The Differential Effect of Attentional Condition on Subsequent Vocabulary Development

Halah Abdulelah Mohammed[1], Norazman Abdul Majid[2] & Tina Abdullah[2]

[1] Faculty of Education, UTM, Skudai, Johor Bahru, Malaysia

[2] Language Academy, UTM, Skudai, Johor Bahru, Malaysia

Correspondence: Halah Abdulelah Mohammed, Faculty of Education, UTM, Skudai, Johor Bahru, 81310, Malaysia. Tel: 60-113-964-3175. E-mail: halah.mohammed@yahoo.com.my

Abstract

This study addressed the potential methodological issues effect of attentional condition on subsequent vocabulary development from a different perspective, which addressed several potential methodological issues of previous research that have been based on psycholinguistic notion of second language learner as a limited capacity processor. The issue of whether learners paying attention to the processing of input for meaning can simultaneously pay attention to process form remains methodologically unclear issue in the area of reactivity. A qualitative study was conducted on six intermediate English as a foreign language learners. Participants were assigned to one of the three types of reading comprehension tasks. Concurrent data of think aloud was employed to establish learners' attention. Results showed that attending learners' attention to processing of lexical forms while reading for meaning has an effect to induce the issue of reactivity effect on subsequent vocabulary development.

Keywords: attention and level of awareness, involvement load hypothesis, reactivity of think-aloud protocol, reading comprehension task, vocabulary development

1. Introduction

Conspicuously, several theoretical models in the field of second language acquisition (SLA), cognitive science, and cognitive psychology have posited the significant role of attention as an enhancing attention is a necessary condition for learning and in second/foreign language development (Schmidt, 1990, 1995, 2001; Tomlin & Villa, 1994; Van Pattern, 1994, 2004). Empirical research evidenced for the beneficial role of attention has been provided by several SLA studies in strands of researches as directly or indirectly evidenced, on the role that attention plays an important role in the input processing and intake processing in the light of cognitive processes (Leow, 1997, 1998, 2000, 2001; Rosa & Leow, 2004; Rosa & O'Neill, 1999). Some of these studies have been based on psycholinguistic notion of L2 learner as a limited capacity processor (McLaughlin, 1987). It is theorized that during input processing, attention resource is limited and it is in struggle to be allocated to certain parts of the input.

VanPatten's model in L2 input processing (1994, 1996, 2004) outlined certain principles that guide the learner's attention to linguistics form in the input (Primacy of Meaning Principle) which postulated that learners process input for meaning before they process it for form. Van Patten (2004) updated his model of input processing based on the notion of Schmidt's noticing hypothesis (1990); attention control approaches to awareness and is responsible for noticing (attention plus a low level of awareness and working memory) that is crucial for intake to take place. VanPatten's model processing based on making form-meaning/function connections during real time comprehension and an online phenomenon that takes place in working memory. Empirical studies paint a different picture or refute Van Patten's (2004) principal of primacy of meaning on the issue of simultaneous attention to form and meaning in L2 learning that attention to form and meaning simultaneously have difficulty in processing and do not have any effect on comprehension (Leow et al., 2008; Morgan-Short et al., 2012).

However, the issue of whether learners' attention to processing of input for meaning can at the same time pay attention to or process form in the same input is still methodologically unclear and needs to be investigated on the issue of reactivity effect on vocabulary development. In other words, the potential methodological processing

issue that arise due to learners' attention to meaning and form simultaneously while exposure to L2 input task, based on the different types of attentional conditions of task-induced involvement, questionably has not been methodologically established before its effect on vocabulary development and subsequent reading comprehension.

The present study sought to address the potential methodological issue that have effect on learner's attention to form/and meaning in different types of attentional conditions of task induced involvement. Concurrent data of participants' reported allocation of attentional resources while interacting with L2 input were gathered to establish learner's attention to form/and meaning before addressing whether different attentional condition of task induced involvement had different effect on subsequent vocabulary development and comprehension. One of the recent advantages in operationalizing and measuring attention is the incorporation of think-aloud in research design. In regard to concurrent think-aloud, the issue of whether performing verbal report of concurrent think-aloud has potentially given way to the learner's attention to processing for form and meaning, and whether this has effect them to induce potential methodological issue called *reactivity* and might have effected on vocabulary development remains to be empirically investigated. This study revisited the issue of *reactivity* effect of concurrent think-aloud in the light of the issue of simultaneous attention to form/and meaning of VanPatten's (2004) models of input processing from different perspectives which addressed several potential methodological issues of previous research in this strand of inquiry. The following research question was formulated to guide the study: do types of different attentional condition based on tasks induced involvement have a differential effect of learners' attention on subsequent vocabulary developing.

2. Review of the Related Literature

2.1 Attention, Level of Processing, and Awareness

The models of the early stages of the learning process in SLA proposed by Gass (1988), Schmidt (1990, 2001), Tomlin and Villa (1994), Robinson (1995),VanPatten (1994, 1996) are all comparable in that they agree that attention facilitates L2 learning as essential for long-term storage and that serial learning cannot occur without attention. The notion of attention, according to Tomlin and Villa (1994), is based on four main concepts: "attention is a limited-capacity system, attention is the process of selecting critical information for further processing, attention represents effortful processing that can be contrasted with more automatic and less effortful processing, and attention is a matter of the control of information and actions."

The role of attention has become an essential issue for a wide variety of theoretical and applied perspectives in the field of SLA. Regarding the theoretical perspective, most if not all approaches to SLA postulate a certain role for the attention, whether it is attention at the level of noticing (Schmidt, 2001) or attention at the detection level (Tomlin & Villa, 1994). Concerning applied perspective, several types of L2 instruction have been developed with the purpose of directing learners' attention to linguistic form/and meaning. Research shows that directing learners' attention to both form and meaning may be more effective for L2 development than instruction that directs learners' attention to form or meaning alone (Norris & Ortega, 2000).

