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Developing and evaluating a pattern grammar inspired CALL tool: PAT GRAM

by

Hong Ma

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Applied Linguistics and Technology

Program of Study Committee:
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Iowa State University
Ames, Iowa
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To my grandmothers
for their love and support.
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This dissertation project developed and evaluated a computer-assisted language learning (CALL) tool, PAT GRAM, that provides explicit instruction on grammar patterns. Evaluation of the explicit instruction offered by PAT GRAM adopted Chapelle’s (2001) framework of criteria for CALL task appropriateness. Following this framework, evidence was collected to investigate language learning potential, learner fit, meaning focus, and impact qualities of the explicit instruction realized through PAT GRAM.

To provide evidence for these qualities, this study employed a case study research design including qualitative and quantitative data. The qualitative data encompassed participants’ responses to semi-structured interviews and retrospective verbal protocols focusing on their perceptions of learning process and use of PAT GRAM. The quantitative data consisted of participants’ pretest and posttest scores on knowledge of verb patterns, revision of sentences that they constructed using the target grammar patterns, and their responses to Likert-scale questions gauging participants’ perceptions of learning experience with PAT GRAM.

The results suggest that PAT GRAM holds great potential to provide effective explicit instruction on grammar patterns in the target instructional context. This conclusion was drawn based on all four investigated qualities of PAT GRAM, including language learning potential, learner fit, meaning focus, and impact. The language learning potential quality of the explicit instruction using PAT GRAM was strongly supported by evidence showing improved knowledge of grammar patterns, accuracy of pattern use, attention to patterns, and positive perceptions of learning using PAT GRAM. Also, learners’ judgment of the explicit instruction using PAT GRAM as appropriate for their level, many incidences of identifying errors, and successful revisions suggest that the explicit instruction offered by PAT GRAM enjoys a high
quality of learner fit. Further, participants’ attention to meaning of patterns and construction of meaningful sentences lent support for the meaning focus quality of the explicit instruction provided by PAT GRAM. Finally, participants evaluated the impact quality of PAT GRAM positively and perceived the learning experience with PAT GRAM as awareness-raising, autonomy-facilitating, confidence-building, and motivation-stimulating. The results of this study convincingly demonstrated the usefulness and appropriateness of the explicit instruction using PAT GRAM in the university English for second language (ESL) classroom and yielded valuable implications for research on and instruction in L2 vocabulary learning.
CHAPTER 1: INTRODUCTION

The English language is an international language spoken all over the world and is the language of science. English teaching, which shoulders the responsibilities of improving education, is therefore important (Norton & Kamal, 2003). Vocabulary, central to language, is of critical importance to language learners (Zimmerman, 1997). Despite the recognized importance of vocabulary, one dimension of vocabulary knowledge — grammar patterns, defined as “all the words and structures which are regularly associated with the word and which contribute to its meaning” (Hunston & Francis, 1999, p. 37) — has received little attention in language pedagogy over the last few decades, since it has long been common to treat grammar and vocabulary separately (Coxhead, 2008). Grammar patterns are developed based on the finding of recent research that lexis and grammar should be considered together, because lexis and its grammatical context form multi-word units for meaning making. For instance, learners have to learn that appear and manage are followed by a to-infinitive only and that finish and suggest are followed by a present participle only. When used with different forms (followed by either to-infinitives or present participles), verbs such as forget, remember, stop, and try tend to have different meanings (Hunston, Francis, & Manning, 1997). Taking lexis as the starting point, Hunston and Francis (1998) pointed out that information about any lexical item must include the patterns it has, and that knowledge of vocabulary definitely encompasses knowing how words are used.

Nevertheless, there has been relatively little application of findings from the huge amount of recent research on grammar patterns to pedagogy. The undervaluation of grammar patterns in language pedagogy may have made “non-native speakers’ knowledge of grammar patterns underdeveloped” (Akbarian, 2010). Perhaps as a consequence of the language courses, where
grammar patterns have not been given sufficient attention, learners may produce sentences with inappropriate grammar patterns or incorrect meaning of the grammar patterns, like the sentence: “Bear in mind that the non-smokers consist about 65% of the Polish society.” The correct pattern of the verb consist is supposed to be consist of. In addition, in terms of meaning of consist of, the subject should be Polish society and the object should be constituents of Polish society. Although the example sentence demonstrates orthographic knowledge and semantic understanding of the verb consist, the student’s misuse of the grammar pattern which has been observed to be associated with the meaning of the word consist affects the accuracy and fluency of the discourse.

Given the discrepancy between the importance of grammar patterns and scarcity of empirical studies in teaching language learners grammar patterns, this dissertation project designed and evaluated the effectiveness of teaching grammar patterns through implementing a computer-assisted language learning (CALL) tool, PAT GRAM. PAT GRAM was designed by the primary investigator to provide learners knowledge of grammar patterns through hyperlinks. Currently, this tool includes only grammar patterns of verbs and may be expanded to encompass grammar patterns of nouns and adjectives in future development. The evaluation of the explicit instruction offered by PAT GRAM in this project follows Chapelle’s (2001) framework of criteria for CALL task appropriateness, which adopts the most current view of evaluation as an argument, and helps the researcher organize both learning outcome data and learning process data.

1.1. Statement of the Problem

In order to understand how PAT GRAM could potentially promote the teaching of grammar patterns, we first need to have knowledge of issues in contemporary language
pedagogy that impede the teaching of grammar patterns. This section elaborates on these issues, including the popularity of communicative language teaching and insufficient support in learning grammar patterns (Kennedy, 2008).

1.1.1. Popularity of communicative language teaching

Grammar patterns have not been widely embedded into contemporary language pedagogy, partially because systematic research on grammar patterns emerged at the very time when “language teaching theory and practice was favoring a focus on messages and function, through communicative language teaching” (Kennedy, 2008, p.38). Communicative language teaching focuses on promoting students’ communicative proficiency, defined as the internalized knowledge of the situational appropriateness of language (Hymes, 1972), through instruction of the four language skills fundamental to the mutual reliance of language and communication (Richard & Rodger, 1986). The attention to communicative language teaching then developed more towards the appropriate use of communicative categories, including notional categories (concepts such as time, quantity, and space) and functional categories (acts such as requests and denials) (Wilkins, 1972). Although both notional and functional syllabi emphasize meaning making, little explicit attention has been given to vocabulary. Grammar patterns centering on the accuracy of formulaic forms even contradict the argument dominant in communicative language teaching that fluency, even in cases where accuracy is compromised, should be prioritized. Though the formulaic aspect of language description was recognized as early as the 1930s, teaching of this aspect has never been fully accepted in the contemporary language-teaching environment, where purer forms of communicative language teaching have exerted prolonged influence. As a consequence, language learners’ knowledge of accurate use of vocabulary has not been sufficiently developed (Howarth, 1998; IRET, 1933).
1.1.2. Insufficient support for learning patterns

Besides the popularity of communicative language teaching, insufficient support also caused difficulties in incorporating grammar patterns into practical language teaching and learning. Currently, the most common sources for vocabulary knowledge, such as explicit instruction by teachers or textbooks, incidental learning with dictionary and glosses, and self-deduction using corpora, do not seem to provide sufficient support for language learners to learn grammar patterns.

In the context of explicit instruction, both textbooks and teachers provide learners limited exposure to grammar patterns. Even though textbooks may list grammar patterns occasionally, vocabulary lists in textbooks are predominantly occupied by single words. Native English teachers should accumulate a considerably greater number of grammar patterns than nonnative teachers, since grammar patterns require native-like selection, referring to “the ability of native speakers to convey meanings by expressions that are not only grammatical but also natural and idiomatic” (Pawley & Syder, 1983, p. 189). However, it is still challenging for native English speaking teachers to teach grammar patterns given that this knowledge, to some extent, is derived from corpus-driven research of authentic data rather than based on intuitive knowledge (Hunston & Francis, 1998). Therefore, without corpus-informed teaching materials targeting grammar patterns, English teachers, both native and nonnative, cannot provide students an inclusive and accurate picture of grammar patterns.

As with incidental vocabulary learning, which heavily relies on extensive reading and checking referential resources, such as a dictionary or a gloss, students may not have the ability to extract grammar patterns (McAlpine & Myles, 2003). In addition, it is reported that students pay primary attention to meaning rather than to the form of grammar patterns, because reading
comprehension is the primary concern in incidental learning (Hayden, 1997; Lee & VanPatten, 1995). Due to these reasons, students’ vocabulary knowledge in terms of grammar patterns tends to develop more slowly than their semantic knowledge, a process that further restricts learners’ productive use of vocabulary.

Corpora have been gradually used more and more in current language classrooms to compensate for the native-like selection missing from the above teaching and learning practices (Groom, 2005; Hunston, 2008). A corpus is defined as a large, principled collection of naturally occurring texts (written or spoken) stored electronically (Reppen, 2001). Examination of corpus data can be realized through concordance. Sinclair (1991) defined concordance as “a collection of the occurrences of a word-form, each in its own textual environment” (p. 32). When working with corpora, students can access the context of each concordance line at request and can even access the original file, which may facilitate learners’ ability to deduce contextual knowledge, including grammar patterns of a word (Charles, 2007). However, exposure to large quantities of concordance lines does not necessarily lead to learning grammar patterns of target words. Take students learning English for an academic purpose as an example. A search for one word from the academic word list (AWL) may result in a student’s exposure to an overwhelmingly large amount of potential authentic language constructions in an array of different forms and meanings (Coxhead, 2008), since these words are highly frequent in academic discourse. Generalizing grammar patterns from these concordance searches, therefore, becomes a great, if not impossible, feat for learners (Stubbs, 2004).

As discussed above, the popularity of communicative language learning and insufficient support in current vocabulary learning activities has contributed to the underdevelopment of learners’ knowledge of grammar patterns. To address these issues, this research project intended
to teach grammar patterns by developing and implementing a computer-assisted language learning tool, PAT GRAM.

