Item-based and cognitive-style-based variation in students' abilities to use metaphoric extension strategies

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Abstract

This article examines the tendency of language learners to use 'metaphoric extension strategies' to work out the meaning of unfamiliar vocabulary. Metaphoric extension strategies exploit the fact that the meaning of words can often be determined by analysing the metaphoric processes that were involved in their formation. For example, the meaning of the word *grounded* can be worked out by reference to the literal meaning of the word *ground*. This article describes an empirical investigation into three important factors that might affect students' tendency to employ metaphoric extension strategies: word concreteness; the presence of contextual clues; and the students' cognitive style. The study found that concrete items provoked significantly more metaphoric extension strategies than less concrete items. The presence of contextual clues led to more successful use of context, but did not reduce the students' tendency to employ metaphoric extension strategies. Finally, the students' cognitive styles had a significant affect on their ability to use metaphoric extension strategies: students who habitually process information in images were more likely to use these strategies successfully than students who process information verbally. These findings suggest that it is worthwhile encouraging language learners to use these strategies, but that it is also important to take individual differences into account.

Key words: Vocabulary learning, metaphor, cognitive styles.

Resumen

Este artículo examina la tendencia que tienen los estudiantes de lenguas de utilizar "estrategias de extensión metafóricas" para averiguar el significado del vocabulario que no conocen. Estas estrategias se basan en que el significado de las palabras se puede a veces deducir del análisis de los procesos metafóricos implicados en su formación. Por ejemplo, el significado de la palabra *grounded* se puede deducir por referencia al significado literal de la palabra *ground*. Se describe una investigación empírica realizada sobre tres factores que pueden afectar la tendencia de los alumnos a emplear estrategias de extensión metafóricas. El estudio determinó que los elementos concretos provocaban en mayor medida más estrategias de extensión metafóricas que los elementos menos concretos. La presencia de

pistas contextuales también ayudaban en este cometido. Los estilos cognitivos de los estudiantes tuvieron un efecto importante en su destreza para usar este tipo de estrategias. Estos resultados sugieren que es importante animar a los alumnos para que utilicen este tipo de estrategias, aunque también habría que tener en cuenta las diferencias individuales.

Palabras clave: aprendizaje del vocabulario, metáfora, estilos cognitivos

Introduction

When new concepts come into existence it is necessary for us to find words to describe them. What often happens is that existing words take on new meanings that are metaphorically related to their old meanings (Rudska-Ostyn, 1986). For example, as well as signifying the organ that we use to see, the word 'eye' is commonly used to refer to the hole in a needle, the small black holes in old potatoes, and the centre of a darts board (bulls-eye). It is also used as a verb, meaning to look at something suspiciously or covetously. Metaphorical extensions such as these abound in a wide variety of discourse types (see, for example, Pollio et al., 1977; Paprotte & Dirven, 1985; White Hayes, 2001). This phenomenon is particularly common in academic disciplines such as politics, economics and engineering, where new concepts are constantly being formed, and words are needed to describe them.

In a previous article (Littlemore, 2002), I described a case study in which a Spanish student of English was encouraged to use a set of strategies that exploit this phenomenon, enabling her to use work out the meanings of new words. These strategies were referred to as 'metaphoric extension strategies' and are described briefly in section 2 below. The problem with this case study was that it involved only one student. As such, its findings do not tell us anything about the usefulness of metaphoric extension strategies for larger groups of students. Nor do they tell us anything about variation in the effectiveness of these strategies. In this article I therefore examine the effectiveness of metaphoric extension strategies in greater detail, and explore a number of factors that might affect the ability of language students to employ such strategies.

It is unlikely that all language students will be able to employ metaphoric extension strategies successfully all of the time. There are likely to be factors connected to the words themselves, as well as individual differences between the students that affect their tendency and ability to employ these strategies. In this article, I report on an empirical investigation into two important factors that might affect students' tendency

to employ metaphoric extension strategies to guess the meanings of unknown words and expressions. The first of these is the concreteness or 'imageability' of the items, and the second is the students' cognitive style. Before turning to these variables, I will first give a brief outline of the concept of 'metaphoric extension strategies'.

Metaphoric extension strategies

As I said above, metaphoric extension strategies exploit the fact that the meaning of words can often be worked out by analysing the metaphoric processes that were involved in their formation. For example, let us take the word 'grounded' as in the sentence 'attitudes are often *grounded* in experience'. The word 'grounded' is a metaphorical extension of the word 'ground' (Dirven, 1985). A student may well be familiar with the word *ground*, but has perhaps not seen it used metaphorically in this way. In order to work out the meaning of the word *grounded*, he or she must begin by thinking of the literal meaning of the word *ground*. He or she should then think of as many concepts as possible that are associated with this word. Concepts that are associated with ground might include the fact that it is low down; things are buried in it; plants have their roots in it; it consists of soil and rock, and so on. This activity requires the student to make a wide range of connections when presented with a given stimulus. This technique is usually referred to as 'associative fluency' (see Guilford, 1967; Carroll, 1993). Next, the student needs to apply some of these associated concepts to the surrounding context. In order to make this final connection, the student must be able to observe the partial similarities between the word, in its literal sense, and the context in which it appears. In the case of *ground*, in the above example, the most relevant concept is that things tend to be buried in it or have their roots in it. This technique is usually referred to as 'analogical reasoning' (Holyoak, 1984). In summary, metaphoric extension strategies involve the student accessing as many meanings as possible for the base concept (associative fluency), whilst identifying all possible links between this concept and the surrounding context (analogical reasoning).