One aspect of attention which has been investigated by SLA research is how learners allocate attention to L2 aural and written input. This line of research has been postulated and motivated mainly by VanPatten's (2004) *Primary of Meaning Principle* which assumes that learners process input for meaning before they process it for form. The process suggested by Van Patten is about making form-meaning/function connections during real time comprehension and on-line phenomenon that arises in working memory. Van Patten (1994, 1996) investigated whether L2 learners could successfully attend to form and meaning simultaneously when presented with aural L2 input. He adopted the position from cognitive psychology that humans have a limited capacity for processing information (McLaughlin, 1987) and argued that L2 learners would have difficulty processing both form and meaning in aural L2 input.

Most recently, Leow et al. (2008) examined this issue and found that allocation of attention to the grammatical form and meaning, for aurally presented L2 input, learners may have difficulty attending simultaneously but did not negatively impact on comprehension of written L2 input. Therefore, from a theoretical perspective, the findings of Leow et al. (2008) did not support or refute VanPatten's (2004) Primacy of Meaning Principle due to the low level of processing reported. Morgan-Short et al. (2012) replicated the findings of Leow et al. (2008), and found that simultaneous attention to the grammatical or lexical form while reading for meaning does not interfere with comprehension when the form is processed in a meaningful manner which in fact lead to increased comprehension. Therefore, the way depth of processing and level of awareness may affect comprehension when L2 learners pay attention to both form and meaning simultaneously is an open question. However, a question arises in this study whether learners' attention to lexical form while performing reading comprehension tasks

based on *task-induced involvement* have an effect to raise awareness and lead to engage learners in deep processing which may have an effect on vocabulary development and on subsequent comprehension.

It is evident that the association between depth of processing and comprehension is a ripe area of investigation. For example, VanPatten's primacy of meaning principle (1994, 1996) logically predicts that processing at deeper levels may interfere with written comprehension because the deeper processing of form conflicts with his first principle that learners process input for meaning before processing it for form. Nevertheless, Leow et al. (2008) found that participants who processed the target form deeper did not have lower comprehension than those who did not. To further complicating the matter, Morgan-Short et al. (2012) found a positive relationship between level of processing and comprehension, the deeper the learner's level of processing, the better comprehension score of the written text. Additional studies need to further address this possible relationship between depth of processing and vocabulary development while processing for comprehension.

Craik and Lockhart (1972) first proposed the concept of depth of processing or level of processing in the field of cognitive psychology, describing it in terms of deep processing versus shallow processing. Depth of processing has recently been related to other concepts such as amount of attention, degree of elaboration, and level of awareness during processing (Leow, 2012). Several frameworks accounting for the initial stages of L2 learning also assign an important role to depth of processing. In Tomlin and Villa's (1994) view, awareness can result in enhanced processing. Schmidt (2001) concurs with Tomlin and Villa through his concept of detection which enables further processing of a stimulus at higher levels. Consequently, depth of processing could be defined as amount of attention, cognitive effort, or time spent processing or elaborating on the target item in the input, and/or noticing induced by different types of experimental tasks or conditions (Laufer & Hulstijn, 2001).

Although the fields of cognitive science, cognitive psychology, and SLA agree that attention is crucial for L2 learning to occur (Robinson, 1995; Schmidt, 2001, Tomlin & Villa, 1994), there is less consensus regarding the role of awareness. While the others have argued that the only learning capable to occur without awareness is non-significant in terms of the task of learning in L2 (Robinson, 1995; Schmidt, 1995). This view makes attention and awareness simultaneously are fundamental and give important roles in noticing hypothesis (Schmidt, 2001). According to Schmidt's (1990) Noticing Hypothesis, attention is the mechanism that controls access to awareness and is responsible for noticing (attention plus a low level of awareness) that is crucial for intake to take place.

Awareness' has been defined as "a particular state of mind in which an individual has undergone a specific subjective experience of some cognitive content or external stimulus" (Tomlin & Villa, 1994). Schmidt (1990) discriminates two significant levels of awareness: a low level, 'noticing', and a high level, 'understanding', which involves metalinguistic awareness. The Noticing Hypothesis theorizes that attention is necessary for noticing, and that noticing is essential and sufficient for intake, whereas understanding leads to deeper learning. Studies such as Leow (1997, 1998), Rosa and Leow (2004), and Rosa and O'Neill (1999) serve as support for noticed intake for grammatical items, and other studies, such as Martínez-Fernández (2008); Godfroid et al. (2010); Godfroid et al. (2013), present findings that support the concept of noticed intake for lexical items

2.2 Involvement Load Hypothesis and Task Induced Involvement

With regards to the VanPatten's (1994, 1996) Primacy of meaning principle, Hulstijn (2001) and Robinson (2002) proposed incidental learning as a learning condition in which learners process for meaning rather than for form, when the processing purpose is text comprehension rather than vocabulary learning and unintentionally learn targeted forms/and their meanings. Within this framework, learners may or may not pay attention to word form and become aware of them while they are reading for meanings in comprehension text. Consequently, theoretical framework of attention supports the significance role of using different type of attentional techniques as a valid condition for SLA (Schmidt, 1990; Hulstijn & Laufer, 2001; Mayer, 2001). Thus, a considerable number of research (Hulstijn, 1992; Rott et al., 2002; Rott & Williams, 2003; Rott, 2005) have investigated the effectiveness of several techniques of different lexical involvement tasks to promote incidental learning and incidental vocabulary learning through reading, such as glossing target words, as providing the meaning of obscure words in the margins of a text. Since texts provide learners with a rich input where lexical items are highly contextualized, the addition of some kind of lexical intervention might further nurture lexical development. Laufer and Hulstijn (2001) suppose the notion of *involvement load hypothesis* based on the notion of attention, awareness, and level of processing as the first attempt to operationalize traditional general labels such as noticing, attention, level of processing, elaboration into task-specific components to the SLA field.

