Assessing the Correlation Between Task- induced Involvement Load, Word Learning, and Learners' Regulatory Ability

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Absrtact: The present study, using quantitative and qualitative analyses, aimed at delineating the interrelationship between the knowledge of metacognition and the regulation of metacognition, along with the role of learners' regulatory ability in mediating the effects of task-induced involvement load on word learning. A total of 60 university EFL students were recruited to the study. They first completed a checklist on metacognition and were then assigned to complete three tasks with varying degrees of involvement load followed by a vocabulary test. Of them, 12 students also participated in an interview. The results showed that the two main components of metacognition, i.e., the knowledge and regulation of metacognition, are closely and significantly correlated. The learners, assigned to four different ability groups (LK/LR, LK/HR, HK/LR, HK/HR), were found to benefit most by engaging in a task with the highest involvement load. Despite the benefits, their regulatory ability mediated the effects of task-induced involvement load on word learning, which was corroborated by the interview results. The relevant implications for teaching and learning words through tasks are further discussed.
Keywords: metacognitive knowledge; regulatory ability; involvement; word learning

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Introduction

Along with the expansion of enrollment in Chinese universities, a large number of students enter post-secondary programs with inadequate vocabulary for the English courses at the college (Coniam, 2014). Thus, great efforts are taken in the teaching and learning of vocabulary in the universities. Indeed, the ability to comprehend English words is the central building block for learning and the lack of proficient vocabulary in a learner is regarded as a barrier to reading comprehension (Coady, 1997; Teng & Zhang, 2015). In the Chinese or other Asian contexts of learning English as a Foreign Language (EFL), constant exposure to the target language is scarce. Thus, deliberate attention to individual words requires more input in English learning and teachers also focus on explaining individual meanings in their native language, thereby, making the vocabulary learning ability subject to the students' efforts (Schmitt, 2010). This further results in low vocabulary learning outcomes (Chacón Beltrán, Abello-Contesse, & Torreblanca-López, 2010). Therefore, there is a need to investigate what affects word learning.

Due to the difficulties experienced in teaching and learning vocabulary, researchers began to seek alternatives, including training students' self-regulatory ability in learning vocabulary (Teng, in press). Indeed, self-regulated learners often exhibit a high sense of self-efficacy in learning English. They are more likely to be cognizant of their strengths and weaknesses and work hard to perform better in academic learning (Pintrich & Schunk, 2002). They also know how to identify a topic, set reasonable goals to examine it, adopt appropriate strategies to familiarize themselves with it, and evaluate as well as modify strategies to develop a craving to have in-depth understanding of the subject matter (Ziegler, Stoeger, & Grassinger, 2011). Thus, it is reasonable to argue that empowering students to become self-regulated is essential. However, as proposed by Zimmerman (1989), self-regulated learning is determined by two main ingredients, that is, personal and environmental processes along with behavioral events in a reciprocal fashion. In addition, self-regulated learners demonstrate a control over their cognitions, motivations, behaviors, and environments because they are "metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 2008, p. 167). According to Carvalho and Yuzawa (2001), although self-regulated learners perform better in their academic learning, self-regulation is influenced by learning settings as well as learners' psychological attributes, for instance, their ability in metacognitive regulation.

Against this backdrop, researchers have attempted to measure how metacognition mediates learners' academic performance (Blankson & Blair, 2016), confidence judgments (Carvalho & Yuzawa, 2001), and word learning (Teng, 2017). In addition, to identify the conditions that foster the acquisition of word learning, some researchers also developed tasks for orienting students' new word self-learning ability. For example, Laufer and Hulstijn (2001) proposed the Involvement Load Hypothesis and designed three tasks based on the involvement. They claimed that word learning depends on three task-induced involvement loads including need, search, and evaluation, which result in a better retention of the learned words. Although researchers have acknowledged the effects of task-induced involvement on word learning, studies investigating the effectiveness of different lexical intervention tasks have led to conflicting results (Huang, Eslami, & Willson, 2012). It is not clear why the differences are there. Some factors mediating the role of task-induced involvement in word learning include learners' word level (Teng, 2015a), frequency in word encounters (Laufer & Rozovski-Roitblat, 2011), time on completing tasks (Keating, 2008), and learners' metacognition (Teng, 2017). These studies drew the conclusion that learners' metacognition influences the extent of their effort in word learning. The purpose of the present study was to employ a mixed method to examine how learners' regulatory ability, a dimension of metacognition, mediates the effects of task-induced involvement on word learning. Unlike previous studies, the combination of quantitative and qualitative results would help in adding knowledge to the current understanding of the relationship between task-induced involvement load and word learning.