The use of mental imagery is likely to help individuals to engage in both associative fluency and analogical reasoning. Paivio and Walsh (1993) argue that image generation serves as a powerful tool in metaphor comprehension. They believe that different pieces of information that are represented visually can be recalled simultaneously, whereas different pieces of information which are represented verbally can only be recalled sequentially (Paivio, 1983). It follows from this that metaphors can best be understood by fusing the base and the target concepts by means of an interactive

image: "An individual merges two images, throwing into relief a common quality and thereby accomplishing a perceptual abstraction without relinquishing the context from which the singled out quality draws its life" (Paivio, 1983: 313).

A strong argument for the role of imagery in the use of metaphoric extension strategies also comes from a study of empirical findings that have been made in metaphor research. For example, Harris et al. (1989) examined subjects' use of imagery in encoding metaphors in comparison to non-metaphors. They found that subjects typically reported vivid images in reaction to metaphors. They used images significantly more frequently to encode metaphorical sentences than non-metaphorical sentences. Interactive images were also present, which, in Harris et al.'s (1989: 178) words: "were frequently highly creative, constructed, literally anomalous 'surrealistic' images involving both the topic and vehicle fused in dynamic interaction".

This suggests that, in order to help students to understand the metaphorical meaning of new expressions such as *grounded* (as in the above example: 'attitudes are often grounded in experience'), it may be beneficial to encourage them to form a mental image of those expressions. It also suggests that, an even more powerful technique would be to form an interactive image between the literal meaning of the term, and the context in which it appears. Students may therefore be more likely to comprehend the word *grounded* if they are able to visualise a person's attitudes actually being stuck in the ground.

One possible limitation of this strategy is that, in order to have complete autonomy over the interpretation process, the student must have some knowledge of the original, literal meaning of the word and this may not always be the case. On the other hand, in the case study reported in Littlemore (2002) which focused on an intermediate learner of English, the student was found to be aware of the literal meaning of the majority of the metaphorical expressions encountered. Similar findings have also been made in previous studies (for example, Littlemore, 2001). Furthermore, it has been noted that metaphorical processes account for the majority of meaning extensions of lexical items (Dirven, 1985), so the strategy is likely to have a broad application.

However, as was mentioned in the introduction, the ease with which students are able to employ this strategy is likely to vary according to the imageability of the words, the presence (or absence) of contextual clues, and the cognitive style of the student. These three possible sources of variation are discussed in sections 3, 4 and 5.

Word concreteness

It is likely to be the case that some words are more easily comprehended through the use of metaphoric extensions strategies than others. One would imagine that the more concrete a word is, the more likely it is to evoke a mental image, and the more likely it is to elicit a metaphoric extension strategy. For example, a student of business English might find it easier to use a metaphoric extension strategy to work out the meaning of 'a company staying afloat' than they would for 'a company exhibiting an entrepreneurial mindset'. A word's concreteness, or 'imageability' has been shown to be one of the most powerful determiners of its memorability (Sadoski et al., 1993). Factors affecting a word's concreteness include its part of speech (research by Johnson and Malgady, 1989 shows that people tend to find it easier to picture nouns than verbs) and the subjectivity of the language (Sadoski & Quast, 1990, found that emotional language is more likely to promote imagery than dry, objective language). One of the hypotheses in this study is that highly imageable words are more likely to be interpreted through metaphoric extension strategies. The imageability of the words used in the study was therefore independently assessed by a group of native speakers.

The presence of contextual clues

When language students come across new or unfamiliar vocabulary, teachers usually encourage them to use contextual clues to guess its meaning. Indeed, this has been identified as one of the most important strategies for dealing with new vocabulary (Nation, 1990). However, students sometimes find that the clues in the surrounding context are inadequate, or that they lack the appropriate skills for using them (Fukkink et al., 2001). When such clues are lacking they may then turn to alternative strategies, such as metaphoric extension strategies. One might therefore expect a student's tendency to use metaphoric extension strategies to be inversely related to the usefulness of the clues in the surrounding context. In this study, we test this hypothesis.

Cognitive style

A person's preference for processing information in a certain way is usually referred to as their cognitive style (Schmeck, 1988). Willing (1988) argues that a person's cognitive

style helps determine the cognitive-psychological aspects of their approach to learning and that this in turn helps determine the cognitive strategies chosen by the student.