1.2. Dissertation Goals

Considering the discrepancy between the immense importance of grammar patterns and the scarcity of empirical studies in teaching grammar patterns, the preliminary goal of the dissertation project was to evaluate a CALL tool, PAT GRAM, developed by the researcher to provide students convenient access to English language grammar patterns. Evaluation of explicit instruction provided by the tool was conducted in a context-specific manner by utilizing the comprehensive CALL materials evaluation framework proposed by Chapelle (2001). This framework of criteria for CALL task appropriateness adopted an argument-based approach for CALL materials/activities evaluation and helped the researcher organize both learning outcome data and learning process data. The scope of the research was focused in several ways. First, this project concentrated on a single register, English academic writing, because, as Howarth (1998) pointed out, it is desirable to focus on a register to make competence of using multi-word units (including knowledge of grammar patterns) contribute to a successful style. Second, since PAT GRAM was developed by accessing content in the book *Collins COBUILD Grammar Patterns 1: Verbs*, only the verbs in this book were covered in this project. Third, as recommended by the well-known researchers of grammar patterns, this research project targeted students with intermediate-high English language proficiency as identified by the ACTFL (American Council on the Teaching of Foreign Languages) framework.

1.3. Significance of the Study

This research aimed to combine the innovative findings in research on grammar patterns and computer technology to contribute to research in both vocabulary acquisition, especially the
learning of grammar patterns, and computer-assisted language learning. The utilization of computer technology sufficiently served the purpose of implementing knowledge of grammar patterns as a reference, and increased opportunities for self-instruction of grammar patterns, where students worked independently of the instructors’ immediate supervision/guidance (Dickinson, 1987). In addition, incorporating grammar patterns into PAT GRAM successfully expanded receptive skill-oriented learning processes to productive learning (learning through writing). Finally, this research project demonstrated a systematic method of empirical CALL evaluation following Chapelle’s (2001) framework of criteria for CALL task appropriateness, which adopts the most current view of evaluation as an argument.
CHAPTER 2: LITERATURE REVIEW

This dissertation investigates the teaching of grammar patterns of selected frequently used academic verbs. This chapter reviews literature in the three interdependent dimensions upon which this dissertation project is established. First, I review theories in second language acquisition that are related to vocabulary acquisition, because grammar patterns that are taught in this study are considered part of vocabulary knowledge. Second, because PAT GRAM intends to teach grammar patterns by incorporating the theory of pattern grammar, important findings of this theory and previous studies related to grammar patterns are reviewed. Third, because PAT GRAM can be considered a computer-assisted vocabulary learning (CAVL) tool focusing on one dimension of vocabulary knowledge, I review literature investigating the design and effectiveness of contemporary CAVL tools.

2.1. Theoretical Perspectives on Second Language Acquisition

The theoretical perspectives on second language acquisition cover theories in second language acquisition that are related to vocabulary acquisition, especially acquisition that occurs with the help of CAVL tools. Such information is relevant to this study given that grammar patterns that PAT GRAM intends to teach can be judged as a component of vocabulary knowledge. Moreover, PAT GRAM is a Computer-assisted language learning (CALL) tool serving as a vehicle for teaching grammar patterns. “The pragmatic goal of computer-assisted language learning (CALL) developers and researchers to create and evaluate learning opportunities pushes them to consider a variety of theoretical approaches to second language acquisition” (Chapelle, 2009, p. 741). Chapelle (2009) provided a detailed discussion of the connection between second language acquisition theories and CALL materials/task development.
and research. Among these theories, input processing theory, interactionist theory, and general human learning (associative-cognitive CREED framework and skill acquisition theory) inspired the design and development of PAT GRAM.

2.1.1. Input processing theory

Input processing theory is defined as “a model of moment-by-moment sentence processing during comprehension” (VanPatten, 2007, p. 116). Processing refers to establishing connections between meaning and form. Input processing theory holds that comprehension is fundamental in language acquisition, because acquisition involves learners establishing form-meaning connections during comprehension, although comprehension does not necessarily lead to acquisition (VanPatten, 2007). “Learners are limited capacity processors and cannot process and store the same amount of information as native speakers can during moment-by-moment processing (VanPatten, 2007, p. 116). One of the most relevant principles in the input processing theory, the primacy of content words principle, states that “learners process content words in the input before anything else (VanPatten, 2007, p. 117). In other words, learners are able to distinguish content lexical items and noncontent lexical items and process content lexical items first to achieve comprehension. Even though the learner does process non-content words, processors responsible for data storage may not be ready to utilize them and will dump them (VanPatten, 2007).

2.1.2. Cognitive interactionist perspective

Cognitive interactionist theory suggests that learning occurs through input, production of language (output), and feedback (Gass & Selinker, 2008). Noticing is identified as one mechanism that mediates between interaction and learning (Gass & Mackey, 2007). Generally, interaction refers to interpersonal activity in a social sense when one person communicates with
another (Ellis, 1999). Ellis’s recognition of another dimension of interaction, intrapersonal interaction, provides initial grounds for understanding the potential value of technology-mediated (Chapelle, 2003). Intrapersonal interaction, mental processing, in other words, forms the basis for interpreting human-computer interaction.

Input refers to “the language that a learner is exposed to (from reading or listening, or in the case of sign language from visual language)” (Gass & Mackey, 2007, p.177). Krashen’s input hypothesis (1989, 1993) postulates that language can be acquired by understanding the input as long as the input is comprehensible to the learner, even though comprehensible input is not a sufficient condition for learning to happen. It is also suggested that modified input, realized through elaboration or simplification, tends to make input more comprehensible to learners.

The importance of output lies in that language production forces learners to achieve syntactic use of language rather than mere comprehension (Gass & Mackay, 2007). It is claimed that pushed output and modified output (prompted by feedback) have greater potential for promoting learning, because learners cannot fake comprehension as they might in receptive tasks, and production forces them to process the vocabulary syntactically (Swain, 1995). Furthermore, the modified output stimulates learners to perform cognitive comparisons between forms in their target language and interlanguage (Ellis, 2012). In summary, several advantages of production in second language acquisition identified in previous literature apply to this study in particular: language production (1) generates better input through the feedback, (2) forces syntactic processing, (3) allows learners to test hypotheses about the target-language grammar, (4) promotes automatization of existing L2 knowledge, and (5) functions as ‘input’ produced by learners (Ellis, 2012; Skehan, 1998; Swain, 1995; Schmidt & Frota, 1986).
“Feedback may help to make problematic aspects of learners’ interlanguage salient and may give them additional opportunities to focus on their production or comprehension” (Gass & Mackay, 2007, p. 182). Feedback can be largely divided into two categories: explicit and implicit. Explicit feedback includes corrections and metalinguistic explanations, while implicit feedback is realized through different negotiation strategies (see Gass & Mackay, 2007 for different negotiation strategies). Learners’ attention can be directed to positive evidence about the correct form in the target language and/or negative information (problems in learners’ interlanguage) through feedback.

Noticing, identified as conscious attention to forms in the input and differences between the input and the learner’s own knowledge, is believed to be indispensable for language learning (Schmidt, 1990; 1994). Noticing helps learners sift through vast amounts of input to pick up information for learning (Gass & Mackay, 2007). Schmidt (2001) claimed that learning cannot occur without noticing. In addition, Schmidt argued that “task demands are an equally important determinant of attentional focus [as goals and motivation],” so pedagogical activities concentrating learners’ attention to linguistic features they may not be conscious of are well justified (Schmidt, 2001, p. 29).

The interactionist theory underlies design of PAT GRAM, but it does not explain how language is integrated into the learners’ own system (Chapelle, 2009). This process of integration, rather, can be explained by general human learning theories, such as the associate-cognitive CREED framework and skill acquisition. The following section elaborates on the two theories.
2.1.3. General human learning

These two theories, the associate-cognitive CREED framework (Ellis, 2007) and skill acquisition theory, view language learning as governed by general laws of human learning, consisting of an associative type of learning, consistent with the behaviorist tradition (e.g., see Pavlov’s experiments with dogs as an example), and cognitive learning, referring to learning processes affected by instruction (Chapelle, 2009; Ellis, 2007).

The associative-cognitive CREED theory predicts that high-frequency constructions are more likely to be learned than low-frequency ones (Ellis, 2007). Constructions, which are form-meaning mappings “conventionalized in the speech community and entrenched as language knowledge in the learner’s mind,” are viewed as the basic units of language representation (Ellis, 2007, p. 78). Constructions in language learning cover a continuum of expressions from particular lexical items “Wonderful!” to complex formulas like “Won the battle, lost the war.” The associative-cognitive CREED theory claims that:

“[t]he learner’s initial noticing of a new [construction] can result in an explicit memory that binds its features into a realization of its whole form…As a result of this, a detector unit for that [construction], whose job is to signal the words’ presence,…whenever its features are present in the input, is added to the learners’ perception system” (Ellis, 2007, p. 79).

The Associative-Cognitive CREED contributes to second language acquisition in that it explains the interaction between explicit and implicit learning processes. According to Ellis (2007), explicit learning establishes the initial form-meaning mappings, which are gradually integrated into learners’ interlanguage through subsequent input, where frequency plays a role.
Skill acquisition theory suggests that skills, including language, are learned through practice, which scaffolds development of knowledge first from declarative knowledge to procedural knowledge, and finally to automatic knowledge. Declarative knowledge refers to knowledge of facts acquired through observation or analysis (such as rules for grammatical accuracy), where procedural knowledge refers to “knowledge how,” namely knowing how to do something (such as using the grammar to speak accurately) (Chapelle, 2009; Dekeyser, 2007). Finally, automatic knowledge is the stage where procedural knowledge is “consistently displayed with complete fluency or spontaneity, rarely showing any errors” through a large amount of practice (Dekeyser, 2007, p. 98). This theory yields numerous implications for learning with technology by critically situating practice, including systematic input, interaction, production, and feedback (Chapelle, 2009).

2.1.4. Implications for tool development

A review of related theories has inspired the design of PAT GRAM in several ways. First, Input Processing theory states that learners, as limited capacity processors, process content words in the input before noncontent words. Even though learners do process noncontent words, they may not be ready to utilize them. Specific to grammar patterns, without storing grammar patterns (grammar pattern usually consists of a content word and its grammatical context) as semi-fixed expressions, second language learners, when decoding, may prioritize content words (e.g., verbs, nouns, and adjectives) without considering their grammatical context simultaneously. Therefore, PAT GRAM was designed to present patterns together with their associated meaning to help learners learn patterns as units for meaning making.

Second, interactionist theory states that learning occurs through input, production of language (output), and feedback (Gass & Selinker, 2008). Noticing, identified as one mechanism
that mediates between interaction and learning (Gass & Mackey, 2007), is believed to be indispensable for language learning (Schmidt, 1990; 1994). PAT GRAM was designed with these concepts in mind. Example sentences with target patterns were included in PAT GRAM to provide input for learners. General meaning of the target patterns exemplified in the example sentences is given to achieve modified input to facilitate comprehension. To combine pushed output and modified output, the learning activity of this study required learners to produce sentences with the target grammar patterns and revise them using PAT GRAM. Feedback of PAT GRAM was realized through presenting correct patterns to learners. Given the importance of noticing, PAT GRAM was created to allow instructors to draw learners’ attention to certain patterns by highlighting them. In addition, grammar patterns were presented with their associated meaning to prompt learners to allocate attention to patterns and their associated meaning simultaneously.