1. Literature review

Metacognition, according to Flavell (1979), refers to an appreciation of the knowledge of one's own cognitive system, together with a regulation of relevant knowledge and skill that it requires. Metacognition includes two components: the knowledge and the regulation of metacognition (Schraw & Dennison, 1994). The knowledge of metacognition refers to one's own cognitive processes while the regulation of metacognition touches upon one's ability in regulating his/her own learning processes (Brown, 1978). The knowledge of metacognition includes three types of awareness: declarative knowledge (i.e., knowing that), procedural knowledge (i.e., knowing how), and conditional knowledge (i.e., knowing when) (Flavell, 1979). The regulation of metacognition entails three skills like planning (i.e., an appropri-

ate selection of the strategies and correct allocation of resources to complete a task), monitoring (i.e., a learner's awareness of task comprehension and performance), and evaluating (i.e., a learner's ability in appraising the efficiency with which the task was performed) (Brown, 1978). It can be inferred from the earlier studies that metacognition is a multidimensional construct, and the knowledge and the regulation of metacognition are related to a learner's ability in performing a task.

Although both knowledge and regulation of metacognition have been addressed in previous studies, it has also been pointed out that the regulation of metacognition plays a decisive role in academic performance (e.g., Mevarech & Amrany, 2008; Teng, 2016). It refers to the extent to which learners exert control over their own learning to master a specific task. This is also regarded as a regulatory ability (Zimmerman, 1989). It is related to the self-implementation of specific operations, including planning, monitoring, and the evaluating of the tasks (Zimmerman, 2000). First, the learners with a high level of regulatory ability tend to plan their performance prior to the task, monitor whether they are still on track during the task performance, and evaluate their performance outcomes after the task (Zimmerman, 2008). It is assumed that because of constant exposure to the learning processes during planning, monitoring, and evaluation cycles, learners are able to use their prior knowledge and strategies in a task performance and exert substantial efforts in future learning (Chen, 2011). Therefore, it has been concluded from these studies that the regulatory ability is viewed as a sequence of actions and/or steering processes with the intention of attaining a task goal. In addition, given the large extent to which learners are metacognitively, motivationally, and behaviorally proactive, the participants are likely to perform the task in their own learning processes.

In the backdrop of this context, many researchers also investigated the possible differences in self-regulatory skills among learners and how this affects their performance in different tasks. For example, Schraw (1994) showed that learners with a higher level of regulation of metacognition performed better than those with a lower level of regulation of metacognition. This is the main factor that produces the individual differences in academic performance as well as the susceptibility to comply with the embedded information in a task. Similarly, Cornoldi, Carretti, Drusi, and Tencati (2015) considered a sample of 135 primary students in Italy. After conducting a training program focusing on metacognition and working memory, they found that learners with low regulatory skills may not have explicit learning goals and may find it difficult to plan, monitor, and evaluate their learning and deploy appropriate strategies in the tasks. Carvalho and Yuzawa (2001) conducted a study of 77 Japanese tertiary-level students and found that metacognitive cues affect learn-

ers' judgment confidence, where students with higher levels of regulation of metacognition were more confident in their performance. In a recent study (Teng, 2017), 77 Chinese EFL students were involved in conducting three tasks and took a test on their judgment confidence and word learning ability, and the results showed that the regulation of metacognition is a good predictor of the learners' judgment confidence and the actual word learning performance. A common theme in these studies is the regulatory ability, which is related to learners' academic performance and affects their problem-solving, judgment confidence, and word learning ability.

As mentioned above, word learning is important in the EFL context and is thus the main focus of the present study. Previous studies also discussed the relationship between metacognition and word learning (e.g., Jucks & Paus, 2012), where it was suggested that word identification involves more than just rapid word retrieval, and the increased speed in decoding words does not automatically lead to increased comprehension. It also showed the difficulties in word learning. Therefore, researchers have attempted to improve learners' word learning by developing new tasks based on the Involvement Load hypothesis (ILH, Laufer & Hulstijn, 2001). According to this hypothesis, an effective learning process of new words is contin gent upon the amount of involvement while processing the tasks. Task-induced in volvement is regarded as a motivational-cognitive construct and consists of three dimensions: need, search, and evaluation. Need refers to whether the prior knowledge of new words is required to complete a task, which is the motivational and non-cognitive dimension of the involvement load. It is considered moderate if imposed by the task, but strong if imposed by the learner. For example, when a learner is intrinsically motivated to perform a task, she/he has a strong need. Search and evaluation are categorized as the cognitive dimensions of the involvement, whose prime focus is on the information processing involved in the learning and remembering of a word's form and meaning. For example, when learners are required to notice new words and pay attention to them, the search is regarded as an attempt that individuals make to determine the meaning of unknown words, encountered during a task, by the aid of a dictionary or consulting a teacher. However, it is absent when such an effort is not required, for example, when a text is accompanied by marginal glosses for unknown words. Finally, evaluation refers to the comparison of a new word with a word already known, deducing a particular meaning of the word among other meanings, or assessing its suitability in a given context. It is moderate when a task requires a learner to recognize the differences between words provided in a given context, such as a fill-in-the-blank task, but it is strong when the task requires a learner to make decisions about the meaning of unknown words and

combine them with known words in an original context, such as writing a sentence or composition. The involvement load of a task is derived from the combinations of the three dimensions of Need, Search, and Evaluation but may not involve all the dimensions. A task where a factor is completely absent is scored as 0, if moderately present as 1, and if strongly present as 2. A task with all the strong dimensions carries a higher level of involvement load. When the involvement level is higher, the task is deemed to be more effective for word learning (Laufer & Hulstijn, 2001).