The Involvement Load Hypothesis posits that incidental tasks that induce higher involvement are conducive to the type of processing that is deemed crucial for vocabulary learning. The notion of involvement includes three

task-specific components: a motivational component, *'need'* (the task requires students to understand the meaning of new words to complete reading task) and two cognitive components, *'search* and *evaluation'*. *'Search'* refers to the attempt to find the meaning of unfamiliar L2, words from expressing concept when the meaning is not provided; 'search' process may include a variety of strategies (Laufer & Hulstijn, 2001). *'Evaluation'* component requires the use of a new word within a sentence or when the learners are required to produce original sentences.

Most studies that are premised on the role of involvement, attention, and depth of processing in incidental vocabulary learning (Bowles, 2004; Rott, 2005; Martinez-Fernandez, 2008) have rarely employed process measures, such as think-aloud protocols to operationalize awareness. Although attempts to measure different levels of language processing and awareness have been done in cognitive psychology and other areas of SLA, this process still needs to be undertaken in studies on incidental vocabulary learning through reading comprehension tasks. However, the issue of whether the differences in attentional condition of tasks induced involvement have a differential potential methodological effect of learner's attention to form/and meaning on subsequent vocabulary development still need to be investigated.

2.3 Think-Aloud and Reactivity Effect of Verbal Report

SLA research report the significant methodological tool of think aloud to examine and operationalize awareness in L2 learning and L2 learners' cognitive processes while they are interacting with L2 task (Leow & Morgan-Short, 2004; Rott, 2005; Leow, 2006; Sachs & Suh, 2007; Leow et al., 2008; Martinez- Fernandez, 2008). One of the recent advancement in operationalizing and measuring attention is the incorporation of think-aloud protocols in research design. Think-aloud protocols are used as the main methodological tool to measure learners' awareness of and attention to certain features of the L2 input. Since concurrent verbal reports are able to show learner's cognitive processes while interacting with the L2 (Bowles, 2010), the verbalizations of think-aloud have been used to investigate different levels of several cognitive concepts such as awareness (Leow, 1997, 2000; Rosa & Leow, 2004; Rosa & O'Neill, 1999; Sachs & Suh, 2007). Levels of processing were also to be investigated through verbalization of concurrent think-aloud which are defined as the amount of attention, cognitive effort, or elaborating on the target item in the input, and/or noticing induced by different types of experimental tasks (Leow et al., 2008; Morgan-Short et al., 2012) (Laufer & Hulstijn, 2001; Leow et al., 2008)

Any discussion of think-aloud protocols needs to consider the possibility of reactivity; that is, for some tasks, think-aloud may actually alter the cognitive processes involved in the task. Bowles' (2010) meta-analysis showed that overall thinking aloud while performing a verbal task has a small effect on post-task performance: positive reactivity was found on receptive learning, negative reactivity was documented from written production, and there appears to be a small positive effect for comprehension tasks. Although think-aloud has been shown to be nonreactive for certain written L2 comprehension tasks (Bowles & Leow, 2005; Leow & Morgan-Short, 2004; Bowles, 2008; Stafford et al., 2012), their potential reactivity has not been examined with the task that direct L2 learners' attention to a particular lexical form in the input while engaging in processing for meaning of reading comprehension task based on tasks-induced involvement. Consequently, this study examines both the theoretical issue of the role of attention in SLA and the methodological issue related to the reactivity of think-aloud as motivated by the line of research addressing the effect of simultaneous attention to lexical form and processing of meaning on L2 comprehension by Leow et al. (2008). However, a limited study has investigated whether paying learners' attention to processing of lexical form while processing for meaning in the different types of attentional reading task based on the involvement load hypothesis have taken effect to give rise to learners' awareness in deep processing and trigger an online methodological issue of reactivity effect on vocabulary development and subsequent comprehension.

3. Method

This study being a pilot study aims to address the potential methodological issue effected of learners' attention to form/and meaning in the different types of attentional condition of task induced involvement while learners interact with L2 input. To establish learners' attention to meaning while interacting with the L2 data before addressing whether differences types of attentional condition of task induced involvement had differential effect on learners' subsequent vocabulary development, concurrent data of participants' reported allocation of attentional resources while interacting with the L2 input were gathered. Attention was operationalized and measured through incorporation think-aloud protocols in research design to address the issue of potential methodological approach of learners' attention to form and meaning. The study employed a qualitative method involving the concurrent verbal report of think aloud protocol as a method in the research design to elicit important concurrent data that would shed light on the actual processes and to provide information on the issue

of potential reactivity.

3.1 The Participants

For the purpose of this study, six intermediate learners of English as a foreign language from different universities in Iraq were consulted. They were chosen based on purposive sampling. Participants were assigned randomly to one of the three experimental conditions tasks (three different types of reading comprehension tasks modified based on the involvement load hypothesis (Laufer & Hulstijn, 2001)), two participants for each task (2×3), and were asked to verbalise their thought as think-aloud in an audio recorder while they engaged in reading comprehension tasks.

3.2 The Experimental Tasks

The experimental tasks differed in the degree of involvement load due to the presence or lack of the three components (*need, search,* and *evaluation*). Specifically, *search* and *evaluation* features were manipulated in three tasks based on the involvement load hypothesis (Laufer & Hulstijn, 2001), so that their potential effect would be isolated. The first task was multiple-choice glosses words with the purpose of identifying the main idea. Following Rott (2005) and Martinez-Fernandez (2008), in each multiple gloss, three options (the correct meaning, and two additional meanings that would make sense in the present context) were provided. In this type of reading task, participants had to search for the meaning of the new words (because it was not provided), and compare different possible options to evaluate which meaning seems fit best in the given context. The second task was fill-in task, the targeted words were deleted from the text, and the participants have to fill in the blanks as they read, choosing from a list of words accompanied by their synonyms. In this condition, participants do not have to search for the meaning of the new words, but they had to compare different possible options to evaluate which word fit best in each given context. The third task was reading the text with answering embedded questions and had to write a composition of what they had understood from the text, the targeted words were neither deleted nor glossed.