One of the most widely studied cognitive style dimensions is the verbaliser/imager dimension. Some people prefer to process information verbally, whereas others prefer to do it by forming mental images (Childers et al., 1985). In the case of vocabulary guessing techniques, students who prefer to process information in images ('imagers') may be more likely to employ metaphoric extension strategies. On the other hand, students who prefer to process information in words ('verbalisers') may prefer to use the surrounding context. It is also possible that imagers will be able to use metaphoric extension strategies more successfully than verbalisers, and that verbalisers will be better at making use of clues in the surrounding context. These differences may mean that for some students, the use of metaphoric extension strategies may be second nature, whereas for others it may be more difficult. The study outlined below tests these hypotheses.

The study

A small, exploratory study was designed in order to answer four research questions that were raised in the preceding discussion of metaphor extension strategies. These are as follows:

1. Is it useful to encourage students to use metaphor extension strategies?
2. Does the concreteness of the item affect a student's inclination and ability to use metaphor extension strategies?
3. Does the presence of contextual clues affect a student's inclination and ability to use metaphor extension strategies?
4. Does a person's cognitive style affect their inclination and ability to use metaphoric extension strategies?

The participants

The participants in the study were 43 post-graduate, overseas students at the University of Birmingham. They were studying a range of disciplines such as Management, Metallurgy, Engineering, Geography and Computer Science. They were all following a fifteen-hour course in English vocabulary and their level of English was upper-intermediate. The testing took place in the final 90-minute session of their course.

Method

The participants were first given a brief introduction to the different types of strategies that one can use to guess the meaning of new vocabulary. This was referred to as a 'strategy awareness-raising session'. Every effort was made to ensure that no particular method was favoured in this session. The handout used in the session is reproduced in Appendix 1.

After the strategy awareness-raising session, the participants were asked to work, at their own pace, through ten vocabulary items, each presented in a short surrounding context. The items used in the study were taken from an original list of 150 items that had been compiled in a pilot study. In this pilot study, an upper-intermediate student on a similar course had been asked to indicate any words that she did not understand. The ten items were selected on the basis that the participant in the pilot study had been familiar with the literal meanings of the words, or of parts of the words and was able, with the help of the teacher, to use these meanings to guess the metaphorical meanings of the words in context. The items, in their surrounding contexts, were as follows:

1. Established companies seldom commit wholeheartedly to new innovations.
2. The needs of the students fit squarely with the university's objectives.
3. Changing peoples' views is not always easy because attitudes are often grounded in experience.
4. The new management must be willing to challenge deep-seated assumptions.
5. The task is going to be enormous, however we have managed to make a few inroads already.
6. It is natural to underestimate developing technologies because initially they don't always measure up to the familiar alternatives.
7. Scientists made an important breakthrough when they discovered how to clone sheep.
8. There has been a gradual build-up of troops on both sides of the border.
9. Lecturers tend to focus on the best students, but it's important for them to consider the needs of also-rans.
10. Global companies must also be able to exploit new opportunities and surmount the challenges of globalisation.

For each item, the participants were asked to work out the meaning of the underlined word. They were then asked to put a tick against any strategies that they had used.

They were allowed to tick as many strategies as they liked. The list of possible strategies was as follows:

Established companies seldom commit wholeheartedly to new innovations.
Meaning of the underlined word or expression in this context:
Please write another short sentence containing the underlined word or expression:
Please indicate with a "Y" which strategies you used when trying to work out its meaning:

"Y" Strategies

- I used only the surrounding context to work out the meaning
- I formed a mental image of the word and used this mental image to help me think of associated concepts
- I thought of the word's associated concepts, without using an image
- I applied concepts associated with the word to the surrounding context
- I formed an interactive image between the word and the context
- I knew the word and didn't need to do any of the above

Figure 1. Instructions for participants

It took the participants between forty and sixty minutes to complete the exercise. Their answers were collected at the end and feedback on their responses was given to each of the participants the following week.

Scoring the items

Two independent, native speaker judges scored the participant's responses. Each of the participants' answers was allocated a score between 0 and 2.

-A score of 0 was allocated to items that were deemed to be completely wrong, as in the following examples:

Target item: they don't always measure up to the familiar alternatives
Participant's response: they don't always *prior to* the familiar alternatives
Target item: The new management must be willing to challenge deep-seated assumptions
Participant's response: The new management must be willing to challenge some difficulties *that you haven't imagined*

-A score of '1' was allocated to items that were deemed to be partially correct, as in the following examples:

Target item: Deep-seated assumptions
Participant's response: *Out of fashion*
Target item: We have managed to make a few inroads
Participant's response: *Parts*

-A score of '2' was allocated to items that were deemed to be completely correct, as in the following examples:

> Target item: companies seldom commit wholeheartedly to new innovations
> Participant's responses: Companies rarely commit *completely* to new innovations
> Target item: It's important for them to consider the needs of the also-rans
> Participant's response: they should also consider the other students *who are not the best students*

The scorers were asked to focus only on the target item. This meant that if a participant had understood the target item, but had misunderstood some of the surrounding words, then he or she was still given a score of two. There was 92% level of agreement between the scorers. In cases of disagreement, the items were discussed with a third party until agreement was reached.

In order to assess the imageability of the items, eight native speakers were given a list of the ten words and asked to indicate on a scale from one to five, how easy they found it to form an image of each word (see Appendix 2). These eight native speakers were all teachers of English but had not taught the participants in the study. As the reliability of their responses was reasonably high (Cronbach's Alpha = 0.76), the mean response was calculated for each item (see Table 7, column 2). These mean scores were taken as a measure of imageability of the items.