Third, theories in general human learning, the associate-cognitive CREED framework and skill acquisition theory, emphasize the importance of explicit teaching, frequent encounters, and practice in cognitive learning. Therefore, PAT GRAM was intended to teach grammar patterns by explicit teaching, considering frequency of patterns, and facilitating repetitive practice. PAT GRAM was designed to teach explicit knowledge of grammar patterns by presenting structure of patterns and their meaning in pairs. Grammar patterns covered in PAT GRAM by its definition are frequent in the English language, because they are extracted from the Bank of English through a corpus-driven approach, which generates hypotheses based on observation of frequent linguistic features. The Bank of English contains over 250 million words collected from various sources in English speaking countries (mainly British), such as newspapers, magazines, books, and daily conversations. Also, the learning activity realized
through PAT GRAM was designed to present grammar patterns of verbs frequently appearing in
the target speech community in which language learners apprentice (academic discourse
community). In terms of facilitating repetitive practice, PAT GRAM, supported by computer
technology, was able to provide learners access to grammar patterns responsively at request.

2.2. Pattern Grammar

This research project intended to develop and investigate the effectiveness of
instructional materials to teach grammar patterns by using computer technology as a vehicle.
Given the scarcity of research on teaching grammar patterns and their importance in language
teaching and learning, this study sets an example for theory-based materials design and
evaluation. The theory comes from second language acquisition, in addition to the theory of
pattern grammar, and the evaluation investigates effectiveness based on evidence on the intended
effects of the design. The following discussion on teaching grammar patterns approaches this
topic from two perspectives: introduction to the pattern grammar theory and its relation to
language teaching and empirical research on grammar patterns.

2.2.1 Pattern grammar and language teaching

Even though it is rare to see grammar and lexis presented simultaneously in traditional
English classes, we do observe occasionally that particular verbs are listed with their possible
structures (e.g., to-infinitive, a present participle, or both) (Hunston et al., 1997). Different from
this traditional method of presenting grammar patterns, PAT GRAM intends to teach grammar
patterns by incorporating findings of the theory of pattern grammar, which “provides a more
comprehensive and useful description of English” than the traditional observation (Hunston et
al., 1997, p. 208).
The theory of pattern grammar. The theory of pattern grammar covers the whole English language in its language description and has successfully established the association between lexis and grammar. First, development of the theory of pattern grammar has covered description of the whole English language by adopting the corpus-driven approach (Groom, 2005; Hunston & Francis, 1999; Sinclair, 1991; 2004). The corpus-driven approach is a way of investigating language by generating hypotheses based on observation of a large, principled collection of naturally occurring texts (written or spoken) stored electronically (i.e. a corpus) (Hunston & Francis, 1999). To be more specific, grammar patterns were extracted from the Bank of English, which can be considered a sufficient representation of the whole English language system, because this corpus contains over 250 million words collected from various sources in English speaking countries (mainly British), such as newspapers, magazines, books, and daily conversations.

Grammar patterns are “in a sense, examples of lexical phrases,” multi-word units that were starting to be identified before language corpora were commonly used, given their emphasis on formulaic nature of language (Hunston & Francis, 1999, p. 14). However, they differ in coverage of language. The existence of language corpora assisted Sinclair (1991) in articulating a corpus-driven language description, the idiom principle, which states that:

A language user has available to him or her a larger number of semi-preconstructed phrases that constitute single choices, even though they might appear to the analyzable into segments (Sinclair, 1991, p. 110).

The idiom principle broadens the idea of a multi-word unit to incorporate more than simply the lexical phrases (Hunston & Francis, 1999).
From the perspective of pattern grammar, patterns permeate each individual sentence. Although the question of how frequent certain patterns are is yet to be answered, researchers have found that each discourse moves from one pattern to the next (Hunston & Francis, 1998). The phenomenon that patterns flow into one another is termed as “pattern flow,” and it occurs when an item that is a component of one pattern is also the starting-point of another pattern (Hunston & Mason, 2004). Figure 1 shows a traditional hierarchical representation of the pattern flow in the clause “if you decide you want to get pregnant,” with one clause realizing an element in another clause (Huston & Mason, 2004).

![Figure 1 Illustration of pattern flow (example from Hunston & Mason, 2004).](image)

Furthermore, contrary to traditional grammar that ignores lexis, pattern grammar has established an association between grammatical structures and lexis (Hunston & Francis, 1999). According to pattern grammar theory, a word can be a component of several different patterns, and a pattern can also be seen as associated with a variety of different words (Hunston & Francis, 2000). The connection between patterns and meanings was articulated as the hypothesis that “the different senses of words will tend to be distinguished by different patterns, and secondly, that particular patterns will tend to be associated with lexical items that have particular meanings” (Hunston & Francis, 1999, p. 83). Corpus-driven research has confirmed these two hypotheses and stated these significant findings in multiple publications (Hunston et al., 1997; Hunston & Francis, 1999; Hunston & Francis, 2000; Hunston, 2003; Teubert, 2007). Hunston et al. (1997) illustrated the first observation that different patterns of a word are associated with different
meanings by providing a list of different patterns of the verb *reflect*. Each of the patterns is associated with a certain meaning of *reflect* (shown in Table 1).

Table 1
*Patterns and Meanings of the Verb Reflect (adapted from Hunston et al., 1997)*

<table>
<thead>
<tr>
<th>Meaning</th>
<th>Example</th>
<th>Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Show that an attitude or situation exist</td>
<td>The riots reflected the bitterness between the two communities.</td>
<td>V n</td>
</tr>
<tr>
<td>2. Light or heat bounces off a surface</td>
<td>The sun reflected off the snow-covered mountains. The glass reflects light naturally.</td>
<td>V prep V n</td>
</tr>
<tr>
<td>3. Image can be seen in a mirror or water</td>
<td>His image seemed to be reflected many times in the mirror.</td>
<td>be V-ed</td>
</tr>
<tr>
<td>4. Think deeply about something</td>
<td>We should all give ourselves time to reflect. I reflected on the child’s future.</td>
<td>V V on/upon n</td>
</tr>
<tr>
<td>5. A thought occurs to someone</td>
<td>He reflected that he ought to write a line to Veronica.</td>
<td>V that-clause</td>
</tr>
<tr>
<td>6. Give a good or bad impression</td>
<td>The affair hardly reflected well on the British. Your behavior reflects on the school itself.</td>
<td>V adv on n V on n</td>
</tr>
</tbody>
</table>

The second observation of pattern grammar is that particular patterns will tend to be associated with lexical items that share particular meanings. All verbs with each pattern have been divided into several sub-groups based on their basic meaning. Each meaning group is labeled with one (or more) of the verbs in this meaning group. This association between patterns and meaning is demonstrated using the pattern “V of n” as an example.

Table 2
*Meaning Groups, Basic Meaning, and Verbs with the Pattern “V of n” (summarized from Sinclair, 1996)*

<table>
<thead>
<tr>
<th>Meaning groups</th>
<th>Basic meaning</th>
<th>Verb identified as having similar meanings</th>
</tr>
</thead>
<tbody>
<tr>
<td>THE ‘TALK’ GROUP</td>
<td>Concerned with talking</td>
<td>Boast, speak, tell, complain, talk, warn</td>
</tr>
<tr>
<td>THE ‘THINK’ GROUP</td>
<td>Concerned with thinking or having an opinion</td>
<td>Approve, daydream, dream, conceive, despair, repent, disapprove, think</td>
</tr>
</tbody>
</table>
As shown in Table 2, twenty-two verbs with the pattern “V of n” were grouped into four meaning groups based on their basic meaning. (Since this pattern contains a long list of verbs, this sample was selected for easiness of presentation.) These meaning groups were labeled as THE “TALK” GROUP, THE “THINK” GROUP, THE “KNOW” GROUP, and THE “REEK” GROUP, respectively, using one verb from each sub-list. Following the two observations concerning grammar patterns, knowledge of patterns in this project refers not only to knowledge of correct forms of patterns, but also knowledge of meanings with which different patterns are associated.

Teaching grammar patterns by adopting the theory of pattern grammar is claimed to be beneficial to students, because this method of learning may promote four crucial aspects of language learning: understanding, accuracy, fluency, and flexibility (Hunston et al., 1997). Hunston et al. (1997) explained the benefits of learning patterns as follows: First, knowledge of patterns can promote understanding, since the broad meaning of a certain word can be deduced based on other words that are nested under the same meaning group with the target word. The meaning group also provides students with clues to guess the meaning of an unknown word in a text. Second, knowledge of patterns can promote accuracy of learners’ language production given that producing correct sentences relies on knowledge of using correct patterns of words based on the language users’ specific intended meaning. Third, fluency is demonstrated through the production of stretches of language without excessive hesitations or false starts (Hunston et
al., 1997). Since language can be seen as a flow of patterns, accurate and automatic production of patterns could help language flow more fluently. Finally, introducing vocabulary and patterns together can encourage learners to develop flexibility in their language production, as words that share a pattern often share aspects of meaning, while one area of meaning can be expressed through more than one pattern (Hunston, et al., 1997). Overall, the pattern approach to grammar could provide language learners multiple benefits and has great potential in aiding language teaching and learning.

**Pedagogical considerations in teaching patterns.** The call for teaching learners knowledge of patterns never aimed to challenge or eradicate prevailing trends of communicative language teaching. Instead, the pattern approach to grammar is centered on a complementary teaching component (Hunston & Francis, 1998). The role of patterns is set as a reference for grammatical consciousness raising, given that language courses completely built around individual patterns are not realistic or pedagogically sound (Hunston & Francis, 1998).