3.3 The Procedure

The researcher demonstrated what it means to think aloud by thinking aloud while performing a task. This was followed by a short practice passage for participants. After that, participants received one of each type of reading comprehension task and were asked to verbalize everything that was going through their mind while making sense of the reading task either in L1 (Arabic) or FL (English).

3.4 Coding

The concurrent verbal report of think-aloud was transcribed, coded, and classified initially as noticing, following Martinez-Fernandez (2008) who categorized two different types of noticing: 'noticing of one word aspect' and 'noticing of two word aspects'. 'Noticing of one word aspect' includes: (a) noticing of word meaning as verbalizing the meaning of a word or reading the glosses out loud; (b) noticing of word form as verbalizing the word form when commenting due to lack of knowledge or when trying to infer its meaning unsuccessfully. While noticing of two words aspects refer to noticing of both word forms and meaning as verbalizing or writing down the word form and meaning in the same stance.

4. Results

The qualitative analysis for the transcription of verbal protocols as seen in Figure 1 showed the overall results of the amount reported noticing of one word aspect (noticing of word form or word meaning) and noticing of two words aspect (noticing of word form and meaning) by the participants while engaged in reading comprehension tasks.

It is obvious to indicate from the findings of think-aloud that reading comprehension tasks with different degree of involvement induced differential effects on noticing. In other words, type of attentional condition of task induced involvement has a differential effect on promoting learners' attention for noticing the unfamiliar words while they engaged in reading comprehension tasks. The amount of reported noticing of word form was higher in answering comprehension task with writing a composition than the other two types of reading task as 28.57% and was less in multiple-choice gloss as 18.91%. While the amount of reported noticing of word meaning was approximately higher in multiple-choice glosses than the other conditional tasks as 35.13% and lower in answering comprehension questions as 32.14%. A superior amount of reported noticing of two word aspects (noticing of word form and meaning simultaneously) occurred in all types of reading comprehension and was higher in multiple-choice glosses than other types of reading tasks as 45.94%. The analysis showed a significant effect of employing concurrent verbal report to induce different types of noticing and has turned out to be very useful tools to operationalize different types of noticing.
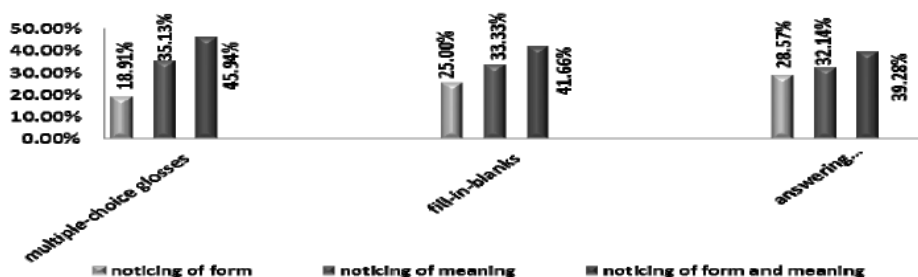
Figure 1. Type of noticing operationalised through think-aloud

It appears that concurrent verbal report in relation to the type of noticing in reading comprehension tasks is able to show that participants in each type of reading comprehension task were capable of moving in and out of different types of noticing. Noticeably, noticing of word form reported through think-aloud was found to be the least explored among other types of noticing since the majority of participants spent less time in this type of noticing. This indicates that participants are reading for meaning and realizing their lack of knowledge when they encounter unfamiliar words during reading the text. Table 1 shows the frequency for the utterances of concurrent verbal report for noticing of word form.

Table 1. The Frequency for noticing of word form reported by participants for each type of reading task

Types of reading comprehension tasks	Freq.	Examples
Multiple-choice glosses with identifying main idea	7	*For some post…impact dis.. disorientation.. I don't know what is the meaning of this word…but may be related to one of the three words between brackets….uh…may be awkwardness…or may be confidence…..eh.. or embarrassment…but I think means some of confusion…I don't know….*
Fill-in-blanks	9	*During the next stage…continue to lack…. uhhh I don't know what the word is suitable for blank 10..uhh.. but I think the word "function"*
Answering comprehension questions	8	*The final period of recovery is the most extend stage ….I think this stage should…uhhh….. all the survivors people forget everything …so related the final stage …the survivor has realized and he may need to solve the problem …and have a struggle to adapt to the changes in his live ….adapt to … what did the author mean here ….I don't know …..but I think adapt to here means familiarize something like this*

Noticing of word form was revealed when attempts were made to comment due to lack of knowledge for the meaning of the unfamiliar word, somewhat indicated a lack of knowledge of the unfamiliar words and did not lead to any cognitive effort. In some cases, participants monitored their comprehension of the unfamiliar word by mentioning that they were unsure for the meaning of unfamiliar words verbalizing, *"I am not sure."* or "*I don't know*" Therefore, noticing of word form which reported through think-aloud did not lead to any effect on vocabulary development and reading comprehension. Figure 2 depicts a very common example of what participants' monitoring their comprehension of the unfamiliar words in noticing of word form just mentioned.

> *Each survivor has a combination of personal assets and vulnerabilities that either mitigate or exacerbate ….mitigate….mitigate….. **I am not sure the meaning of mitigate…may be means reduce….I don't know…what is the meaning of mitigate**…..*

Figure 2. Common activity of noticing of word form

Hence, it indicated that noticing of word form only did not lead to any cognitive effort of vocabulary learning and vocabulary development while participants engaged in reading comprehension tasks. The utterances reported of noticing of word form only showed common qualities to those in Martínez-Fernández' work (2008).