A lot of empirical studies have been conducted to measure ILH and some of them empirically supported the involvement load. For example, Teng (2015b) designed three tasks of using new words in original sentences (strong evaluation), reading plus fill-in- blank (moderate evaluation), and the reading comprehension task (evaluation is absent). A total of 180 Chinese EFL students were involved, and the results showed that the task with the strongest evaluation exhibited the largest word learning gains. Similarly, in Wang's (2015) study, 64 college sophomore non-English major students in Taiwan undertook four vocabulary tasks with different involvement loads. The results revealed that after doing the post-reading exercises, the learners could make a difference on word gains. The task with the highest involvement leads to the best learning gains. On the other hand, some previous studies contradict or partially support the ILH. For example, Mondria's (2003) study involved 38 Dutch students (14-16 years old), who learned French vocabulary through four tasks (Task 1: inferring meaning; Task 2: inferring and verifying meaning; Task 3: inferring, verifying and memorizing meaning; and Task 4: memorizing meaning given in a list of the target words with Dutch equivalents). The re sults revealed that, although Task 4 led to the best learning outcome, the differences in learning vocabulary were not significant from the first three tasks. Similarly, Niu (2014) involved 98 undergraduate students in completing a collaborative oral output task, which revealed that even one task may lead to learners showing different degrees of word processing (i.e., task-inherent involvement load), and hence, different lexical learning, since learners may perform the same task differently. Studies (Huang et al., 2012; Keating, 2008) also suggest that word learning is better in the learners who read a combination of expository and narrative text than those who read either an expository or narrative text, but when time on task was taken into account, the benefits connected to different involvement loads faded. After reviewing the conflicting results noted above, it can be inferred that learners seem to encounter difficulties in learning a large amount of vocabulary through the tasks. In addition, they seem to be unable to achieve implicit processes and additional information concerning differential depth of processing while performing the tasks.

Even though the same tasks were designed through ILH, some learners scored high in the target word learning while others score low. The conflicting results lead us to consider the possible differences in learners' abilities to process the tasks. For example, the learners' regulatory ability in performing a task is a factor to be considered.

In sum, it is essential to explore the causes of the differences in learners' susceptibility to comply with the tasks with varying involvement loads. The first rationale for the present study was that the degree of involvement in a task and self-regulated learning appear to be interrelated (Fox & Riconscente, 2008). Second, the task-induced involvement load proposed by Laufer and Hulstijn (2001) attempts to measure the learners' ability for incidental word learning, which asks the question whether students would spontaneously acquire the meanings for unknown words encountered in the text based on self-directed learning. The involvement, in this regard, was used as a means to create conditions for self-regulated learning and lead students to gradually become autonomous in their word learning. Third, previous studies have shown that the knowledge and regulation of metacognition conjointly played a significant role in explaining learners' performance (Bandura, 1986; Bernacki, Nokes-Malach, & Aleven, 2015). Finally, what is critical for lexical learning is learners' degree of word processing, which is in accordance with Craik and Tulving's (1975) depth of processing hypothesis and Schmitt's (2008) conclusion that engagement with unknown words for lexical learning is essential. It explains how the relative demands of a given task produce different levels of cognitive processing. As revealed by Kim (2011), individual differences, including learners' cognitive involvement, might be important to consider when implemented with pedagogic tasks. Likewise, as suggested by Ender (2014), the learning strategies used by learners to cope with unknown lexical items are related to their cognitive operations. These previous studies provide a theoretical basis for the research design in the present study, wherein the purpose was to measure how learners' regulatory ability mediates the effects of involvement load on word learning ability. To this end, research questions are formulated as follows:

1.To what extent does word learning differ due to the effects of task-induced involvement load?

2.To what extent does learners' regulatory ability mediate the effects of task-involvement load in word learning?

2. The study

2.1 Participants

Sixty business-English-major students (10 males and 50 females) from a university in China participated in this study. Their ages ranged from 18 to 20 years. They had studied English as a Foreign Language (EFL) for at least six years. They volunteered to participate in this study for extra course credits. All of them signed a consent form. They were instructed that they needed to do some reading and vocabulary exercises and were also informed that they were free to withdraw from this study at any time. However, they were not informed of the real purpose of the study.