In order to assess the usefulness of the contextual clues, six native speakers were given a list of the words in context and asked to indicate, on a scale from one to five, the usefulness of the contextual clues for working out the meanings of the items (see Appendix 3). These native speakers were all teachers of English who had either taught the participants in the study or students of a similar level. As the reliability of their responses was reasonably high (Cronbach's Alpha = 0.72), the mean response was calculated for each item (see Table 8, column 2). These mean scores were taken as a measure of the usefulness of the contextual clues for each item.

In order to assess the cognitive style of the participants, Childers et al.'s (1985) 'Style of Processing' scale was administered to each of the participants after the study. This is a twenty-two item questionnaire whose reliability and validity have been found to be strong[1]. The questionnaire is reproduced in Appendix 4.

Results

Is it useful to encourage students to use metaphor extension strategies?

All types of strategies were used both successfully and unsuccessfully by different participants for different items, and no particular strategy was a predictor of overall success (see Table 1). So at this stage, we cannot say whether or not it is useful to encourage students to use metaphor extension strategies.

Descriptive Statistics

	Mean score for successful interpretation	Std. Deviation	Predominant strategy used	Predictor strategies
Grounded	1.76	.53	Mental image	• None
Breakthrough	1.74	.59	Context	• None
Wholehearted	1.69	.60	Context	• None
Square	1.60	.73	Mental image	• Context • Application of concepts to surrounding context
Also-rans	1.57	.77	Context	• Application of concepts to surrounding context • Interactive image
Build-up	1.31	.90	Context	• Word already known
Inroads	1.22	.82	Context	• Context • Mental image • Associated concepts without an image
Deep-seated	1.17	.91	Context and mental image	• Application of concepts to surrounding context • Interactive image
Surmount	1.12	.86	Context	• Context • Mental image
Measure up to	.83	.82	Context	• None

Table 1. Means standard deviations, and predominant strategies used for each item.

There were some interesting cases of both contextual clues and metaphoric extension strategies leading to the wrong interpretation, as in the following examples:

Example 1

Target item: *There has been a gradual* ***build-up*** *of troops on both sides of the border*

Participant's response: *There has been a gradual* ***construction*** *of troops*

Strategy: Formed a mental image and thought of associated concepts

Example 2

Target item: *Established companies rarely commit* **wholeheartedly** *to new innovations*
Participant's response: *Already settled companies don't make* **mistakes** *respecting new innovations*

Strategy: Used only contextual clues

In Example 1, the participant may have associated the word 'build' with the word 'construction', which usually applies to physical objects. They thus concentrated on an inappropriate characteristic of the word. In Example 2, the participant may have inferred that well established companies are less likely to make mistakes than new companies.

Equally, there were some encouraging cases of successful use of both types of strategy:

Example 3

Target item: *The task is going to be enormous, however we have managed to make a few* **inroads** *already*
Participant's response: *bits and pieces; part of the job,* **small first steps**

Strategy used: Formed a mental image and thought of associated concepts

Example 4

Target item: *Established companies rarely commit* **wholeheartedly** *to new innovations*
Participant's response: *with full heart and soul*

Strategy used: Thought of associated concepts without using an image

Example 5

Target item: *Scientists made an important* **breakthrough** *when they discovered how to clone sheep*
Participant's response: *The scientists* **opened up a new way of thinking**

Strategy used: Used only contextual clues.

In Example 3, the participant was able to form an image a series of 'inroads' and from this image, was able to extract associated concepts such as smallness, incompleteness and stepping. In Example 4, the participant associated the word soul with the word heart, thus resulting in a fairly deep understanding of the expression. In Example 5, the participant was able to use contextual clues such as 'discovered' and 'important' in order to work out the meaning of the word.

However, these findings, as they stand, are not particularly useful as they do not tell us anything about how the effectiveness of metaphoric extension strategies varies from item to item, or from student to student. In order to go into slightly more depth, a multinomial, logistic regression analysis was employed for each item. In this procedure, a dependent variable is entered into the model. The variables that are thought to affect this dependent variable are also entered into the model and the analysis computes which of these variables, if any are likely to have had an effect on the dependent variable. In this study, the dependent variable was success in finding meaning of the item, and the independent variables were the strategies employed (means and standard deviations of strategy use for each item can be found in Appendix 5).

For the items 'grounded', 'breakthrough', 'wholehearted' and 'measure up to', no particular strategies were overall predictors of the student's success in working out the meaning (see Appendix 6). However, for the remaining items, some strategies appeared to be particularly significant predictors of the students' success.

For the expression 'fit squarely with' *use of context* was a significant predictor of success and *thinking of associated concepts* was a near-significant predictor of success (see Table 2). These results suggest that some participants were able to work out the meaning of the item using only contextual clues. Others may have thought of a square fitting snugly into a corner. They may have then worked out the meaning of the item by equating 'square' with 'the students' needs', and 'corner' with 'the university's objectives'.

