets used in experiments

	MT	LWT	CNT
High-Familiar Metaphorical Sentences and Targets for Experiments 1 and 2			
1. He reminded his son that **FREEDOM IS TRUTH** after they finished their long walk.	liberty	honesty	inaugural
2. Only those who understand that **THE FAMILY IS A ROCK** will be ready to listen to the speech.	secure	hard	ginger
3. Jerry's father told him that **ADVENTURE IS A ROLLER-COASTER DURING THEIR LONG CONVERSATION**.	daring speed	ride gun	different long
4. The newscaster's comment that **THE**			

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| **ROCKET WAS A BULLET** was heard by the whole audience. | advance | rungs | pastry |
| 5. The belief that **HARD WORK IS A LADDER** is common to this generation. | | | |

Some important considerations for this lexical decision test was that:
1. Faster lexical decisions were assumed to indicate on-line activation.
2. MT   assess activation of metaphorical phrase that must be constructed online
3. LWT reflects lexical access of the final word in the metaphor, assuming to be required for metaphorical interpretation
4. The LWT allowed us to determine the effectiveness of the cross-modal priming paradigm in the event that no facilitation was obtained for the MT,   and to determine whether literal meaning faded as it was integrated into a figurative meaning.
5. An indirect processing model would predict that only literal interpretation would be immediately available. Faster reaction times (RTs) to LWT as compared with CNTs would be expected, whereas the MTs should not differ from the CNTs.

Table: Low familiar metaphorical sentences and targets used in experiments

	MT	LWT	CNT
Low-Familiar Metaphorical Sentences and Targets for Experiments 1-3			
Moderate apt			
1. Jason's roommate agreed that **A LONG DISTANCE SWIMMER IS A WARRIOR** when they talked about it.	stamina	sword	bread
2. The thought that **A GOOD PROFESSOR IS AN OASIS** was clung to by the entire class.	fulfilling	desert	slipper
3. Karen wrote in her diary that **THE STARS WERE SNOWFLAKES** under the entry for Friday evening.	unique	cold	fifteen
High apt			
1. Aunt Mabel showed the boys how **A DUSTY AND CROWDED ATTIC IS A PARADISE** that lazy Saturday afternoon.	turmoil	whistle	happening
2. It has been said that **THE FALL OF AN EMPIRE IS THE SUNSET** by many respected scholars.	memories	heaven	joining
	decline	colorful	sneaker
3. Jeff realized **that A SEA CAPTAIN IS A QUARTERBACK** after his last lesson.			

6. Alternatively, direct processing models predict that the metaphorical interpretation will be processed immediately, therefore LWTs and MTs will be faster than CNT.

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7. If familiarity influences the availability of a metaphorical interpretation, then facilitation for the MTs should likely be more for high-familiar metaphors.
The major finding in the study availability of the figurative meaning can be seen in high-familiar metaphors and not in low-familiar (LF) metaphors. Evidence of figurative activation can be seen for LF metaphors that had been rated highly apt. As for most LF and moderate-apt metaphors, figurative activation was found.

In terms of the locus of activation, activation of the metaphorical target was not caused by lexical activation of the words within the metaphors, but rather was due to activation of emergent properties of the metaphorical phrase. The evidence was that neither topic nor vehicle showed signs of priming the metaphor target. In other words there was no evidence of facilitation of the MT by either the topic or vehicle prime. Metaphor seems to involve the emergence of features that are salient characteristics of neither metaphorical term.

A powerful method for empirical semantics investigation

Researchers or student researchers looking for a basic but effective method for empirical semantic research should consider conducting experimentation using the Lexical Decision Task. In Lexical Decision Task, participants are asked to decide whether a letter string is an actual word in their language (Hasson & Giora 2007). For example, when a person is shown the word "gun", it takes a few milliseconds for the person to process and give response (this is called Reaction Time or R.T.). However if the person was given some kind of stimuli, namely, a word that is within the semantic field of gun, such as "bullet", studies have shown that the reaction time is smaller. This phenomenon strongly suggests that by *priming* the participant with the word "bullet", *facilitation* occurs in that the participant accesses the conceptual domain in which BULLET and GUN are located, and because of this, the person does not need to access the concept anymore when presented the word "bullet", thus enabling him/her to respond faster. The materials in lexical decision and naming studies typically consist of 1/3 real words, 1/3 non-words and 1/3 of unrelated words. A one-way analysis of variance (ANOVA)-Pre-stimulus X Stimulus (Real Word Target, Non-Word Target, or Unrelated Target)-can be conducted.

Meyer and Schvaneveldt (in Hasson & Giora 2007) found that people were faster to "decide" that butter is a word in English when it was preceded by the word bread than when it was preceded by the word nurse. This kind of facilitation is often referred to as priming, and it is attributed to automatic spread of activation between related meanings in the mental lexicon (see illustration below).

Pre-Stimuli:	**Stimuli**:	**Time needed to respond:**
"Nurse"	"butter"	------------------------------------>**500ms** (longer reaction time)
"Bread"	"butter"	---------------->**300ms** (shorter reaction time)

Note: Subjects are asked to determine whether the stimuli is a word.
Figure Illustration of priming effect of "bread" on stimuli "butter"

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Conclusion and suggestion

In the discussion presented above, it is clear that conducting research by way of introspection relying on the researchers' own intuition is not a commendable strategy. Linguistics research in Indonesia done by students in the graduate and also the postgraduate level are dominated by the use introspection in analysis.

In the study of linguistic meaning, when a researcher uses his intuition to claims of semantic representations that supposedly model meaning processing in the human mind, then there is no way of proving whether that the finding is incorrect. This is where such kind of research method does not meet the falsifiability criteria of epistemology and thus fall short of being scientific. Though at times the findings and conclusions may be interesting and, at most, helpful, they cannot be accepted as true or accurate.

It is suggested that student researchers look forward to doing investigation into semantics incorporating more concrete empirical methods, one of which, suggested in this paper, is the Lexical Decision task. This method has been widely used in experimental psychology and comes highly recommended for use in linguistics being a major aspect of psychology or cognition. Student researchers must breakout of the customary flawed practices and put all effort to heighten the scientific value of their work so as to insure wider acceptability of their work, which can be achieved by experimental-based research.

Acknowledgement

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