Compared with other types of syllabi, it is suggested that incorporation of pattern grammar into a lexical approach is more convenient, since both lexical approach and pattern grammar prioritize lexis and emphasize the association between lexis and grammar (Howarth, 1998; Hunston & Francis, 1998). The lexical approach intends to develop learners’ knowledge of words and multi-word units with emphasis on the importance of comprehending and producing multi-word units (Olga, 2001). A lexical syllabus centers on vocabulary identified from a corpus by predicting a group of words learners are most likely to encounter. Given that patterns are presented based on the core lexical items, it is convenient to generate a list of patterns for vocabulary covered in a lexical syllabus (Sinclair, 1996). Although most logically associated with a lexical syllabus, the pattern approach to grammar can form a part of any syllabus,
including a grammatical syllabus, or a functional or notional syllabus (Howarth, 1998; Hunston et al., 1997). A grammatical syllabus usually includes a list of structures, tenses, and other grammatical points learners are supposed to learn. Introducing knowledge of patterns can complement the grammar-oriented syllabus with knowledge of meaning and vocabulary and help students establish connections between grammar and vocabulary (Sinclair, 1996). On the other hand, functional syllabi provide a list of communicative functions, such as requests and denials, and notional syllabi are organized based on notional categories (concepts such as time, quantity, and space). Since little explicit attention has been given to vocabulary in both functional and notional syllabi, incorporation of knowledge of patterns could provide students a balanced learning experience with a focus on learning objectives specified in the syllabus and the development of vocabulary knowledge. Incorporating patterns into an already fully designed syllabus seems to impose “an unreasonable additional load upon learners already struggling to remember large amounts of vocabulary and understand detailed grammatical systems” (Hunston et al., 1997, p. 210). However, the association between patterns and words (the two important observations) makes the load upon learners not as great as it appears (Hunston et al., 1997).

Also, in the field of corpus linguistics, Data-Driven Learning (DDL), developed by Tim Johns (Johns, 1991), is closely associated with the teaching of multi-word units (including grammar patterns) (Bennett, 2013). DDL requires students to examine corpus data by asking questions and finding the answers through direct inquiry in corpora. The teacher’s role is shifted to a director or facilitator of the student-initiated research. The inductive approach associated with data-driven learning, however, has been criticized (Vannestal & Lindquist, 2007; Widdowson, 2002). Some students who attended an inductive corpus-based grammar course held by Widdowson (2002) commented that reading about grammatical rules in the book was more
rewarding than corpus analysis. Emphasizing learners’ different cognitive styles, Meunier (2002) and Flowerdew (2008) pointed out that generating rules from a list of concordance lines might appeal to field-dependent students, who tend to perceive the field as a unified system (Brown, 2000), whereas field-independent learners, who demonstrate stronger analytical and problem solving abilities than field-dependent learners (Wooldridge & Haimes-Bartolf, 2006), tend to prefer explicit instruction rather than inductive learning typical of corpus-based pedagogy.

Besides students’ cognitive styles, the choice between an inductive or deductive approach has been related to the nature of a particular inquiry (Flowerdew, 2009). Inductive learning of an aspect of multi-word units can be very problematic (Vannestal & Lindquist, 2007), since it is difficult for students to extrapolate the tendencies in language given conflicting examples that students may encounter (Hunston & Francis, 2000; Flowerdew, 2009), and the daunting number of concordance lines required for the extrapolation (Coxhead, 2008). Therefore, a deductive approach, as exemplified in the pattern approach to grammar, could potentially complement the inductive approach of teaching grammar patterns.

Another important consideration related to teaching multi-word units, including grammar patterns, is that it is desirable to focus on a specific register (Howarth, 1998). Following this recommendation, this research project was intended for target language learners learning English for academic purposes (EAP). These students are expected to be competent in the traditional basic language skills of listening, speaking, reading, and writing in academic contexts. Underlying these skills is learners’ knowledge of academic vocabulary (Akbarian, 2010; Barrow, Nakanishi, & Ishino, 1999). However, while academic vocabulary knowledge also involves the patterns of academic words, current academic vocabulary pedagogy has not incorporated patterns, and thus lends little support to teaching patterns of academic vocabulary. For instance,
the most current Academic Vocabulary List (Gardner & Davis, 2013) and the new Academic Word List generated by Coxhead (2000) provide academic words in isolation with no indication of patterns of these academic words. As a consequence, EAP learners and teachers tend to focus merely on individual academic words without considering the grammar patterns of these academic words (Coxhead, 2008).

2.2.2 Research on grammar patterns

Empirical evidence on the value of grammar patterns is also scarce in view of the increasing attention being paid to multi-word units in teaching English as a second/foreign language (Howarth, 1998). Rather, research on grammar patterns is typically descriptively linguistic in nature. The dominant number of studies utilizes corpora as research tools for investigating correspondences between pattern distribution and word form (Hunston, 2003), distributions of patterns across disciplines and genres (Charles, 2007; Groom, 2005), and comparisons of pattern use by apprentice and expert writers (Romer, 2009).

To relate distribution of patterns in general corpora to their linguistic context, Hunston (2003) compared the frequency of two complementation patterns (that-clause and wh-clause) in the large general corpus Bank of English. She interpreted the distribution of these two patterns in combination with the different word forms of 26 verb lemmas. The results suggested that the patterns tend to co-occur differentially with different word forms. For instance, the wh-clause generally occurs most frequently with the base form, while the that-clause occurs most frequently with the -ed form. However, not all of the 26 verbs studied followed this general observation. As Hunston (2003) pointed out, the findings tested the hypothesis that word forms comprising a lemma tend to appear in different grammatical contexts, which further empirically supported the interdependence of lexical grammar.
Some researchers chose to explain frequency of patterns in a discipline-oriented manner with a focus on academic prose; however, these studies usually centered on a limited number of patterns (one or two) and related frequency to purposes that texts in different disciplines serve and the semantic group of core words in the specific patterns. Groom (2005) compared distribution of *it* v-link ADJ that- (e.g., “It is clear that the problem of evidence continues to vex new historicist criticism.”) and *it* v-link ADJ to-inf (e.g., “It is important to compare unemployment rates on a consistent basis.”) in four multi-million word corpora representing two different genres (research articles and book reviews) and two different disciplinary discourses (History and Literary Criticism). These two patterns were selected since use of *it* as a grammatical subject distinguishes the highly personal and subjective presentation of knowledge, which are valued in academic discourse (Hewings & Hewings, 2002). The researcher concluded that the choice of patterns is associated with different communicative priorities and epistemological percepts of the written genres and disciplinary discourses (Groom, 2005).

Adopting a similar research design, Charles’ (2007) findings were consistent with Groom’s (2005) conclusion. Charles (2007) chose to investigate disciplinary variation using the pattern nouns followed by a complement clause (e.g., “the argument that the Justices exhibit strategic behavior…”), since this pattern has been frequently used in academic discourse as a stance marker. Two corpora representing politics/international relations (190,000 words) and materials science (300,000 words) were selected for the analysis. The result indicates that the Noun *that* pattern (Noun is capitalized to indicate the key word of the pattern) is over three times as frequent in the politics/international relations corpus as in the materials science corpus. With consideration of the source of the proposition in the complement clause, Charles (2007) attributed this difference in distribution to the fact that many nouns in the politics corpus refer to
propositions put forward by political entities, which tend to be rare in materials science.

Adopting the notion by pattern grammar that nouns in a pattern can be divided into semantic groups, the researcher found that writings in the politics corpus primarily use ARGUMENT nouns (e.g., argument, assertion) to demonstrate their stance toward others’ research. By contrast, EVIDENCE nouns (e.g., evidence, observation) appeared more frequently in materials science for evaluating the writers’ own research.

Another line of research on grammar patterns is designed to uncover the differences between novice and expert (or native and nonnative) writers’ use of grammar patterns in academic discourse. For instance, Romer (2009) explored the use of the introductory *it* pattern (e.g., *it is essential for EFL learners to come to grips with connotations*, attested example), which is very common in academic discourse and causes problems for EFL learners (see Groom, 2005; Hewings & Hewings, 2002; Oakey, 2002). Romer’s (2009) study analyzed four corpora, including three apprentice corpora and one expert corpus consisting of published research articles in different disciplines. The three apprentice corpora represent texts produced by upper-intermediate language learners, advanced language learners, and unpublished English native speaker college students. Therefore, comparison between these corpora revealed proficiency development from a low to high level and from nonnative to native speakers’ use of grammar patterns under investigation.

Although all above studies approach grammar patterns from different perspectives, all of the researchers pointed out that their findings yielded pedagogical implications and contributed to teaching grammar patterns to some extent. First, teaching the grammatical contexts with which complementation patterns are associated can help students produce patterns in a more accurate and native-like manner (Hunston, 2003). Pedagogical implications also included the
suggestion that drawing students’ attention to different pattern uses between novice and expert academic writers and across disciplines/genres can help students become more accepted writers in their communities of practice (Charles, 2007; Groom, 2005; Romer, 2009).

Despite the claimed pedagogical implications, empirical findings that contribute to real language learning are still difficult to find. It seems that all current studies concerning grammar patterns provide a very narrow scope of patterns by investigating a small number of typical patterns or problematic patterns to students, such as *it*-introductory clause, *that*-clause, and *wh*-clause. In addition, none of the mentioned studies set the effectiveness of teaching grammar patterns as their primary research goal. Therefore, questions such as how to teach grammar patterns effectively or what are the factors influencing the effectiveness of teaching grammar patterns still remain empirically unanswered.

In summary, the promising achievements of corpus-driven research, the eloquently argued importance of pattern grammar, and thorough discussion on pedagogical considerations in teaching grammar patterns have sufficiently prepared researchers and teachers for teaching vocabulary knowledge in terms of patterns, evaluating teaching effectiveness, and generating pedagogical implications for teaching grammar patterns. Conversely, available empirical efforts have not sufficiently addressed the issue of practical teaching of patterns, and instead, assumed a widespread and uncritical acceptance of pattern grammar. Therefore, the current researcher intends to evaluate PAT GRAM designed as a vehicle for complementing classroom instruction by serving as a reference tool for learners. More specifically, this research project investigated the effectiveness of PAT GRAM in teaching grammar patterns of academic words. In addition,
because the current version of PAT GRAM only covers verbs, the scope of the research is restricted to the effectiveness of PAT GRAM in teaching vocabulary knowledge in terms of patterns of academic verbs.

2.3. Computer-assisted Vocabulary Learning

This section reviews previous literature on computer-assisted vocabulary learning (CAVL) realized through human-computer interaction, because PAT GRAM is such a computer-assisted language learning tool designed to facilitate L2 vocabulary learning by increasing students’ vocabulary knowledge through their learning of the grammar patterns associated with the word. The section first introduces previous CAVL applications and then discusses the design of CAVL applications with reference to important conversations in vocabulary learning. Finally, this section summarizes the evaluation of previous CAVL applications so as to inform the evaluation of the explicit instruction realized through PAT GRAM.