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	23.944	9.850	2	.007
Mental image	15.959	1.866	2	.393
Associated concepts (no image)	19.811	5.717	2	.057
Application of concepts to surrounding context	17.365	3.272	2	.195
Interactive image	17.049	2.955	2	.228
Word already known	16.473	2.379	2	.304

Table 2. Significant predictors for the successful interpretation of 'fit squarely with'

Three strategies were significant predictors of the participants' success in working out the meaning of the expression 'also-rans'. As we can see in Table 3, these were *the use of context, the application of concepts to surrounding context,* and *the formation of an interactive image*. These results suggest that some participants were able to work out the meaning using only the

contextual clues, whereas others may have pictured university students in a race in which the successful ones were the winners, and less successful ones were the 'also-rans'.

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	25.583	15.695	2	.000
Mental image	15.299	5.411	2	.067
Associated concepts (no image)	13.589	3.701	2	.157
Application of concepts to surrounding context	16.514	6.626	2	.036
Interactive image	19.575	9.687	2	.008
Word already known	11.891	2.003	2	.367

Table 3. Significant predictors for the successful interpretation of 'also-rans'

Two strategies were significant predictors of the participants' success in working out the meaning of the expression 'deep-seated'. As we can see below in Table 4, these were *thinking of associated concepts* and *the application of associated concepts to the surrounding context*. Participants may, for example, have thought of the characteristics of a deep – seated armchair and imagined the 'deep-seated assumptions' getting stuck in the armchair. Interestingly, the use of imagery does not appear to have enhanced the success rate of this strategy.

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	Df	Sig.
Context	22.948	.590	2	.745
Mental image	23.587	1.229	2	.541
Associated concepts (no image)	31.480	9.122	2	.010
Application of concepts to surrounding context	30.241	7.883	2	.019
Interactive image	26.843	4.485	2	.106
Word already known	25.250	2.892	2	.235

Table 4: Significant predictors for the successful interpretation of 'deep-seated'

Three strategies were significant predictors of success in working out the meaning of the item 'make inroads into'. As we can see below in Table 5, these were *the use of context, the formation of a mental image,* and *thinking of associated concepts*. The use of an *interactive image* was a near-significant predictor. These results suggest that, in order to work out the meaning of this item, participants either used the context, or perhaps they thought of roads entering difficult or rough territory.

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	28.918	6.340	2	.042
Mental image	28.841	6.263	2	.044
Associated concepts (no image)	29.460	6.883	2	.032
Application of concepts to surrounding context	25.398	2.821	2	.244
Interactive image	28.228	5.651	2	.059
Word already known	22.578	.000	0	.

Table 5. Significant predictors for the successful interpretation of 'make inroads into'

Two strategies were significant predictors of the participants' ability to work out the meaning of 'surmount'. As we can see below in Table 6, these were *the use of context* and *the use of a mental image*. It seems that participants were either able to work out the meaning using only the context, or they conjured up a mental image of (for example) a person climbing a mountain, and used this image to help them.

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig
Context	33.968	15.759	4	.003
Mental image	34.407	16.199	2	.000
Associated concepts (no image)	21.258	3.049	2	.218
Application of concepts to surrounding context	21.425	3.217	2	.200
Interactive image	23.134	4.925	2	.085
Word already known	25.992	7.784	2	.020

Table 6. Significant predictors for the successful interpretation of 'surmount'.

These findings show that the success rates of the various strategies varied according to the item. They also indicate that there was some variation between the participants in their ability to use different strategies. In the following three sections, we examine these sources of variation in more detail.

Are concrete, imageable items more likely to provoke and be solved by metaphor extension strategies?

There seems to have been a link between the imageability of the items and their tendency to provoke metaphoric extension strategies. We can see from Table 7 (columns 2 and 3) that three items ('grounded', 'fit squarely', and 'deep-seated') were more likely to trigger an image-based, metaphoric extension strategy. As one would

expect, these items all had relatively high imageability ratings. Two of the items that provoked metaphoric extension strategies ('fit squarely with' and 'deep-seated') had the highest imageability ratings of all the items. Therefore we can say that there appears to be a link between the imageability of the items and their tendency to provoke image-based, metaphoric extension strategies.

However, there does not appear to be a relationship between the imageability of an item and the usefulness of metaphoric extension strategies for identifying the meaning of that item (see Table 7, columns 2 and 4). This finding suggests that the success rate of metaphoric extension strategies is unrelated to the imageability of the items. One reason for this finding could be that, for less easily imaged items, greater cognitive effort is required on the part of the student, and that this effort contributes to the success of the strategy.

Column 1 Item	Column 2 Imageability	Column 3 Predominant strategies used	Column 4 Strategies that predicted success in identifying the meaning of the item
Fit squarely with	4.7	• Mental image	• Context • Application of concepts to surrounding context
Deep-seated	4.5	• Context • Mental image	• Application of concepts to surrounding context • Interactive image
Measure up to	4.0	• Context	• None
Breakthrough	3.8	• Context	• None
Grounded	3.5	• Mental image	• None
Build-up	3.5	• Context	• Word already known
Wholehearted	3.0	• Context	• None
Inroads	2.8	• Context	• Context • Mental image • Associated concepts without an image
Surmount	2.7	• Context	• Context • Mental image
Also-rans	2.5	• Context	• Application of concepts to surrounding context • Interactive image

Table 7. Imageability ratings, predominant strategies used, and most successful strategies for each item.