All participants completed the Metacognitive Awareness Inventory (MAI) of Schraw and Dennison (1994) prior to the study (see the measure section). MAI includes two sections: the knowledge-of-metacognition checklist and the regulation-of-metacognition checklist. The mean score for the knowledge-of-metacognition checklist was 32.13 (SD = 5.21). 32 learners scoring above the mean score were defined as high knowledge-of- metacognition learners (M = 41.12, SD = 4.12). 28 learners who scored below the mean score were defined as the low knowledge-of-metacognition learners (M = 25.12, SD = 3.15). The mean score for the regulation-of-metacognition checklist was 69.13 (SD = 6.05). Of the learners, 31 were defined as high-regulation learners (M = 76.95, SD = 5.81), and 29 were defined as low-regulation learners (M = 53.13, SD = 4.89).

We adopted the method in Carvalho and Yuzawa (2001) and combined the knowledge-of-metacognition with the regulation-of-metacognition scores. The participants were divided into four groups: 15 as the low knowledge and low regulators group (LK/LR), 16 as the low knowledge but high regulators group (LK/HR), 15 as the high knowledge but low regulators group (HK/LR), and 14 as the high knowledge and high regulators group (HK/HR).

2.2 Reading materials and target words

The reading materials were three texts taken from a textbook for business-English major students (Wang & Sun, 2014). The texts were selected because they were within the major of the participants. It was assumed that the participants might be interested in such materials. These texts had never been used in their normal class. Each text contained around 800 words and included eight target words. These words were important for understanding the texts. The learners' prior knowledge about the new 24 target words was pre-tested (see the measure section). It was con-

firmed that they did not have any prior knowledge of any of the target words. The target words consisted of 9-11 letters (consummate, aggressive, intimidate, procurement, resolution, litigation, custodian, arbitration, jeopardize, aggregate, predicament, lucrative, remittance, irrevocable, predominant, indemnity, conveyance, reimburse, exacerbate, grievance, sympathetic, compliment, adamantly, eliminate).

2.3 Task types

Three tasks, imposing different reading conditions on the participants, differed from one another in the degree of involvement load (Laufer & Hulstijn, 2001). Task 1 required reading of a text with marginal glosses (index 1, the lowest involvement load). Task 2 required filling in of blanks using a given word list. This list included the target words, some difficult words, and some frequently used words that participants might already know (index 2, a moderate involvement load). Task 3 required reading of a text with marginal glosses and writing a related composition with the given words (index 3, the highest involvement load). In particular, all the three tasks had a moderate need, as the necessity to understand an unfamiliar word was task-induced rather than self-imposed. Search was absent in all the three tasks because the meanings of the target words were provided. Evaluation was systematically manipulated across the three tasks. First, evaluation was absent in Task 1 as word meanings were given in the marginal glosses. Second, evaluation was moderate in Task 2 as the word meanings were supposed to be selected from a word list. Third, evaluation was strong in Task 3 as the word meanings were to be selected from a word list and the learners were required to evaluate the words via composition writing. The details of the task-induced involvement index are presented in Table 1.

Table 1 Task-induced involvement load index

Involvement load	Task 1	Task 2	Task 3
Need	Moderate (1)	Moderate (1)	Moderate (1)
Search	Absent (0)	Absent (0)	Absent (0)
Evaluation	Absent (0)	Moderate (1)	Strong (2)
Involvement load index	1	2	3

Each task included the same three texts (see the procedure section). The text in Task 1 was designed to include glosses for the target words in the margins. Task 2 was designed such that the 8 target words were replaced by equally-sized blanks required to be filled in from a word list following the text. The target words, their parts of speech (noun, verb, adjective, adverb), and a brief definition were provided in the word list. The text in Task 3 was designed to include marginal glosses as in

Task 1 and the wordlist same as in Task 2.

2.4 Measures

2.4.1 Metacognitive assessment

All participants completed the Metacognitive Awareness Inventory (MAI) of Schraw and Dennison (1994). The MAI is a tool to assess metacognitive knowledge and regulation that includes two subscales: the knowledge of metacognition and the regulation of metacognition. The first subscale was adopted to assess learners' metacognitive knowledge, and the second to measure their perceived regulatory ability. Both subscales have been shown to be reliable (H?ndel, Artelt, & Weinert, 2013). The knowledge of metacognition subscale contained 17 items, which mainly measured learners' declarative, procedural, and conditional knowledge. For this subscale, Cronbach's Alpha was 0.78. The regulation of metacognition subscale consisted of 35 items, measuring learners' awareness of planning, monitoring, evaluating, information management, and debugging strategies. For this subscale, Cronbach's Alpha was 0.83.