Noticing of word meaning was found to be the moderately explored between the two types of noticing (noticing of word form only and noticing of word form and meaning). It was realised that the participants spent more time in noticing of word meaning as compared to noticing of word form. Noticing of word meaning was explored through verbalization of participants' thoughts when they read the gloss word or unfamiliar word and tried to identify its meaning while engaged in performing reading comprehension tasks in order to understand the meaning of the reading text and complete reading tasks. Actually, tasks with different amounts of involvement were capable of inducing different types of noticing with different levels of processing through a variety of strategies. Noticing of word meaning was identified through several strategies that were produced by the participants in all types of reading comprehension tasks as displayed in Table 2 which explains the frequency for the utterances of concurrent verbal report of think-aloud for noticing of word meaning with examples.

Table 2. The Frequency for noticing of word meaning reported by participants for each type of reading task

Types of reading comprehension tasks	Freq.	Examples
Multiple-choice glosses with identifying main idea	13	*ehhhh…I think 'catastrophic' means calamitous*
Fill-in-blanks	12	*uhhh……they are also unable to….umm…their attention on their surrounding or …..their action with other people… they are also unable to… focus…their attention on their surrounding ….or….. collaborate their action with other people*
Answering comprehension questions	9	*In the third stage... as a remedy phase after a disaster….uh… victims may experience a short-lived sense of optimism…um… sense of optimism and some pride at having managed to survive…uh… the survivor may have hopeful about the future …..I think the author intend from the term "roll up their sleeves" that … the survivor people… may have …uh…an optimism and hopeful to rebuild their future…..*

In comparison to the previous type of noticing (noticing of word form only), findings for the noticing of word meaning only demonstrated that participants were immersed in their understandings for the meaning of the unfamiliar words during exposure to the input. In other words, the think-aloud protocols revealed that the majority of participants who verbalized the unfamiliar words for this type of noticing (noticing of word meaning only) used a variety of strategies when they encountered the unfamiliar words for all types of reading comprehension tasks. Strategies explored in noticing of word meaning including accessing and retrieving existing knowledge sources in order to assign the meaning of the unfamiliar words, such as prior knowledge, use of context, and synonym. This was done because it showed the participants' intrinsic the component *need* and subsequently *search* for the meaning of the unfamiliar words. When searching for the meaning of the unfamiliar words in the context, participants sometimes identified and utilized words in the immediate environment or looked at a previous sentence for semantic clues, in some case used clues from the subsequent unfamiliar words encounter. In few cases, participants inferred the correct meaning of the unfamiliar words during the second encounter through a connection between the unfamiliar words and known words or through connecting the previous knowledge with the existing knowledge in the context to infer meaning concurred with Rott's work (2005).

The findings for noticing of word meaning demonstrate that participants who processed the unfamiliar words more often through *search* and *evaluation* strategies, developed more strongly word encodings. In other words, tasks involving higher degree of *search* and *evaluation* processes might induce deeper processing through a variety of strategies such as contextual guessing, accessing or retrieving existing knowledge sources through using of context, a synonym, and background knowledge in order to assign the meaning of the unfamiliar word.

Essentially, noticing of word form and meaning discloses an interesting range of activities and strategies that are extended by the evocation of the potential methodological issue which occurred between input-intake-working

memory. In other words, the findings on noticing of word form and meaning were able to show that while participants were capable of moving in and out of different type of noticing in the same time, they also showed distinctive qualities compared to those in Rott's work (2005) as the majority of the participants indicated lack of knowledge of the unfamiliar word then moved on to evaluate the context and tried to infer its meaning. Although participants spent more time in this type of noticing (noticing of word form and meaning) as compared to the previous type of noticing (noticing of word form or meaning only), higher amount of utterances were reported as compared to noticing of word form or word meaning only. Findings show a significant aspect of noticing of word form and meaning as participants were capable to use their previous knowledge and tried to think of their understanding previously held through a series of cognitive strategies which were being used by the participants as they tried to examine, understand the meaning of the unfamiliar word, and evaluate its meaning with providing the reason for constructing its meaning while engaged in performing reading comprehension tasks. Table 3 shows the frequency for the utterances of concurrent think-aloud protocols for noticing of word form and meaning with examples.

Table 3. The frequency for noticing of word form and meaning reported by participants for each type of reading task

Types of reading comprehension tasks	Freq.	Examples
Multiple-choice glosses with identifying main idea	17	*umm…and major terrorist attack uhhh….are extremely traumatic and generate some predictable responses from the people involved….umm…. traumatic….uh.. traumatic…. I don't know what is meaning of 'traumatic' umm… but I think one of these words are related to the meaning of 'traumatic' such as shocking…umm….yes..it is shocking because pleasing it is not suitable…. and stress leads to something like effect of effort but I think shocking is suitable meaning of traumatic*
Fill-in-blanks	15	*umm…. If I put the word 'catastrophic' in the first blank…I think its appropriate because in the passage is mentioned as 'events'…such as natural disasters…. 'Disaster' is mean terrible…here 'catastrophic' also means terrible.*
Answering comprehension questions	11	*uh….I think….there are two different states that the author mentioned in the third and fourth paragraphs…umm…in the third paragraph….uhh..the survivor people may experience a sense of optimism…I'm not sure the meaning of optimism …. and in the fourth paragraph…. after the victims begins to recognise the available disaster assistance they are most likely to become depressed or even attempt suicide and the survivor feel abandoned and forgotten….I think these different cases…optimism and depression…uhh..optimism… I think means hopeful…..hopeful in the future and express their willingness to roll up their sleeves means rebuild a new life…so in the fourth paragraph the survivor people feel abandoned and suicide after recognising the limits of available disaster assistance so they become depressed did not have any hopeful in the future… I don't know the meaning of depressed but I think lead to something like unhappy…*

Noticeably, noticing of word form and meaning reveals an interesting range of activities that extend the evocation of new significant strategies which were explored and used to construct the meaning of the unfamiliar word concurred with the works of Rott (2005) and Martinez-Fernandez (2008). Testing hypothesis and evaluation were found to be the most explored strategies in noticing of word form and meaning while performing reading comprehension task.