Does the presence of contextual clues affect a student's inclination and ability to use context-based strategies as opposed to metaphoric extension strategies?

The findings with regard to this research question are interesting. If we look at Table 8 (columns 2 and 3), we see that there was not a particularly strong relationship between

the usefulness of the contextual clues and the participant's tendency to use these clues. For example, for the item 'fit squarely', which apparently had the most useful contextual clues, the predominant strategy used was 'forming a mental image'. On the other hand, if we look at columns 2 and 4, we see that items with useful contextual clues (for example, 'fit squarely', 'surmount' and 'inroads') tended to be more successfully identified when participants used the context to work out their meanings. This suggests that although the presence of useful contextual clues did not necessarily provoke the use of context-based strategies, when they did, these strategies tended to be successful.

The findings outlined in sections 7.2 and 7.3 therefore suggest that high imageability of the items provokes the use of metaphoric extension strategies, but that high imageability is not related to the *successful* use of such strategies. In contrast, the presence of contextual clues does not necessarily lead participants to use these clues, but that when they do, they are more likely to do so successfully. From this, we can conclude that different types of strategies are provoked by different types of items, and that different strategies are appropriate for determining the meanings of different types of items. In the following section, we look at how characteristics of the participants themselves may have affected their inclination and ability to use metaphoric extension strategies.

Column 1 Item	Column 2 Usefulness of contextual clues	Column 3 Predominant strategies used	Column 4 Strategies that predicted success in identifying the meaning of the item
Fit squarely	4.0	• Mental image	• Context • Application of concepts to surrounding context
Surmount	3.3	• Context	• Context • Mental image
Build-up	3.3	• Context	• Word already known
Wholehearted	3.0	• Context	• None
Inroads	2.8	• Context	• Context • Mental image • Associated concepts without an image
Measure up to	2.8	• Context	• None
Deep-seated	2.6	• Context • mental image	• Application of concepts to surrounding context • Interactive image
Grounded	2.3	• Mental image	• None
Also-rans	2.0	• Context	• Application of concepts to surrounding context • Interactive image
Breakthrough	1.8	• Context	• None

Table 8: Usefulness of contextual clues, predominant strategies used, and most successful

Does a person's cognitive style affect their inclination and ability to use metaphoric extension strategies?

This is also a two-part question. First of all, let us consider whether imagers were more likely than verbalisers to use metaphoric extension strategies, with verbalisers relying more heavily on contextual clues. Imagers were significantly more likely than verbalisers to employ the strategy of linking concepts associated with an image to the surrounding context ($p<0.05$) (see Appendix 7). However, contrary to expectations, verbalisers were not more likely than imagers to use contextual clues to work out the meanings of the new words. In fact they did not appear to favour any strategy in particular (see Appendix 7).

Having discussed inclination, let us now look at ability. Were imagers better than verbalisers at using metaphoric extension strategies and were verbalisers better at using contextual clues? In order to calculate the success rate of the various strategies, instances of their usage were weighted according to whether the participant had successfully worked out the meaning of the item using that strategy. Imagers were significantly more successful than verbalisers at using interactive images ($p<0.05$) (see Appendix 8). This finding suggests that people who process information in images are more likely to use this strategy successfully than people who process information verbally. Verbalisers appeared to be better than imagers at using the context to work out the meaning of a word ($p<0.1$).

These findings suggest that a person's cognitive style is more strongly related to their ability to use a particular strategy than to their preference for using a particular strategy. This is interesting as the verbal/imagery questionnaire itself tended to focus more on preferences than abilities.

Discussion

The findings made in this study appear to indicate that it may well be worthwhile training students in the use of metaphoric extension strategies in order to help them understand new vocabulary. They also suggest that these strategies are likely to be provoked by highly imageable words, and favoured by students who have an imager cognitive style. The results also show that the most successful users of metaphoric extension strategies are likely to be students with an imager cognitive style, who are able to create relevant interactive images. Verbalisers are better at using contextual clues. Surprisingly, the imageability of the items was not related to the ease with which their

meanings could be worked out through the use of metaphoric extension strategies. Finally, the presence of useful contextual clues did not automatically lead students to use these clues, but when they did, they tended to use them successfully.

These findings suggest that we should continue to encourage our students to use all the available contextual clues when working out the meaning of new and unfamiliar vocabulary. But we should also encourage them to employ metaphoric extension strategies, even when the imageability of the items is not immediately apparent. Whilst doing so, we should keep in mind the fact that students with an imager cognitive style are likely to find the whole approach more appealing, and are likely to be better at forming relevant interactive images than students with a verbal cognitive style. The findings made in this study suggest that students who appear to find metaphoric extension strategies difficult may be experiencing these difficulties because they have a more verbal thinking style. Languages teachers need to respect this fact, and should not push their students too hard when they appear to be experiencing difficulties in forming appropriate images.