The scoring system for both subscales was a five-point Likert-type scale ranging from I totally disagree (0) to I totally agree (4). After this, the participants were required to indicate if each statement in the checklist was applicable to their own daily learning routine. The possible maximum scores for the knowledge and the regulation of metacognition were 68 and 140 points, respectively.

2.4.2 Vocabulary tests

The learners were expected to need a 3,000-word level knowledge for a basic comprehension in reading (Qian, 2002). Hence, prior to the commencement of the experiment, the students were tested for their overall receptive vocabulary size through a Vocabulary Levels Test (VLT) (Schmitt, Schmitt, & Clapham, 2001). All participants responded correctly to at least 27 out of the 30 items in the test (the cutoff point was 26 out of 30). Thus, they met this requirement.

The Vocabulary Knowledge Scale (VKS) of Wesche and Paribakht (1996) was adapted to measure participants' word learning. This was administered twice: as pre-test and post-test. The pre-test was administered four weeks before the study. It was used to test the prior knowledge of the target words. It was presumed that after a four-week break, the learners would not retain the target words in memory as this was a vacation period, and they were not exposed to any English courses during this period of four weeks. The results of the pre-test revealed that the learners did not have prior knowledge of the target words. The post-test was administered one week

after the study. It was used to measure their improvement in the learning of the tar get words. The participants needed to provide a correct English synonym or a Chinese translation to show that they knew the target words, in both pre- and post-test conditions.

The VKS scoring system was slightly different from what was proposed by Wesche and Paribakht (1996). In the present study, a score of zero was given if a learner reported that he or she had never seen a target word. A score of one was given if a learner indicated that he or she had seen a word before but did not know its meaning. A score of two was given when a learner provided an acceptable English synonym or a Chinese translation. As there were 24 items in each task, the possible maximum score for each task was 48 points. Two experienced raters scored the tests independently, and a complete agreement between the raters was obtained.

2.4.3 Interviews

As reported above, the participants were divided into four groups according to their metacognitive ability (LK/LR; LK/HR; HK/LR; HK/HR). Three learners from each group were randomly selected for an interview. They were invited to elaborate on their learning experiences while performing the tasks. The interviews were conducted in their native language, Chinese, as they were more comfortable in using Chinese. The time allotted for each interview was about 10 minutes. When critical events were mentioned by the interviewees, we probed and elicited more details to gain insight into their personal feelings and reflections. Sample questions for the interview are: (a) Could you please share some experience while performing the three tasks? (b) What do you think of these exercises? (c) What difficulties are involved in performing the tasks? (d) How did you overcome those difficulties? (e) What did you think of your performance? Why? (f) Could you please share with me some critical reflections about this type of task learning? (g) What affects your learning?

Table 2 Procedures

Time	Class		
	A	B	C
Week 1	Pretest (100 other words +24 target words), MAI		
Week 5	Task1	Task 2	Task3
	Text 1	Text 1	Text 1
Week 6	Task 2	Task 3	Task1
	Text 2	Text 2	Text 2
Week 7	Task 3	Task 1	Task 2
	Text 3	Text 3	Text 3
Week 8	Posttest, interview		

Did you check your answers?

2.5 Procedures

An in-class experiment was conducted with the participants, which lasted for eight weeks with two hours per week. The detailed procedure is presented in Table 2.

The participants were asked to complete a pre-test in the first week, followed by the MAI survey in the second week. They undertook the reading tasks for three consecutive weeks, from Weeks 5 to 7. To eliminate the effects of any individual differences, a within-subject design was used for the study, in which all students were exposed to all the texts and target words, and worked for the three tasks at the end of the eighth week. In the eighth week, a post-test that included all the 24 target words was undertaken to assess their word learning. The participants were tested individually and free to work at their own pace. Later, a total of 12 learners were invited individually for face-to-face interviews.

2.6 Data analysis

Both metacognitive knowledge and regulation were termed as "between-subject" factors, while task-induced involvement was termed as "within-participant" factor. The repeated measure ANOVA was selected as the statistical procedure for such split-plot factorial study design to deal with both within- and between-participant factors.

The interview data were analyzed through thematic analysis, which is helpful for identifying, analyzing, and reporting the themes of the research topic (Braun & Clarke, 2006). We persistently conducted an in-depth assessment of the interview data by continuously reading the original transcripts, followed by deconstructing, constructing, and reconstructing the social meanings in the data with particular at tention to possible emergent themes. Researcher triangulation was achieved through rigorous discussions.