An association was found between type of noticing and constructing the meaning of unfamiliar words verbalized in reading text during performing reading task based on task-induced involvement. The unfamiliar word which was verbalized in noticing of word form and meaning were more likely to be developed throughout attempting to

test several meaning then refine their word knowledge, or change the initial wrong meaning assignment during the second encounter as compared to noticing of word meaning. Figure 3 demonstrates a very common example of what most participants in the study as they explored this type of noticing in constructing the meaning of unfamiliar words through hypothesis testing and evaluation.

> *Each survivor has a combination of personal assets and vulnerabilities ….umm…that either mitigate or exa…exacerbate….disaster stress.. ehh ... what is the meaning of mitigated and exacerbate…exacerbate? ...may be one of them is different meaning from the other because here is mention 'or'….uhhh…I think mitigated means reduce because mitigate…..uh….means…something like…like ….moderate ... or may make less...uhh…. I think the word moderate in the bracket means mitigate……oh….no… I think the word "ease" means... 'mitigate' because "ease" such like simplicity the effort, effect, or make easy….*

Figure 3. Common activity noticing of word form and meaning

In fact, an online methodological issue called *reactivity* was raised and occurred in noticing of word form and meaning which was explored through verbalization of concurrent think-aloud and was accurately different in noticing of word meaning only. Most of the new words verbalized by the participants in noticing of word meaning were learned and happened in intake as cognitive registration. While the same new words verbalized in noticing of word form and meaning were learned and developed regardless to the changes of the meanings of new words and this happened during the second encounter based on three components of involvement load (*need*, *search*, *evaluation*). Metalanguage and metalinguistic awareness for the provision of reasons in making meaning of the unfamiliar words were observed in noticing of word form and meaning. In this study, participants' uses of metalinguistic verbalization characterized by providing the reasons of constructing, explanations, and justifications for the meaning of new words were associated with the accuracy of their revisions for changing the meaning of new words during the second encounter of unfamiliar word while engaged in performing reading task.

Actually, as can be seen in Figure 3, there are conclusive results about the effects of attentional conditions based on task-induced involvement regarding the participants' simultaneous attention to form and meaning in the reading task on their subsequent development of vocabulary in the reading text. In other words, the potential methodological issue of reactivity effect of think-aloud was arisen through participants' simultaneous attention to processing of form and meaning while exposed to reading task and this issue has contributed positively effect on subsequent vocabulary development.

5. Discussion

The qualitative findings of this study revealed that type of attentional condition of task-induced involvement appeared to have a differential effect on vocabulary development and subsequently reading comprehension when the learners have processed to construct the meaning of the unfamiliar words while they were engaged in processing of reading comprehension task. Regarding the research question in this study whether types of attentional condition based on task induced involvement have a differential effect of learners' attention on subsequent vocabulary development, the results showed that tasks with different involvement load induced different types of noticing as measured by think-aloud protocol. Three types of noticing were operationalised as the ability for verbal report: noticing of word forms only, noticing of word meaning only, and noticing of word form and meaning. Following Bowles (2004) and Martínez-Fernández (2008), the first two types of noticing —word form only and meaning only— constitutes one level of awareness.

In this study, noticing of word form and meaning was interpreted as a high level of awareness. Schmidt (1995) proposed that awareness at the low level –noticing- which involves a cognitive registration of a form, awareness at a higher level —understanding— which involves awareness of more word aspects, such as understanding the meaning and syntactic features of the word. In other words, awareness at the level of understanding involves noticing plus metalinguistic awareness (such as thinking, analysing, comparing, experiencing conscious insight, or attempting to understand the significance of a linguistic form) (Schmidt, 2001).Within this framework, it is interpreted in this study that noticing of word form or meaning is a cognitive registration of a form that constitutes a low level of awareness. In turn, noticing of both word form and meaning can be interpreted as a

higher level of awareness, since it involves a cognitive registration of more word aspects. Therefore, this study supports previous findings of studies on levels of awareness employing morphological and syntactic structures (Rosa & O'Neill, 1999; Rosa & Leow, 2004). In this study, a higher level of awareness was found in all conditions of reading comprehension tasks, and was usually related to high-level of processes such as hypothesis testing, inferring, and context evaluation with metalinguistic awareness. Noticing with providing a reason or awareness at the level of understanding might have more of an impact on learning based on Sachs and Polio's findings (2007). Consequently, developing the meaning of unfamiliar words were better occurred at the level of understanding than level of noticing.

Noticeably, it is important to indicate that treatment condition of reading comprehension task based on task-induced involvement required deeper processing which may influence the extent of higher level of awareness for the occurrence of the unfamiliar words and their attended meanings with range of strategies as used by study participants during the act of performing reading comprehension task. The results of the analysis of thinking-aloud protocols showed that the performance verbal report while engaging in reading task might create additional learning opportunities, promote increased attention which leads to deep processing, more reasoning, and ultimately a positive occurrence of reactivity (Sanz et al., 2009; Jourdenais, 2001) might have effect on vocabulary development.

A potential methodological issue of reactivity effect of concurrent think-aloud was revealed while learners were paying attention to processing of word form and meaning during exposed to reading comprehension task based on different methods of attentional condition of task-induced involvement that required participants to read the text for comprehension and complete the comprehension task. In fact, the issue of reactivity effect of think-aloud appeared at the high level of awareness when the participants comment on a lack of knowledge of the words and incorrectly inferring the meaning of a new word, then endeavour to construct the meaning of the same word with providing metalinguistic awareness when they engaged in reading comprehension task. In this study, positive reactivity effect on vocabulary development was evident in the participants' ability to produce the meaning of unfamiliar words presented in the reading task as well as to complete the reading comprehension tasks.