2.3.1. CAVL applications

With the development of technology, instruction of all types, including foreign language instruction using computers, has become widely accepted (Chapelle, 2001). Computer technology not only provides learners interactive language learning tasks, but also extends assistance beyond regular class time, making students’ self-instruction possible (Chapelle, 2007; Gunduz, 2005). A meta-analysis published recently covering 37 studies from 1970 to 2006 suggested that language instruction with computer technology was more effective than instruction without it (Grgurovic, Chapelle, & Shelley, 2013). Vocabulary learning, a crucial component of language learning, has also received great attention from computer-assisted language learning (CALL) (Ma, 2013). Many CAVL applications have been created to facilitate
L2 vocabulary learning. Following the categorization framework proposed by Ma (2013), CAVL applications can be generally divided into lexical resources/aids and lexical programs/tasks.

**Lexical resources/aids.** Lexical resources/aids refer to technologies developed to provide learners access to the meaning of new vocabulary items and include online resources such as Wikipedia, electronic dictionaries or lexical concordancers (Ma, 2013). Wikipedia is a free, web-based encyclopedia allowing creation and modification of webpage content and collaboration between users (Khany & Khosravian, 2014). Dictionaries have long been used by learners to expand their vocabulary, and the web-based or localized electronic versions provide learners more convenient access to lexical knowledge than do print forms (McAlpine & Myles, 2003). Different from electronic dictionaries that explicitly display the word meaning or other lexical information, lexical concordancers present occurrences of the searched word or phrases in its textual environment. The learners need to infer lexical information, such as meaning and grammatical and collocational patterns, independently or with instruction (Yilmaz & Soruç, 2015).

Wikipedia, the online encyclopedia, has potential of facilitating language learning because its various functions can support many language learning activities. Khany and Khosravian (2014) summarized the functions of Wikipedia, which mainly include allowing users to add articles to their watch list, edit these articles, view site statistics, and access the most popular articles. Availability of these functions may help engage students in various reading and writing activities. By participating in these activities, learners’ vocabulary knowledge tends to improve (Baumann & Kame’enui, 2004; Pearson, Hiebert & Kamil, 2007). Wikipedia has been adopted in some language teaching classrooms also because it allows collaboration between
students through online access. This can not only facilitate classroom management but also extend collaborative learning activities beyond the classroom (Khany & Khosravian, 2014).

The development of web-based or localized electronic dictionaries is based on their printed counterparts, but incorporates computer technology (Rizo-Rodriguez, 2008). Compared to hard copies, electronic dictionaries provide learners more convenient access to lexical information about lexical items, including definitions, derived words, idioms, collocations, examples, and other lexical information. Many electronic dictionaries also integrate multimedia resources, such as pronunciation (e.g., Cambridge advanced learners’ dictionary, Collins Cobuild advanced learners’ dictionary, Longman dictionary of contemporary English), video clips (Macmillan English dictionary for advanced learners), and pictures (Longman dictionary of contemporary English) (Rizo-Rodriguez, 2008).

One of the most frequently reported corpora that support concordancing is the Corpus of Contemporary American English. Concordancers also have been embedded into other CAVL applications to present lexical information of target words in authentic contexts (Cobb, 1997; Horst, Cobb & Nicolae, 2005; Poole, 2012). One of the most widely known examples is the Compleat Lexical Tutor developed by Tom Cobb. The effectiveness of concordancers in vocabulary learning is controversial (Yilmaz & Soruç, 2015) and has been related to variables, such as learner proficiency, instructional guidance, and activity design (Ma, 2009; Ma, 2013).

**Lexical programs/tasks.** Lexical programs/tasks can be generally categorized into: computer-assisted lexical glosses, computer-mediated communication (CMC) lexical-based tasks, computerized vocabulary exercises, and dedicated CAVL programs (Ma, 2013). Lexical glosses provide explanations for words or phrases that are judged to be outside learners’ current
competence through hyperlinks (Askildson, 2011; Chen & Yen, 2013; Widdowson, 1984). CMC lexical-based tasks refer to vocabulary learning tasks realized through asynchronous (email and text message) and synchronous communication (online written or oral chatting). Computerized vocabulary exercises intend to provide learners vocabulary drills through receptive retrieval (e.g., matching L1 and L2 words and matching definition sentence) and productive retrieval (e.g., complete a definition sentence by typing the target word) (Allum, 2004; Stockwell, 2007). Compared to previously introduced CAVL applications that facilitate a different aspect of vocabulary learning process (e.g., learning a word in context, obtaining semantic information, inferring grammatical and collocational patterns of a word, and production of a word), dedicated CAVL programs promote vocabulary learning more comprehensively and systematically by combining all procedures necessary for vocabulary learning (Ma, 2013).

Computer-assisted lexical glosses are widely used to facilitate reading comprehension with vocabulary learning as a by-product (Chen & Yen, 2013; Bowles, 2004; Cheng & Good, 2009). These glosses can be categorized into marginal glosses, bottom glosses, pop-up window glosses, and end-of-text glosses based on different gloss locations (AbuSeileek, 2008). Different multimedia modes of these glosses include text, graphics, video clips, and audio (Akbulut, 2008; Chen & Yen, 2013; Plass, Chun, Mayer, & Leutner, 2003; Yanguas, 2009).

The implementation of synchronous and asynchronous CMC tasks for vocabulary learning has received increasing interest because CMC has been found to promote negotiation between learners and push them to produce more linguistic output (AbuSeileek & Qatawneh, 2013). Synchronous and asynchronous CMC modes differ in that the asynchronous mode allows learners more time to respond and more opportunities to consult external resources (AbuSeileek
Two different modes of communication, written and oral communication, have been frequently adopted in CMC tasks. Yanguas (2012) pointed out that written communication provides learners more opportunities to attend to form and neutralize the effects of unequal power relationships among learners. AbuSeileek and Qatawneh (2013), on the other hand, found that oral communication produces more output than written communication. Besides choice of different modes of communication, many researchers judge a well-designed communicative task as essential for CMC (Fuente, 2010; Lee, 2011). Two-way tasks (jigsaw tasks and information-gap tasks), which require learners to combine the information they hold respectively to complete the task, are most frequently used in CMC research (Yanguas, 2012).

Computerized vocabulary exercises draw learners’ attention to the target forms with the semantic information presented in either a contextualized or decontextualized manner. The simplest form of CVEs is electronic lists or flashcards that are arranged alphabetically or semantically (Ma, 2013; Nakata, 2011). Some flashcard programs offer readymade flashcards, while others also allow users to create and edit flashcards (Burston, 2007). More complicated electronic flashcards (e.g., SuperMemo & Anki) have been created to support expanded rehearsal, which sets gradually increasing intervals between each review (Ma & Kelly, 2006). Compared to flashcards, another type of computer-assisted exercises provides more contextualized exercises, including matching definition sentence to the word, completing definition-like sentences by choosing the right word, or completing definition sentences by typing a word (Allum, 2004).

Dedicated CAVL programs facilitate vocabulary learning comprehensively in that they support both contextualized and decontextualized, both meaning-focused and form-focused,
vocabulary learning. In addition, dedicated CAVL programs not only teach vocabulary but also provide subsequent exercises (Ma & Kelly, 2006). For example, CAVOCA, developed by Groot (2000), scaffolds vocabulary learning by presenting new words in context-rich sentences, providing immediate feedback to meaning deduction, and displaying reading materials with new words to consolidate vocabulary knowledge. Another dedicated CAVL program, WUFUN, organized the vocabulary learning activity sequentially: previewing a story, drawing attention to vocabulary through glosses, introducing memorization strategies (e.g., verbal association, imagery or rhyming), and practicing words in contexts (Ma & Kelly, 2006).

All these CAVL applications introduced above serve to facilitate vocabulary learning from different perspectives and rely on different instructional methods. The choices involved in the design of these CAVL applications have never been random. Rather, these choices are deeply rooted in the wider field of vocabulary learning. The next section elaborates on the connection between design of CAVL applications and important discussions in vocabulary learning.

2.3.2. CAVL applications & vocabulary learning

The theoretical and practical considerations involved in the design of CAVL applications reflect important findings in vocabulary learning. Discussions in vocabulary learning about what and how vocabulary should be learned are closely related to CAVL applications, since these two questions specify the content of CAVL applications and guide the methods of teaching lexical information (implicit or explicit) (Groot, 2000).

Advances in the study of vocabulary learning guide the development of CAVL applications and informs the content of CAVL applications. Researchers in vocabulary learning have recognized the two dichotomous but highly related dimensions of vocabulary knowledge:
vocabulary size and depth (Akbarian, 2010; Milton, 2009; Read, 2000). Size and depth of vocabulary knowledge refer to the number of words that language learners know and how well the language learner knows a word (Akbarian, 2010; Jaen, 2007). The multidimensional qualitative lexical knowledge (vocabulary depth) has been recognized as including pronunciation, spelling, meaning, register, frequency, and grammatical and collocational patterns (Jaen, 2007; Qian & Schedl, 2004).

The recognition of multidimensionality of vocabulary knowledge, especially grammatical and collocational patterns, has been gradually reflected in the design of various CAVL applications. For example, newly developed flashcard programs allow learners to create flashcards for not just single words, but also multi-word units (i.e., grammatical and collocational patterns) (Nakata, 2011). Even though computer-assisted lexical glosses have been designed primarily to provide semantic information to facilitate comprehension, recent attempts of gloss development have ventured to incorporate corpus-extracted sentences presented in concordance lines into textual glosses so as to foster learning of grammatical and collocational patterns of the target words (Poole, 2012). Dedicated CAVL programs such as CAVOCA and WUFUN intentionally draw learners’ attention to grammatical and collocational patterns by presenting words in context (Groot, 2000) or specifying the grammatical and collocational patterns in glosses (Ma & Kelly, 2006) and consolidating learners’ memorization of the recognized patterns through various exercises.

Notwithstanding growing emphasis on grammatical and collocational patterns of vocabulary, the majority of CAVL applications majorly serves to provide semantic information and has not incorporated grammatical and collocational patterns of vocabulary. To the author’s knowledge, almost all computer-assisted lexical glosses are designed to facilitate reading
comprehension by providing semantic meaning of vocabulary. Poole's (2012) creation of textual glosses presented in concordance lines is the only exception. In her critical review of flashcard software, Nakata (2011) discovered that only a limited number of programs offered support for flashcard creation to include multi-word units. Even though dedicated CAVL programs included grammatical or collocational patterns of vocabulary, the number of dedicated CAVL programs is still scarce compared to CAVL applications facilitating receptive comprehension (Groot, 2000; Ma & Kelly, 2006). Therefore, there is a call for development of CAVL applications to provide learners access to grammatical or collocational patterns of vocabulary, to which this project endeavors to respond.