It might be interesting to incorporate metaphoric extension strategies into the 'help' options of multimedia applications designed to teach reading skills. A strength of multimedia is that it can offer a choice of different kinds of help options, and that students can choose which kind of help option they require. When they encounter new words, students with an image-based cognitive style may benefit from a hyperlink to an image of the word's literal meaning, so that they can then employ metaphoric extension strategies, resulting in deeper learning and longer retention. Students with a verbal cognitive style may prefer a hyperlink to a verbal explanation of the word's meaning in context. Students could also make use of both types of hyperlinks, thus making a 'two-pronged attack' on the unknown word.

Finally, it remains to be said that more research is required to investigate the influence of factors such as learning context and cultural background on the effectiveness of metaphoric extension strategies. Let us take, for example, the word 'wholeheartedly', which was used in this study. In many Western languages, the heart is said to be the metaphorical seat of emotions and so this should be a fairly easy item to determine for most students from the West. When we look at Malay, however, the metaphorical seat of the emotions is the *liver* (Charteris-Black, 2002) so Malay students may be confused by this metaphorical reference to the heart. In this case, the difference is very clear-cut; however there are likely to be other words that have the same set of

metaphorical connotations, but where the saliency of the meanings varies from culture to culture. Now that we have identified item-based and cognitive-style based sources of variation in students' abilities to employ metaphor-based vocabulary-guessing strategies, we should perhaps now examine contextual and culturally-based variation in their abilities to use these strategies.

NOTE

1 Cronbach's alpha is reported to be 0.88 (Childers et al., 1985). In a study designed to measure the relationship between the imager cognitive style and a person's ability to recall images in advertising, the scale was found by Heckler et al. (1993) to have significant predictive validity ($p < 0.05$).

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Appendix 1

Strategy awareness-raising session

We're going to be looking at strategies for working out the meaning of new words and remembering those meanings.

Questions to ask when trying to work out the meaning of a new word…

Does the word sound like anything in your own language?

For example, the English word 'advocate' sounds like the Spanish word 'abogado' in Spanish.

Can you break it down into smaller words?

For example, the word 'unforeseen' can be broken down into 'un' (meaning 'not') 'fore', meaning 'before' and 'seen', the past participle of the verb 'to see'. This might help you to infer that the meaning of the word is 'not predicted'.

Does the context help?

Imagine, for example that you have come across the sentence 'I don't like studying because it is boring and tiring' and you don't know the meaning of 'boring'. You might infer that it is a negative sort of word because of contextual clues such as 'don't like' and 'tiring'.

Is the word onomatopoeic?

For example, the word 'rustling' sounds like the noise that it refers to (i.e. the noise that Autumn leaves make when you walk on them).

Can you think of the literal meaning of the word?

You may find that you know the literal meaning of the word, but cannot think of what it means in this particular context. For example, you may come across the sentence:

> *It was time for her to finish with her boyfriend. Their relationship had become a bit entrenched and it was time for her to move on ....*

You do not know the meaning of the word "entrenched" but have some idea of meaning of "trench".

1. Form a mental image of a **"trench"**
2. Think of concepts associated with this image (people have been there a long time, there is no clear escape, people are bored and tired, everyone is stuck in the mud...)
3. Apply concepts associated with the word "**trench**" to the context of "**relationships**"
4. Form an interactive image between "**trench**" and "**relationships**"

Appendix 2

Word concreteness questionnaire

Questionnaire

Please indicate how easy you find it to form a picture in your head of the following things.

1 = Very difficult
2 = Quite difficult
3 = OK
4 = Quite easy
5 = Very easy

Item	How easy?				
Fit squarely	1	2	3	4	5
Grounded	1	2	3	4	5
Deep-seated	1	2	3	4	5
Build-up	1	2	3	4	5
Wholehearted	1	2	3	4	5
Also-rans	1	2	3	4	5
Measure	1	2	3	4	5
Inroads	1	2	3	4	5
Surmount	1	2	3	4	5
Breakthrough	1	2	3	4	5

Appendix 3

Contextual clues questionnaire

Look at the contexts surrounding the underlined word
contextual clues are for an average presessional student to us
underlined words.

(Assume that the student knows the meanings of all th
but does not know the meanings of the underlined words ar

1 = Easily enough information to work out the meaning
2 = Almost enough information to work out the meanin
3 = A reasonable amount of information
4 = A small amount of information
5 = No information at all

Item

1. Established companies rarely commit wholeheartedly t
   innovations.
2. The needs of the students fit squarely with the universi
   objectives.
3. Changing peoples' views is not always easy because atti
   are often grounded in experience.
4. The new management must be willing to challenge deep ated
   assumptions.
5. The task is going to be enormous, however we have

Appendix 4

Your learning style

Do you tend to think in words or in images?