Table 3 General effects of involvement load on word learning

Group	Low load		Moderate load		Strong load		Total	
	M	SD	M	SD	M	SD	M	SD
LKG	32.11	8.45	34.14	9.13	36.45	8.98	34.23	8.89
HKG	34.53	7.58	37.68	8.91	39.54	8.76	37.25	8.94
LRG	33.33	5.67	35.13	6.56	38.25	6.65	35.57	7.21
HRG	41.56	5.76	41.35	6.52	41.51	7.56	41.44	7.65
Total	35.38	12.31	37.07	10.98	38.93	9.08	37.12	12.45

Note: KG=Low Knowledge Group HKG=High Knowledge Group LRG=Low Regulation Group HRG=High Regulation Group

3. Results

3.1The effects of task-induced involvement load on word learning

The results presented in Table 3 describe the answer to the first research question, to what extent word learning differs due to the effects of task-induced involvement load.

Table 3 shows that the task with a strong load demonstrated the largest word learning gains (M = 38.93, SD = 9.08). In addition, the learners in the high regulation group demonstrated the largest word learning gains (M = 41.44, SD = 7.65). The ANOVA results revealed that task-induced involvement load has a significant effect on the word learning performance (F (2, 85) = 8.91, $p < .05$), whereas the post hoc analyses indicated that task-induced involvement load significantly influenced low regulators (F (2, 83) = 9.31, $p < .05$). Hence, it is evident that low regulators were more likely to increase their word learning efficiency significantly when presented with strong involvement load. Similarly, the learners with a higher level of metacognitive knowledge were able to increase their world learning in a task with strong involvement load (F (2, 85) = 9.76, $p < .05$), which is also consistent with the learners having lower level of metacognitive knowledge (F (2, 85) = 10.14, $p < .05$). This shows that vocabulary learning was the highest in the task with the highest level of involvement and descended with the decrease in the involvement load.

Conversely, this effect on the word learning performance was affected by the Regulation of Metacognition × Involvement Loads interaction (F (2, 146) = 19.75, p >. 05). The learners with a high level of regulatory ability achieved similar results in word learning performance in the three tasks (F (2, 15) = 5.51, p >.05). This suggests that although learners' word learning gains were in line with the predictions of ILH, the differences in the effects of task-induced involvement loads on word learning emerged as a function of learners' regulatory ability.

3.2 The effects of learners' regulatory ability on mediating task-involvement load in word learning

Table 4 shows the results of different ability groups on the general effects of involvement load on word learning and answers the second research question as to what extent learners' regulatory ability mediates the effects of task-involvement load in word learning.

Table 4 shows that the learners in the HK/H R group appear to achieve the highest scores in word learning, followed by the LK/HR, HK/LR, and LK/LR

Table 4 General effects on involvement load on word learning (different ability groups)

Group	Low load		Moderate load		Strong load		Total	
	M	SD	M	SD	M	SD	M	SD
LK/LR	30.15	11.12	35.61	12.15	39.85	11.15	35.2	11.47
LK/HR	42.35	12.11	43.51	10.56	44.12	12.15	43.32	11.60
HK/LR	32.12	11.45	38.15	9.99	42.15	10.56	37.59	10.66
HK/HR	44.14	9.89	45.56	10.12	46.13	10.71	45.27	10.24
Total	37.19	11.14	40.70	10.70	43.06	11.14	40.31	10.99

groups, which are consistent in each task with different levels of involvement. It is also evident that word learning results are influenced by the Knowledge × Regulation of Metacognition interaction. Simple effect analyses indicated that learners' regulatory ability significantly affected the low- metacognitive knowledge learners' word learning performance ($F(2, 23) = 8.12$, $p < .05$). Similarly, learners' regulatory ability also had a significant effect on the high-metacognitive knowledge learners' word learning performance ($F(2, 85) = 10.12$, $p < .05$). However, the knowledge of metacognition did not significantly affect the low regulators' word learning ($F(2, 10) = 24.46$, $p > .05$) and the high regulators' word learning ($F(2, 10) = 24.51$, $p > .05$). High performance in regulatory ability compensated for deficits in the knowledge of metacognition.

3.3 Analysis of the interviews

In order to have a better understanding of how learners conducted their learning and how their individual differences in regulatory ability affected their performances during the tasks, we invited three learners from each group for interviews. We classified the interviewees' responses into four themes: (a) paying particular attention to target words prior to tasks; (b) constructing connections; (c) monitoring the usage of strategies; and (d) evaluating the outcomes.

3.3.1 Paying particular attention to target words prior to tasks

The three learners of the HK/HR group did try to comprehend the words before performing the tasks. For example, one student said, "I took notes of some words. I tried to find out as many words as possible and see what was requested. I set a goal for finishing this task." Another added, "I had a plan on what words I was going to use for my exercises." Two students of the LK/HR also expressed the same com ments, whereas the other student said that she could find no clues on how to learn the words from the tasks. All the students in the LK/LR and HK/LR groups claimed that they were only interested in completing the exercises according to requirements. They said, "I simply saw the words and finish the exercises," "If the teacher

had instructed the meaning and usage of some words, it would help us finish the exercises," and "I have no skills in regulating my learning."