Although these results are in line with studies in SLA (Sach & Polio, 2007; Sanz et al., 2009), it contradicts studies cited in Ericsson and Simon (1984); Bowles (2008); Bowles and Leow (2005); Leow and Morgan-Short, (2004) who have reported that metalinguistic and non-metalinguistic verbalization during text processing did not significantly affect learners' subsequent performance when compared to control group. Differences in design may be enough to explain the contradicting evidence; the aim of employed think-aloud in research design was to probe whether, in fact, the attentional condition of task-induced involvement had a differential effect of learners' attention to form/and meaning that may influence the extending to which a reactive effect is induced on subsequent vocabulary development. Based on the results, it is postulated that "the impact of protocol generation depends strongly on the task, suggesting that the causes of reactivity are not general but due jointly to the demands of the task and to verbalization" (Russo et al., 1989).

Consequently, it could be concluded that requiring learners to perform think-aloud protocol has the potential effects to alter the processes they are meant to reflect. Performing thinking-aloud while learners are engaged in reading comprehension task has effect to operationalize awareness, and hence better learning and developing the meaning of new vocabulary. According to Sanz et al. (2009), L2 learners thinking-aloud spend more time on a task as they were asked to carry out two parallel tasks (the language task and the demand to talk about it), both slowing down the processes and creating additional task requirements possibly induce awareness and create conditions that may result in positive reactivity. Finally, further research should be investigated such as the relationship between the level of awareness, level of processing, and vocabulary development in the issue of reactivity.

References

Bowles, M. A. (2004). L2 glossing: To CALL or not to CALL. *Applied Linguistics, 87*(3), 541-552. http://dx.doi.org/10.2307/20063060

Bowles, M. A. (2008). Task type and reactivity of verbal reports in SLA: A first look at a L2 task other than reading. *Studies in Second Language Acquisition, 30*(3), 359-387. http://dx.doi.org/10.1017/S0272263108080492

Bowles, M. A., & Leow, R. P. (2005). Reactivity and type of verbal report in SLA research methodology: Expanding the scope of investigation. *Studies in Second Language Acquisition, 27*, 415-440. http://dx.doi.org/10.1017/s0272263105050187

Bowles, M. A. (2010). *The think-aloud controversy in second language research*. New York. Routledge.

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11*, 671-684. http://dx.doi.org/10.1016/S0022-5371(72)80001-X

Gass, S. (1988). Integrating research areas: A framework for second language studies. *Annual Review of Applied Linguistics, 9*, 92-106. http://dx.doi.org/10.1017/S0267190500000829

Ericsson, K. A., & Simon, H. A. (1984). *Protocol analysis verbal reports as data* (Rev. ed.). Cambridge, Massachusetts, London, England: The MIT Press.

Godfroid, A., Boers, F., & Housen, A. (2013). An eye for words: Gauging the role of attention in incidental L2 vocabulary acquisition by means of eye-tracking. *Studies in Second Language Acquisition, 35*(3), 483-517. http://dx.doi.org/10.1017/S0272263113000119

Godfroid, A., Housen, A., & Boers, F. (2010). A procedure for testing the noticing hypothesis in the context of vocabulary acquisition. In M. Pütz, & L. Sicola (Eds.), *Cognitive processing and second language acquisition* (pp. 169-197). Amsterdam/Philadelphia: John Benjamins. http://dx.doi.org/10.1075/celcr.13.14god

Hulstijn, J. H. (1992). Retention of inferred and given word meanings: Experiments in incidental vocabulary learning. In P. J. L. Arnaud, & H. Bejoint (Eds.), *Vocabulary and Applied Linguistics* (pp. 13-124). London: Macmillan. http://dx.doi.org/10.1007/978-1-349-12396-4_11

Hulstijn, J. H. (2001). Intentional and incidental second language vocabulary learning: a reappraisal of elaboration, rehearsal and automaticity. In P. Robinson (Ed.), *Cognition and Second Language Instruction* (pp. 258-286). Cambridge: Cambridge University Press. http://dx.doi.org/10.1017/CBO9781139524780.011

Hulstijn, J. H., & Laufer, B. (2001). Some empirical evidence for the involvement load hypothesis in vocabulary acquisition. *Language Learning, 51*(3), 539-558. http://dx.doi.org/10.1111/0023-8333.00164

Jourdenais, R. (2001). Cognition, instruction, and protocol analysis. In P. Robinson (Ed.), *Cognition and Second Language Instruction* (pp. 354-375). Cambridge: Cambridge University Press. http://dx.doi.org/10.1017/CBO9781139524780.014

Laufer, B., & Hulstijn, J. A. N. (2001). Incidental vocabulary acquisition in a second language : The construct of task-induced involvement. *Applied Linguistics, 22*(1), 1-26. http://dx.doi.org/10.1093/applin/22.1.1

Leow, R. P. (1997). Attention, awareness, and foreign language behaviour. *Language Learning, 47*(3), 467-505. http://dx.doi.org/10.1111/0023-8333.00017

Leow, R. P. (1998). Toward operationalizing the process of attention in SLA: Evidence for Tomlin and Villa's (1994) fine-grained analysis of attention. *Applied Psycholinguistics, 19*(1), 133-159. http://dx.doi.org/10.1017/S0142716400010626

Leow, R. P. (2000). A study of the role of awareness in foreign language behaviour: Aware versus unaware learners. *Studies in Second Language Acquisition, 22*(4), 557-584. http://dx.doi.org/10.1017/S0272263100004046

Leow, R. P. (2001). Attention, awareness, and foreign language behaviour. *Language Learning, 51*, 113-155. http://dx.doi.org/10.1111/j.1467-1770.2001.tb00016.x

Leow, R. P. (2006). The role of awareness in L2 development: Theory, research, and pedagogy. *Indonesian Journal of English Language Teaching, 2*(2), 125-139.

Leow, R. P. (2012). Explicit and implicit learning in the L2 classroom: What does the research suggest? *The European Journal of Applied Linguistics and TEFL, 2*, 117-129.