In addition to the content of CAVL applications, ongoing discussions in vocabulary learning also have informed different methods of teaching lexical information in CAVL applications. The two complementary approaches to vocabulary learning, the implicit and the explicit learning paradigms, underlie the design of previously introduced CAVL applications. Implicit learning refers to meaning focused learning in natural contexts, while explicit learning requires deliberate efforts exerted to build association between meaning and form (Ma & Kelly, 2006). Incidental learning, the most important feature of the implicit learning paradigm, is largely defined as the learning of vocabulary as a by-product of an activity not explicitly targeting vocabulary learning (Rieder, 2003). Intentional vocabulary learning, associated with an explicit learning paradigm, on the other hand, is defined as any activity intentionally designed for memorizing lexical information (Hulstijn, 2001).

The importance of implicit vocabulary learning has been recognized by many researchers. For example, Choo, Lin, and Pandian (2012) argues that except for the first few thousand most commonly used words, English vocabulary is largely acquired through extensive
reading where learners infer the meaning of unfamiliar words. However, some researchers have questioned implicit learning by pointing out that, due to text complexity or learner limitations, inferring may not be an easy and efficient learning strategy for learners to achieve vocabulary comprehension (Poel & Swanepoel, 2003; Sokman, 1997). Fortunately, some CAVL applications, such as online dictionaries and computer-assisted lexical glosses, were designed to facilitate incidental vocabulary acquisition and reading comprehension by providing learners convenient access to semantic information (AbuSeileek, 2011; Chapelle & Jamieson, 2008; Chun, 2001; Erçetin, 2010; Kiliçkaya, 2010; Laborda, 2009; Marsden, Mackenzie, & Lindsay, 2007; Sharma, 2008). Computer-assisted lexical glosses particularly serve incidental vocabulary learning by “providing learners modified input, helping make the input salient, potentially resolving miscomprehension, and prompting noticing” (Chapelle, 2007, p. 101). The glosses not only provide learners with convenient access to semantic information unobtrusively, but also draw students’ attention to vocabulary through different multimedia modes (Ma, 2013).

Even though incidental vocabulary learning assisted by CAVL applications has been demonstrated as effective in multiple contexts (e.g., AbuSeileek, 2008; Chen & Yen, 2013), some empirical studies found that reading comprehension accompanied by explicit vocabulary training (Wesche & Paribakht, 2000) or decontextualized word-focused activities (Laufer, 2001) outperformed incidental learning through reading comprehension in improving learners’ vocabulary knowledge quantitatively and qualitatively.

Supporters of the explicit learning paradigm of vocabulary learning, further, argued that vocabulary learning solely depending on incidental learning can be problematic (Groot, 2000; Ma & Kelly, 2006). One belief questioning incidental learning is that incidental learning requires a longer time than learners can actually afford, because learners, especially those of intermediate
and advanced levels, need to accumulate a large vocabulary in a limited time to achieve functional language proficiency (Groot, 2000).

Another strong argument about insufficiency of incidental vocabulary learning is that mainly recognition of words is achieved. Correct usage of words associated with production, on the other hand, is not adequately addressed (Ma & Kelly, 2006). In the process of incidental learning, the primary goal is to achieve comprehension and vocabulary learning is only a by-product. Grammatical and collocational patterns not fundamental to comprehension, therefore, attract little attention from learners. The explicit learning paradigm, by contrast, requires learner’ conscious efforts in memorizing lexical information and serves the ultimate goal of productive use. Guided by the explicit learning paradigm, many computerized vocabulary exercises have been intentionally built to scaffold learners’ memorization of lexical information with a focus on explicit learning (Nakata, 2011).

To reconcile the discrepancy between implicit and explicit vocabulary learning, Ma (2013) suggested a combination of both learning paradigms in CAVL applications to provide learners a balanced chance of receiving extensive exposure and focused attention to word forms and other dimensions of vocabulary knowledge. Following this suggestion, developers of CAVL applications, especially those advancing dedicated CAVL programs, exerted great efforts to create various vocabulary learning activities that assist both implicit and explicit learning. For instance, both CAVOCA and WUFUN initiate implicit learning by presenting new words in context-rich sentences and texts embedded with computer-assisted lexical glosses, respectively. Also, both programs explicitly draw learners’ attention to form of the words by providing derivations, idiomatic usage, memorization strategies, and so forth.
Design of these CAVL applications follows different pedagogical considerations and has the potential of promoting learners’ vocabulary knowledge with little teacher intervention. However, appropriateness and effectiveness of these CAVL applications needs to be evaluated systematically. The next section specifically discusses evaluation of CAVL applications.

2.3.3. Evaluation of CAVL applications

With commercial publishers and academic institutions investing large amounts of resources in developing CALL materials, it is the applied linguists’ responsibility to evaluate whether these materials positively affect language learning (Jamieson & Chapelle, 2004). In one of her most influential publications, *Computer Applications in Second Language Acquisition*, Chapelle (2001) articulated two types of CALL evaluation: judgmental and empirical evaluation. Judgmental analysis evaluates the degree to which the desired features actually appear in the CALL materials (Chapelle, 2009), and is often realized through “checklists and surveys that are derived from instinctual, subjective, or skilled selection” (Ma, 2008, p. 109). Empirical evaluation, on the other hand, requires empirical data collected from the classroom or actual site of use (Chapelle, 2009; Ma, 2008).

The judgmental evaluation of CAVL applications mainly consists of expert judgment and assessment of learners’ perceptions. Numerous published software reviews of CAVL applications can be categorized as judgmental evaluation (e.g., Nakata, 2011; Rizo-Rodriguez, 2008). For example, Nakata (2011) critically investigated flashcard software that presents lexical information in a paired-associate format, where learners are required to associate the L2 word form with its first language translation or L2 definition. Based on a review of previous literature on flashcard learning and paired-associate learning, Nakata (2011) first developed criteria for evaluating flashcard programs, then examined nine computer-based flashcards against the
criteria. Rizo-Rodriguez (2008) compared five advanced learners’ dictionaries of English on CD-ROM in terms of their graphical user interface, accessibility and information retrieval, macrostructure (alphabetical list of entries), microstructure (the content of entries), thesaurus-like consultation, and multimedia resources.

In addition to expert judgments, learners’ perceptions, generally collected through questionnaires or interviews, have also been widely adopted in CAVL evaluation as an important form of judgmental evaluation (AbuSeileek, 2008; Chen & Yen, 2013; and Erçetin, 2003). For example, Yanguas (2012) utilized a questionnaire that required participants to compare their experiences using computer-mediated communication with traditional face-to-face interaction in the classroom in terms of learning, quality of practice, and nervousness. In AbuSeileek’s (2008) study, students rated their preference of different gloss locations through a questionnaire. Besides the questionnaire, Erçetin (2003) also interviewed participants about their perceptions of the usefulness of annotations and their reading experience facilitated by annotations.

To complement judgmental evaluation of CAVL applications, considerable efforts have been exerted to evaluate CAVL applications empirically. A large number of such studies relied on learners’ improvement after exposure to CAVL applications as the primary evidence for learning outcomes (AbuSeileek, 2008; Akbulut, 2007; Chen & Yen, 2013; Yanguas, 2009). Most of these studies adopted experimental or quasi-experimental research designs with pretests and posttests to make comparisons between students’ learning outcomes from use of CAVL applications and those of non-CALL activities. (see AbuSeileek, 2008; Bowles, 2004; Laufer, 2000; Taylor, 2006, 2009, 2013). Empirical evaluations of CAVL applications that relied on this comparative framework have been criticized as inadequate for informing CALL evaluation due to methodological limitations (Chapelle, 2001; 2003; Chapelle, Jamieson, & Park, 1996; Garrett,
1991; Jamieson, Chapelle, & Preiss, 2005). Jamieson, Chapelle and Preiss (2005) attributed the methodological limitations to the difficulty of controlling the large number of variables (e.g., teachers’ instruction, natural acquisition, or testing effects) in natural contexts that may affect the learning outcomes. Further, they claimed that the attempts of controlling variables and excluding context to fulfill experimental or quasi-experimental research designs are problematic, since “it is typically the contextual factors that contribute greatly to success or failure” (Jamieson et al., 2005, p. 94). As Jamieson et al. (2005) pointed out that the pressing question to answer for today is “to what extent a particular type of CALL material can be argued to be appropriate for a given group of learners at a given point in time” rather than justification of computer use for language instruction (p. 94).

Despite the abundance of research investigating the effectiveness of CAVL applications empirically, what has been done to date has “only scratched the surface” (Chapelle, 2007, p. 98). Many researchers have begun to realize the importance of learning process data in CAVL research and have advocated for more attention to what learners actually do when they are engaged in CAVL activities (Blake, 1992; Chapelle, 2001; Hulstijn, 1993; Ma, 2008). Learning process data is “consistent, observable behavior displayed by students as they [work] on L2 tasks” (Chapelle, 2003, p. 98). Typical quantitative learning process data includes the number of mouse clicks, time spent on CAVL activities, and navigation patterns, while qualitative data may consist of learners’ reflections or comments about the learning process, and observations documented by researchers (Chapelle, 2003; Desmarais, Duquette, Renié, & Laurier, 1998; Hegelheimer & Tower, 2004; Hwu, 2005; Ma, 2008). A review of previous CAVL research
indicates that only a small portion of CAVL evaluation studies has presented learning process data (see Bowles, 2004; Ma & Kelly, 2006; Plass, Chun, Mayer, & Leutner, 1998; Yanguas, 2009, as examples).

Bowles’ (2004) study ranked among the few studies that incorporated learning process data. She utilized think-aloud protocols to elicit evidence of students’ noticing of the target words when they were using the computer-assisted lexical glosses to complete a reading comprehension exercise. This data helped Bowles interpret participants’ performance in a reading comprehension test and vocabulary test relying on the noticing hypothesis. Bowles found that the numbers of instances of noticing by the experimental groups were not significantly higher than those of the control group, which explains the non-significant difference between two groups in their test performance. Plass et al. (1998) utilized logfile, a file that is embedded in computers to record user behaviors, to identify 130 German university students’ learning preferences. The type of glosses (L1 translation and pictures or video clips) students looked for when reading an English text was recorded using logfile. Based on the logfile record, the researchers were able to classify the students into visualizers, verbalizers, and the neutrals, and discuss effectiveness of multimedia glosses by relating the glosses to students’ learning styles. Also, Ma and Kelly (2006) found that user action data, including time spent on the program, number of words viewed, and time spent on the exercises closely correlated with performance data.