Please answer this short questionnaire:

Item	Please circle
1. I enjoy doing work that requires the use of words	
2. There are some events in my life that I like to "relive" by mentally picturing just how everything looked	
3. I can never seem to find the right word when I need it	
4. I do a lot of reading	
5. When I'm trying to learn something new, I'd rather watch a demonstration than re	

Appendix 5

Means and standard deviations of strategy use per item

	Item 1: Wholehearted		**Item 2**: Square		**Item 3**: Grounded	
	Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Context	.24	.43	.19	.40	.17	.44
Mental image	.17	.38	.31	.47	.31	.47
Associated concepts (no image)	.26	.45	.14	.35	.00	.26
Application of concepts to surrounding context	.14	.35	.22	.42	.29	.46
Interactive image	.17	.38	.00	.26	.17	.38
Word already known	0.047	.22	.00	.15	0.14	.35

	Item 4: Deep-seated		**Item 5**: Inroads		**Item 6**: Measure up to	
	Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Context	.24	.43	.32	.47	.31	.47
Mental image	.24	.43	.24	.43	.17	.38
Associated concepts (no image)	.00	.30	.00	.30	.14	.35
Application of concepts to surrounding context	.14	.35	.15	.36	.17	.38
Interactive image	.12	.33	.00	.30	.17	.38
Word already known	.00	.15	.00	.00	.00	.00

	Item 7: Breakthrough		**Item 8**: Build-up		**Item 9**: Also-rans	
	Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Context	.24	.43	.29	.46	.29	.46
Mental image	.14	.35	.21	.42	.21	.42
Associated concepts (no image)	.00	.26	.00	.26	.00	.22
Application of concepts to surrounding context	.12	.33	.17	.38	.15	.36
Interactive image	.12	.33	.00	.26	.17	.38
Word already known	.26	.45	.00	.26	.00	.15

	Item 10: Surmount	
	Mean	**S.D.**
Context	.26	.50
Mental image	.21	.42
Associated concepts (no image)	.00	.15
Application of concepts to surrounding context	.14	.35
Interactive image	.00	.30
Word already known	.00	.22

Appendix 6

Non-significant multinomial logistic regression analyses for individual items

Item 1: Wholehearted

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	19.069	4.188	2	.123
Mental image	14.959	.078	2	.962
Associated concepts (no image)	16.476	1.595	2	.451
Application of concepts to surrounding context	14.922	.041	2	.980
Interactive image	16.939	2.058	2	.357
Word already known	15.591	.710	2	.701

Item 3: Grounded

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	19.350	5.185	4	.269
Mental image	12.957	-1.208	2	1.000
Associated concepts (no image)	12.459	-1.707	2	1.000
Application of concepts to surrounding context	14.755	.590	2	.745
Interactive image	12.878	-1.287	2	1.000
Word already known	12.743	-1.423	2	1.000

Item 6: Measure up to

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	31.000	.327	2	.849
Mental image	34.721	4.047	2	.132
Associated concepts (no image)	34.438	3.765	2	.152
Application of concepts to surrounding context	32.657	1.983	2	.371
Interactive image	31.020	.346	2	.841
Word already known	30.674	.000	0	.

Item 7: Breakthrough

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	12.709	.158	2	.924
Mental image	15.968	3.416	2	.181
Associated concepts (no image)	14.819	2.267	2	.322
Application of concepts to surrounding context	14.819	2.267	2	.322
Interactive image	15.494	2.943	2	.230
Word already known	15.102	2.550	2	.279

Item 8: Build-up

Effect	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Context	24.610	1.273	2	.529
Mental image	28.586	5.248	2	.072
Associated concepts (no image)	27.777	4.440	2	.109
Application of concepts to surrounding context	29.095	5.758	2	.056
Interactive image	23.879	.542	2	.763
Word already known	29.419	6.082	2	.048

Appendix 7

Parametric (Pearson's) correlations of strategy preferences with the imager cognitive style

		Correlation with imager cognitive style
Context	Pearson Correlation	-.216
	Sig. (2-tailed)	.169
Mental image	Pearson Correlation	-.150
	Sig. (2-tailed)	.342
Associated concepts (no image)	Pearson Correlation	.113
	Sig. (2-tailed)	.478
Application of concepts to Surrounding context	Pearson Correlation	.388*
	Sig. (2-tailed)	.011
Interactive image	Pearson Correlation	.247
	Sig. (2-tailed)	.115
Interactive image	Pearson Correlation	.130
	Sig. (2-tailed)	.411

* Correlation is significant at the 0.05 level (2-tailed).
* Correlation is significant at the .05 level (2-tailed).
** Correlation is significant at the .01 level (2-tailed).

Appendix 8

Parametric (Pearson's) correlations of strategy success rates with the imager cognitive style

		Correlation with imager cognitive style
Context	Pearson Correlation	-.274
	Sig. (2-tailed)	.079
Mental image	Pearson Correlation	-.171
	Sig. (2-tailed)	.279
Associated concepts (no image)	Pearson Correlation	.113
	Sig. (2-tailed)	.478
Application of concepts to surrounding context	Pearson Correlation	.168
	Sig. (2-tailed)	.288
Interactive image	Pearson Correlation	.388*
	Sig. (2-tailed)	.011
Word already known	Pearson Correlation	.283
	Sig. (2-tailed)	.069

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).