Leow, R. P., & Morgan-Short, K. (2004). To think aloud or not to think aloud: The issue of reactivity in SLA research methodology. *Studies in Second Language Acquisition, 26*, 35-57. http://dx.doi.org/10.1017/S0272263104261022

Martínez-Fernández, A. (2008). Revisiting the involvement load hypothesis: Awareness, type of task and type of item. In M. Bowles, R. Foote, S. Perpiñán, & B. Rakesh (Eds.), *Selected Proceedings of the 2007 Second Language Research Forum* (pp. 210-228). USA: Somerville, MA: Cascadilla Proceedings Press.

Mayer, R. E. (2001). *Multimedia learning* (1st ed.). New York, NY, USA: Cambridge University Press. http://dx.doi.org/10.1017/CBO9781139164603

McLaughlin, B. (1987). *Theories of second language learning*. London: Edward Arnold.

Morgan-Short, K., Heil, J., Botero-Moriarty, A., & Ebert, S. (2012). Allocation of attention to second language form and meaning: Issues of think aloud and depth of processing. *Studies in Second Language Acquisition, 34*, 659-685. http://dx.doi.org/10.1017/S027226311200037X

Norris, J. M., & Ortega, L. (2000). Effectiveness of L2 instruction: A research synthesis and quantitative meta-analysis. *Language Learning, 50*, 417-528. http://dx.doi.org/10.1111/0023-8333.00136

Robinson, P. (1995). Attention, memory, and the noticing hypothesis. *Language Learning, 45*, 283-331. http://dx.doi.org/10.1111/j.1467-1770.1995.tb00441.x

Robinson, P. (2002). Effects of individual differences in intelligence, aptitude and working memory on adult incidental SLA. In P. Robinson (Ed.), *Individual Differences and Instructed Language* Learning (pp. 211-266). Philadelphia/Amsterdam: John Benjamins. http://dx.doi.org/10.1075/lllt.2.13rob

Rosa, E. M., & Leow, R. P. (2004). Awareness, different learning conditions, and second language development. *Applied Psycholinguistics, 25*(2), 269-292. http://dx.doi.org/10.1017/S0142716404001134

Rosa, E., & O'Neill, M. D. (1999). Explicitness, intake, and the issue of awareness. *Studies in Second Language Acquisition, 21*(4), 511-556. http://dx.doi.org/10.1017/S0272263199004015

Rott, S. (2005). Processing glosses: A qualitative exploration of how form-meaning connections are established and strengthened. *Reading in a Foreign Language, 17*(2), 95-124.

Rott, S., & Williams, J. (2003). Making form-meaning connections while reading : A qualitative analysis of word processing. *Reading in a Foreign Language, 15*(1), 45-75.

Rott, S., Williams, J., & Cameron, R. (2002). The effect of multiple-choice L1 glosses and input-output cycles on lexical acquisition and retention. *Language Teaching Research, 6*(3), 183-222. http://dx.doi.org/10.1191/1362168802lr108oa

Russo, J. E., Johnson, E. J., & Stephens, D. L. (1989). The validity of verbal protocols. *Memory and Cognition, 17*(6), 759-769. http://dx.doi.org/10.3758/BF03202637

Sachs, R., & Polio, C. (2007). Learners' uses of two types of written feedback on a L2 writing revision task. *Studies in Second Language Acquisition, 29*, 67-100. http://dx.doi.org/10.1017/s0272263107070039

Sachs, R., & Suh, B-R. (2007). Textually enhanced recasts, learner awareness, and L2 outcomes in synchronous computer-mediated interaction. In A. Mackey (Ed.), *Conversational interaction in second language acquisition: A collection of empirical studies* (pp. 197-227). Oxford: Oxford University Press.

Sanz, C., Lin, H., Lado, B., Bowden, H. W., & Stafford, C. A. (2009). Concurrent verbalizations, pedagogical conditions, and reactivity : Two CALL studies. *Language Learning, 59*(1), 33-71. http://dx.doi.org/10.1111/j.1467-9922.2009.00500.x

Schmidt, R. W. (1990). The role of consciousness in second language. *Applied Linguistics, 11*(2), 129-185. http://dx.doi.org/10.1093/applin/11.2.129

Schmidt, R. (1995). Consciousness and foreign language learning: A tutorial on the role of attention and awareness in learning. In R. Schmidt (Ed.), *Attention and awareness in foreign language learning* (pp. 1-63). Honolulu, Hawai: University of Hawai Press.

Schmidt, R. (2001). Attention. In R. Schmidt (Ed.), *Cognitive and second language instruction* (pp. 1–60). Cambridge: Cambridge University Press. http://dx.doi.org/10.1017/CBO9781139524780.003

Stafford, C. A., Bowden, H. W., & Sanz, C. (2012). Optimizing language instruction: Matters of explicitness, practice, and cue earning. *Language Learning, 62*(3), 741-768. http://dx.doi.org/10.1111/j.1467-9922.2011.00648.x

Tomlin, R. S., & Villa, V. (1994). Attention in cognitive science and second language acquisition. *Studies in Second Language Acquisition, 16*(02), 183-203. http://dx.doi.org/10.1017/S0272263100012833

VanPtten, B. (1994). Evaluating the role of consciousness in second language acquisition: Terms, linguistic features and research methodology. In J. H. Hulstijn, & R. Schmidt (Eds.), *Consciousness in Second Language Learning: AILA Review* (Vol. 11, pp. 27-36). Amsterdam: Vrije Universiteit Amsterdam & the University of Hawai'i at Manoa.

VanPtten, B. (1996). *Input processing and grammar instruction in second language acquisition: Theory and research* (2nd ed.), Norwood, New Jersey: Ablex Publishing Corporation.

VanPtten, B. (2004). Input processing in SLA. In B. VanPtten (Ed.), *Processing instruction: Theory, research, and commentary* (pp. 5-31). Mahwah, New Jersey: Lawrence Erlbaum Associates Publishers.

Copyrights