3.3.2 Constructing connections

The three interviewees of the HK/HR and two of the LK/HR groups said that they tried to construct connections between the problems on the tasks and the problems that they solved in the classroom. For example, one student reported, "I think I could find some connections with similar exercises we did in class." Other responses included: "I am sure I have done some similar exercises before," "That was exactly the way to learn words, so I knew how to do it, because I saw the similarity," and "I knew exactly how I was going to find it (the way to learn new words)." In contrast, all the interviewees of the HK/LR and LK/LR groups responded differently. Their responses included: "I did not check for myself to see if the task was familiar," "It was difficult to conduct tasks like these," and "The tasks did not remind me of anything."

3.3.3 Monitoring the usage of strategies

The three students of the HK/HR and one student of the LK/HR groups reported that they looked for appropriate strategies for solving the tasks. One of them said that she monitored the effectiveness of the strategies. For example, she stated, "I tried to find some clues embedded in the text to help myself understand or use the words." Another student said, "I tried to monitor my understanding of the text, adjust my reading speed to fit the difficulty of the text and fix any comprehension problems." Other positive comments included "When the strategies did not work well, I made adjustments until the strategies were in tune with the learning goals" and "I checked the information in the text that might help me overcome the difficulty." In contrast, all the students in the HK/LR and LK/LR groups confessed that they did not look for a strategy. They said, "I solved the task automatically without being conscious of any strategies," "I did not think of the strategies that could help me with the tasks," and "I did not think too much during the tasks."

3.4.4 Evaluating the outcomes

The three students of the HK/HR and two students of the LK/HR groups described how they evaluated the outcomes. They said, "When I completed the exer cises, I checked the new words by starting all over, from the very beginning," and "I read the texts many times, and when I finished the exercises, I evaluated my learning in order to see if I could guess the meaning of some difficult words." In contrast, all the students in the HK/LR and LK/ LR groups expressed negative comments, and they said, "The time was only sufficient for me to finish the exercises, and I did not have enough time to check my answers," "when I finished the exercis-

es, I did not evaluate how I could solve the difficulties in a better way," and "I finished my writing, but I am not sure whether I had written it well because I did not know how to use some words."

5. Discussion and Conclusions

The first research question explored and revealed that word learning is significantly affected by task-induced involvement load; that is, word learning was highest in the task with the highest level of involvement and descended with the decrease in the involvement load. This is in line with some of the previous studies (e.g., Laufer & Hulstijn, 2001). Following research focusing on tasks with varying degrees of involvement load (Eckerth & Tavakoli, 2012; Teng & Zhang, 2015), the present study indicated that learners benefit most from being engaged in a task that uses the target words productively in the original contexts. Moreover, it indicated that a comparison of new words with those already known is more beneficial than reading the glossed words for basic comprehension. Therefore, we conducted an argument analysis and found that word learning is highest in the sentence writing task (strong load), lower in the reading plus fill-in task (moderate load), and lowest in the reading comprehension task (low load). As the evaluation component is systematically controlled in these three tasks, the result of the present study suggests that it is crucial for word learning.

However, the results of the present study also showed that low regulators are susceptible to task-induced involvement load, while high regulators, on the other hand, were not significantly affected by the task-induced involvement load. This agrees with previous findings that task completion is significantly influenced by students' self- regulatory ability and motivational beliefs (e.g., Bembenutty, 2009). However, the reasons for this, which were not presented in previous studies, could be explained by the interview results of the present study. It suggests that learners with a high level of regulatory skills tend to avoid a distraction, perceive responsibility for learning, set goals, self-reflect on their learning processes, and manage time, and this may help them attain success in word learning regardless of the varying degrees of involvement load in the tasks. Therefore, high regulators possess a high level of metacognitive awareness along with the motivational domain (Blankson & Blair, 2016). As the tasks were completed independently, the motivational domain of high regulators may invoke them to value the task and may develop a high belief in their own ability to complete the tasks and reach goals (Hong, Peng, & Rowell, 2009). This can further explain how high regulators can compensate for

the deficits of tasks with a low level of involvement and maintain a certain good level of word learning results in a task with low involvement load.

The second research question explored how learners' regulatory ability mediates the effects of task-involvement load in word learning. First, the knowledge of metacognition and regulatory ability are independent but closely and significantly correlated components (Brown & Kinshuk, 2016; Sperling et al., 2002). Therefore, it suggested that learners with a higher level of knowledge of metacognition and regulatory ability performed better in word learning, which corroborates earlier findings that metacognition is a strong predictor of high-quality learning and effective problem-solving abilities (Blankson & Blair, 2016). One possible explanation is that metacognition enables learners to better manage their cognitive skills and determine as well as overcome their weaknesses by constructing new metacognitive skills. Similar results in interview sessions suggest that students with a wide range of metacognitive skills perceived the value of utilizing appropriate strategies for their learning or modifying the existing learning strategies and skills (Teng, 2016). It appears that metacognition is an important dimension to be considered for EFL students' learning.