Given the importance and scarcity of process data in the evaluation of CAVL applications, a growing number of researchers suggest using build-in and plug-in tracking devices, such as Hyper cam, Camtasia, and Snapz Pro, to observe learners’ behavior unobtrusively (Fischer, 2007; Ma & Kelly, 2006; Ma, 2013). Future evaluation of CAVL applications, therefore, should consider collecting learning processes so as to achieve a balance
between learning outcomes and learning processes. Informed by the trend in CALL evaluation, this research project intends to evaluate the explicit instruction offered by PAT GRAM through learning outcome and learning process data.

2.4. Research Questions

The review of evaluation of CAVL applications suggested that the most informative CALL evaluation for many purposes needs to be context-specific and incorporate both judgmental evaluation (expert judgment or learners’ perceptions) and empirical evaluation (learning outcome data and learning process data). The CALL evaluation framework proposed by Chapelle (2001) aims to guide CALL researchers to pose questions and collect evidence to design CALL evaluation. Therefore, this study adopted Chapelle’s (2001) framework and shaped the research design and research questions accordingly. As specified in Chapelle’s (2001) framework, researchers can provide evidence for six characteristics of CALL tasks (presented in Table 3).

Table 3
Criteria for CALL Task Appropriateness (from Chapelle, 2001, p. 55)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language learning potential</td>
<td>The degree of opportunity for beneficial focus on form.</td>
</tr>
<tr>
<td>Learner fit</td>
<td>The amount of opportunity for engagement with language under appropriate conditions given learner characteristics.</td>
</tr>
<tr>
<td>Meaning focus</td>
<td>The extent to which learners’ attention is directed toward the meaning of the language.</td>
</tr>
<tr>
<td>Authenticity</td>
<td>The degree of correspondence between the CALL activity and target language activities of interest to learners out of the classroom.</td>
</tr>
<tr>
<td>Positive impact</td>
<td>The positive effects on the CALL activity on those who participate in it.</td>
</tr>
<tr>
<td>Practicality</td>
<td>The adequacy of resources to support the use of the CALL activity.</td>
</tr>
</tbody>
</table>
My evaluation of the explicit instruction provided by PAT GRAM collected data according to the four criteria—language learning potential, learner fit, meaning focus, and impact—as these criteria applied to the purpose of the current activity using PAT GRAM and helped organize all data for judgmental evaluation and empirical evaluation (with a focus on both learning outcome and learning process data). Language learning potential, central to CALL activities, was included and evaluated through all forms of data, including learners’ perceptions, learning outcome data, and learning process data. Learner fit and meaning focus are also important to the evaluation of the explicit instruction provided by PAT GRAM, since whether the explicit instruction provided by PAT GRAM fitted the proficiency level of participants and whether PAT GRAM successfully drew participants’ attention to the meaning of patterns determined to what extent PAT GRAM achieved its goal of helping participants establish form-meaning associations. These two criteria were evaluated through data on learners’ perceptions and learning process. Impact, evaluated through learners’ perceptions and learning process, was included, since whether the explicit instruction realized through PAT GRAM had a positive impact beyond language learning potential is related to whether it can be adopted in future. Authenticity was not included, because PAT GRAM as an explicit teaching tool has never aimed to facilitate learning activities that resemble tasks outside the classroom. Also, practicality was not assessed, because it was assumed for this case.

The following research questions were posed to lead evidence collection for each of the evaluation criteria:

Language learning potential

1. What evidence suggests that students have acquired the patterns of target
academic verbs when using PAT GRAM?

2. What evidence suggests that the accuracy of students’ use of patterns of academic verbs has improved through interaction with PAT GRAM?

3. What evidence indicates that PAT GRAM draws students’ attention to the patterns of target academic words?

4. How do students perceive their learning through using PAT GRAM?

Learner fit

5. What evidence suggests that the explicit instruction provided by PAT GRAM is appropriate for the target group EAP students?

Meaning Focus

6. What evidence indicates that PAT GRAM is able to draw students’ attention to meanings of the grammar patterns of the academic verbs?

Positive Impact

7. What evidence indicates that learning patterns of academic verbs using PAT GRAM provides students with a positive impact?

2.5. Chapter Summary

This chapter reviewed literature on three interrelated components that this dissertation project is established upon: theoretical perspectives on second language acquisition, pattern grammar, and CAVL applications. First, the section on theoretical perspectives on second language acquisition covered theories in second language acquisition that informed the design of
PAT GRAM. Specifically, based on the Input Processing theory, PAT GRAM was designed to present patterns together with their associated meaning to help learners learn patterns as units for meaning making. The interactionist theory guided the design of PAT GRAM to: 1) include example sentences with target patterns as input; 2) provide general meaning of the target pattern exemplified in the example sentences to achieve modified input; 3) facilitate pushed output and modified output; 4) provide feedback through presenting correct patterns to learners; and 5) allow instructors to draw learners’ attention to certain patterns by highlighting them. Following theories in general human learning, the associate-cognitive CREED framework and skill acquisition theory, PAT GRAM intended to teach grammar patterns by explicit teaching, considering frequency of patterns, and facilitating repetitive practice. Afterwards, a review of the previous literature on the theory of pattern grammar and its relation to language teaching and empirical studies related to grammar patterns elaborated on the promise of this theory, discussed pedagogical considerations in teaching grammar patterns, and indicated the scarcity of empirical studies on teaching grammar patterns. Thirdly, review of contemporary CAVL applications revealed the relationship between the design of CAVL applications and important findings in vocabulary acquisitions and informed the evaluation of the explicit instruction provided by PAT GRAM. Finally, research questions were formed based on Chapelle’s (2001) evaluation criteria for CALL task appropriateness, which successfully addressed issues in current CALL evaluation. Following Chapelle’s (2001) framework, this study included data sources to address questions about the quality of the materials for learning. Specific research methods were employed to facilitate the data collection and interpretation. The next chapter provides a detailed account of the research methods adopted in the evaluation of the explicit instruction provided by PAT GRAM.
CHAPTER 3: METHODOLOGY

This chapter describes the methodology adopted in this dissertation project. To answer the research questions based on the evaluation framework for CALL task appropriateness proposed by Chapelle (2001), this study adopted a case study research design in which four sections of an academic writing course were considered the cases and quantitative data were gathered from them to gain an understanding of participants’ use of PAT GRAM and learning without PATG RAM. The participants in the course sections were 61 international students enrolled in a tertiary institution in the United States. The study was conducted during normal class time in which the participants were being taught academic written discourse. This chapter also provides a detailed account of materials, including both the pedagogical materials, used for the treatment and data collection materials used for collecting quantitative and qualitative data. The specific sampling procedure is then presented to balance representativeness of the data and depth of the investigation. Afterwards, the procedure for data collection is explained as consisting of three phases: before the treatment, within the treatment, and after the treatment. Finally, the data analysis is described to explain how an answer was provided to each research question.

3.1. Research Design

I chose a case study design to investigate my research questions, because this study intended to “develop in-depth understanding of the case[s] through collecting multiple forms of data” (Creswell, 2001, p. 486). A case study, according to Yin (2003), is defined as a method of empirical inquiry that investigates a phenomenon not readily distinguishable from its context and relying on multiple sources of evidence. In this study, I wanted to develop an in-depth
understanding of the phenomenon of a learning episode in a first-year ESL writing class. The learning episode was carried out through the use of PAT GRAM for learning grammar patterns and I attempted to gain an in-depth understanding through the use of multiple forms of data that address questions about the quality of the learning materials. In order to gather sufficient data to address the questions, I designed a multiple case study, with a total of four cases, two of which used PAT GRAM and two of which served as contrasting cases for comparison with the PAT GRAM cases (see Table 4).

This multiple-case study was designed to be explanatory, since it aimed to establish a cause-effect relationship between PAT GRAM use and participants’ improvement in knowledge of grammar patterns and explain how learning happened in the process of using PAT GRAM. According to Yin (2003), “multiple cases should be selected so that they replicate each other—either predicting similar results (literal replication) or contrasting results for predictable reasons (theoretical replication)” (p. 5). In this study, as shown in Table 4, Case 1 replicated Case 2 literally, and Case 3 replicated Case 4 literally. Case 1 is a theoretical replication of Case 3, and Case 2 is a theoretical replication of Case 4. Based on this design, it is expected that the two cases that used PAT GRAM would show significant improvement in knowledge of patterns if the explicit instruction provided by PAT GRAM was effective, and two cases that did not use PAT GRAM would demonstrate no significant improvement.

Table 4  
*Four Cases of This Study*

<table>
<thead>
<tr>
<th>Case 1 (used PAT GRAM)</th>
<th>Case 2 (used PAT GRAM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taught by Teacher A</td>
<td>Taught by Teacher B</td>
</tr>
<tr>
<td>Case 3 (did not use PAT GRAM)</td>
<td>Case 4 (did not use PAT GRAM)</td>
</tr>
<tr>
<td>Taught by Teacher A</td>
<td>Taught by Teacher B</td>
</tr>
</tbody>
</table>
This replication of cases was designed by adopting the logic of the non-equivalent control group design, a quasi-experimental design that involves an experimental group and a control group, and requires both groups to take a pretest and posttest (Campbell & Stanley, 1967). The non-equivalent control group design can prevent the main effects of history (“the specific events occurring between the first and second measurement in addition to the experimental variable”), maturation (“processes within the respondents operating as a function of the passage of time, including growing older, hungrier, more tired and so forth,” such as acquisition of patterns in natural context), testing (“the effects of taking a test upon the scores of a second testing”), and instrumentation (“changes in the calibration of measuring instrument or changes in the observers or scorers used may produce changes in the obtained measurements”), because both the experimental group and the control group should have equal exposure to these variables (Campbell & Stanley, 1967, p. 48). These variables were sufficiently controlled in this study by comparing the treatment group and the contrast group’s learning outcomes, because the two groups can be considered homogenous in terms of history (e.g., taking the same English writing class from the same teachers), maturation (e.g., having equal chances of acquiring knowledge of patterns in a natural context), and testing and instrumentation (e.g., taking the same pretest and posttest).