An unexpected finding suggests that high regulatory ability can compensate for deficits in the knowledge of metacognition, but the high level of knowledge of metacognition fails to compensate for low regulatory skills. This is apparently observable in similar word learning results between the LK/HR and HK/HR groups. The absence of high regulatory ability produced different results in the LK/LR and HK/LR groups, and this contradicts Carvalho and Yuzawa's (2001) findings that the knowledge of metacognition is a strong predictor of learning performance, in the same way that regulatory ability is a strong predictor of learning results. The re sults of a recent study (Teng, 2017) showed that the knowledge of metacognition is a good predictor of the judgement confidence, like regulation of metacognition. However, the knowledge of metacognition is not a predictor of EFL students' word learning. The conflicting results may be explained by the interview results of the present study. Our interview results showed that learners with high-regulatory skills tend to set a reasonable learning goal, plan according to their appropriate selection of strategies, correct allocation of resources, and monitor the proper functioning of the selected strategies. They continued to work when the strategies worked well and made adjustments until the strategies were in tune with their learning goals. They also constructed connections between the problems faced during tasks and those solved in the classroom. Following this, they monitored their learning performance and evaluated the final product. However, the learners with low regulatory skills or

high metacognitive knowledge were not able to have the explicit learning goals. Furthermore, they failed to plan, monitor, and evaluate their learning effectively, as well as deploy appropriate strategies in the tasks (Cornoldi et al., 2015). Therefore, it is argued that EFL students' regulatory skills play a mediating role in their word learning.

Overall, the effects of task-induced involvement load on word learning are mediated by learners' regulatory ability rather than by knowledge of metacognition. The pattern found for the intensity of the task-induced involvement load from the most to the least affected group was in the order of LK/LR > HK/LR > LK/HR > HK/ HR, which is similar to that found by Carvalho and Yuzawa (2001). This shows that knowledge of metacognition is connected with the declarative knowledge that affects the learners' knowledge about themselves, tasks, and strategies (Schraw, 1994). In contrast, the task-induced involvement load affects the learners' word learning as a function of their regulatory ability, which enables them to determine how strategies are appropriately selected, resources are correctly allocated, and task performance is monitored and evaluated through which the word learning is accomplished (Teng, 2017). Practical implications for teaching and learning vocabulary can be concluded from the following findings. First, tasks that differed in the construct of evaluation led to different results in learning vocabulary, which indicates that evaluation, a construct of task-induced involvement, is crucial for vocabulary learning. Based on our results, guiding learners in comparing and assessing knowledge and using target words through a task leads to the acquisition of target words. In teaching, vocabulary instruction should include word-focused tasks that require high degrees of evaluation. Second, teachers should take into account the students' regulatory ability before assigning them tasks, as students lacking it are dependent learners. Teachers may adopt effective training of regulatory skills for students, which may help them to be proactive, self-disciplined, engaged in self-creation, self-initiation, and self-evaluation of their academic tasks (Teng, 2016). Finally, as suggested by Kostons, Gog and Paas (2012), in order to make self-regulated learning become effective, students need to be able to assess and evaluate their own performance on a learning task. In other words, learners should be trained with the skill of self-evaluation.

However, there are some limitations to this study. First, it is difficult to assess the metacognition based on a self-report questionnaire. In particular, the questionnaire might not have been sensitive enough to accurately measure the learners' metacognitive knowledge and regulation of metacognition because the output was based only on the students' recall of their academic routine. They might have a

wrong perception of their metacognitive knowledge and regulatory skills. For further research, it is essential to apply multi-method designs, for instance, combining multiple concurrent instruments to get an accurate portrayal of students' metacognition (H?ndel, Artelt, & Weinert, 2013). Second, future studies involving a larger sample of participants, preferably with a different background, would make the research in this line more conclusive. Third, students might be uncomfortable in expressing their feelings during interviews; hence more in-depth data may be collected while asking learners to reflect on their learning through writing diary entries. In other words, data triangulation is necessary for future studies. Fourth, the same vocabulary test was used as the assessment tool before and after the study, which may have been influenced by test- retest effects. In addition, the students from different classes might have discussed it with each other after class during the experiment, which might have compromised the results. Finally, the completion time was not fixed across the tasks. Therefore, generalizations concerning task-induced involvement are difficult to make, as the previous studies have suggested that the benefits associated with more effective tasks were negated when completion time was held constant across tasks (e.g., Huang et al., 2012; Keating, 2008). However, despite the limitations, the present study builds a basic understanding of our understanding of how EFL students' individual differences in regulatory ability may mediate the role of task-induced involvement in word learning.

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