Campbell and Stanley (1967) pointed out that the comparison in a non-equivalent control group design is between activities involving the control group and the treatment received by the treatment group during the same period of time. Specific to this study, explicit learning using PAT GRAM (the treatment) was compared to implicit learning through immersion in English-mediated context. Therefore, the contrast group was assigned to complete computer-based grammar exercises that did not cover target grammar patterns. Another research design could
involve having the contrast group study the grammar patterns included in the treatment through different materials (e.g., paper-based materials, dictionaries, or concordancers). However, such a research design would investigate the difference between PAT GRAM and other invented materials, which was not the purpose of the study. The purpose of this study was to investigate whether the addition of PAT GRAM materials to the writing class could result in more effective learning of the grammar patterns than implicit learning, not whether PAT GRAM would teach grammar patterns better than other materials that other dedicated grammar pattern instructional materials.

This study consisted of two phases, in which quantitative data and then qualitative data were collected sequentially. This research design was selected, since one data set was not sufficient to answer different research questions involving learning outcomes, the learning process, and learners’ perceptions. The qualitative data consisted of participants’ responses to semi-structured interviews and retrospective verbal protocols focusing on their perceptions of implementation of PAT GRAM and learning process using PAT GRAM. The quantitative data, which were subservient to the qualitative data, consisted of participants’ pretest and posttest scores on knowledge of academic verb patterns, revision of sentences that they constructed using the target grammar patterns, and their responses to Likert-scale questions.

3.2. Participants

This study was conducted at a large Midwestern university in the United States. The participants were 61 students enrolled in four sections of a composition course for international students. Since all students were officially admitted into the university, they all had passed the threshold TOEFL score required by the university, which indicated that they were at least able to demonstrate a satisfactory command of English to function sufficiently in an English-mediated
academic context. For the undergraduate students, admission to this university requires a score of 71 with minimum scores of 17 in the Speaking and Writing sections in Internet-Based TOEFL (IBT), a minimum score of 530 in Paper-Based TOEFL (PBT), or an overall band score of 6.0 with no sub score below 5.5 in International English Language Testing System (IELTS), and a minimum score of 420 on the Critical Reading Section of the SAT (Office of Admissions). The requirements for admission to different graduate programs varied, but were higher than those for undergraduate education.

When first entering the university, all students who were nonnative speakers of English were required to take an English Placement Test (EPT). Based on the quality of their writing samples (one component of the EPT test), students were placed into one of three different levels of academic writing courses. Both graduate and undergraduate students who demonstrated obvious grammatical issues impeding readers’ comprehension and lack of development of ideas were placed into this specific course geared towards the improvement of accuracy and development in paragraph writing. The research was conducted in these classes. The participants were judged as demonstrating intermediate to high English language proficiency according to the EPT essay rating rubric, a measurement based on the ACTFL (American Council on the Teaching of Foreign Languages) framework. The proficiency level of these participants also matched the target users of the book Collins COBUILD Grammar Patterns 1: Verbs, namely intermediate and advanced learners of English (Sinclair, 1996).

To obtain more detailed information about the participants, a demographic survey (shown in Appendix B) was distributed to have participants report their first language (L1), gender, TOEFL score, years of English learning, length of time living in an English speaking country. Table 5 shows the data collected using the demographic survey.
Table 5
Demographic Characteristics

<table>
<thead>
<tr>
<th>L1</th>
<th>Gender</th>
<th>TOEFL scores</th>
<th>Years of Learning English</th>
<th>Length of Time Living in an English Speaking Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese (47)</td>
<td>Male (40)</td>
<td>71-88 (iBT)</td>
<td>2-15 years</td>
<td>2 months - 3 years</td>
</tr>
<tr>
<td>Korean (6)</td>
<td>Female (21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arabic (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spanish (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malay (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinhalese (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Forty-seven native speakers of Chinese, six native speakers of Korean, five native speakers of Arabic, one native speaker of Spanish, one native speaker of Malay and one native speaker of Sinhalese participated this study. The participants consisted of 40 males and 21 females. Their TOEFL iBT scores ranged from 71 to 88, and their years of learning English varied from 2 years to 15 years. The length of time living in an English speaking country for the participants ranged from two months to three years.

3.3. Teaching Context

With a focus on preparing students for general course writing assignments, this academic composition course incorporated assignments representing a range of discourse structures important in academic contexts. The assignments consisted of four paragraph writing assignments, including the composition of a process paragraph, descriptive paragraph, reason paragraph, and effect paragraph, one compare-and-contrast presentation, and an opinion essay. In this course, each writing assignment required three drafts, and students received formative feedback from both their instructors and an Automated Writing Evaluation system between
drafts. Generally, the instructor’s feedback focused more on content and organization in the first round of feedback provision, and then shifted to a concentration on language issues in the second round.

Improvement of English grammar, mechanics and vocabulary knowledge was a curricular component secondary to the instruction of writing in different discourse structures, because writing samples of these students were identified as containing grammatical mistakes which impeded readers’ comprehension, such as simple sentence structures that heavily relied on basic coordinate conjunctions (e.g., and, but, or) and subordinate conjunctions (e.g., because, if, when). Also, their writing samples were identified as demonstrating limited use of vocabulary, repetition of expressions, and problematic word usage.

However, the already intensive curriculum plus the multidisciplinary make-up of students left little space for explicit and planned attention to grammar and vocabulary. In this teaching and learning environment, the explicit instruction provided by PAT GRAM has the potential of facilitating self-learning by providing students access to knowledge of verb patterns. Meanwhile, the need for knowledge of both grammar and lexis for students registered in this class matched the core of pattern grammar, namely, the association between grammar and lexis. Therefore, this type of classroom context was appropriate for this dissertation project, which investigated the quality of PAT GRAM for providing information on grammar patterns of verbs covered in *Collins COBUILD Grammar Patterns 1: Verbs*.

Both English writing teachers of the participants were graduate students in the English department of the Midwestern university where the data was collected. Teacher A, the principle investigator, was a fifth year Ph.D. student and her native language was Chinese. She had the experience of teaching ESL courses for five years. Teacher A, a native speaker of English, was a
second year masters student and she had taught ESL courses for two years and had volunteered as a conversation partner, ESL tutor and ESL teacher for one year. Both teachers followed the textbook and syllabus of the target course, which specified the same teaching content, assignments, and schedule for all sections of the course.

3.4. Materials

This section delineates both pedagogical materials used for the treatment and data collection materials used for collecting quantitative and qualitative data. Pedagogical materials included (1) materials that provided information on grammar patterns to the treatment group participants (i.e., the tool, verbs selected for instruction, and information highlighted for drawing students’ attention) and (2) materials that guided the contrast group to review grammar and vocabulary covered in their curriculum (i.e., exercises for the control group). The pedagogical materials for the contrast group were designed to exclude verb patterns covered in the intervention to the treatment group. In addition to pedagogical materials, data collection materials are described. Quantitative data was collected through pretest, posttest, sentence construction sheet, and Likert-scale questionnaire. Qualitative data, on the other hand, was collected with the help of the instruction sheet for retrospective verbal protocols and questions designed for semi-structured interviews.

3.4.1. Pedagogical materials

The pedagogical materials utilized in this dissertation project consisted of (1) the PAT GRAM tool, (2) verbs selected for instruction, (3) information highlighted for drawing students’ attention, and (4) exercises for the contrast group. The first three materials served jointly for presenting knowledge of grammar patterns to the treatment group. Exercises for the contrast
group rather reviewed grammar rules and vocabulary covered in the curriculum from the current English composition course.

3.4.1.1. The PAT GRAM tool

This section provides an introduction to the PAT GRAM tool, including its functions and development process. In terms of functions, PAT GRAM was designed to satisfy students’ need for convenient access to knowledge of grammar patterns and teachers’ need to guide students’ attention by highlighting information and adding verbs. Development of PAT GRAM relied on the book *Collins COBUILD Grammar Patterns 1: Verbs* and computer technology.

Functions of PAT GRAM

PAT GRAM is able to provide students information on patterns related to a verb on demand and can serve as a reference tool for students’ self-learning with and without learning goals set by a classroom teacher. Students can make a choice between two alternatives by clicking on *Practice in Class* or *Practice on Your own* at the bottom of the home page (shown in Figure 2).

The *Practice in Class* choice enables PAT GRAM to serve as a reference tool to supplement normal classroom teaching. This is realized by allowing teachers to create classes in PAT GRAM and provide students a certain list of verbs for self-learning. This function is useful given the common scenarios in language classes in which a teacher may ask students to learn about words covered in the syllabus or encountered in various learning materials. The teacher may also want to enhance students’ vocabulary retention and recall or ability in productive use of the target words by requiring students to construct sentences with the target verbs. A writing teacher may even encourage students to use certain words in their writing assignments. These activities could all be facilitated by PAT GRAM.
As shown in Figure 2, the teacher can create an account using the register and log in button at the top right side of the screen and create a class or classes under his/her account. For each class created, the system will randomly generate a four-digit code to identify the class. If the teacher informs his/her students of the code, the students will be able to view the verbs added by the teacher and study these verbs. On the teacher’s private page, he/she can type in a verb in the text box at the top, then click “Add,” and the target verb will be added to the class shown in the bottom text-box and become visible to the students registered in the class. As shown in Figure 3, the teacher added three verbs (believe, encourage & transform) to his/her class.

This tool displays patterns together with meaning groups (as shown in Figure 4, the pattern “V n into n” is presented together with The ‘CHANGE’ GROUP) for two reasons. First, a verb used in a certain pattern could be categorized in different meaning groups (e.g., The
Figure 3 Teachers’ page for adding verbs.

Pattern “imply that” is associated with both the ‘SAY’ group and the ‘SHOW’ group; displaying patterns and meaning groups together could distinguish between the same patterns with different meanings. Second, displaying patterns together with meaning groups could draw students’ attention to meaning and form simultaneously. In the following discussion, patterns displayed together with meaning groups are termed as pattern-meaning group combinations. It is also worth noticing that some patterns may not be associated with certain meaning groups (see the pattern “V n from n into n” of the verb “transform” in Figure 4). Since some verbs can be used in a considerable number of pattern-meaning group combinations and each pattern-meaning group combination may include a long list of example verbs, teachers can choose to highlight certain pattern-meaning group combinations and certain example verbs as learning priorities for students. This could be accomplished by clicking on a target verb that has been added to the list, and then clicking on the Edit button (shown in Figure 3). For instance, the teacher may choose to highlight some pattern-meaning group combinations and example verbs associated with the verb transform. After clicking on the verb transform and the Edit button, the teacher can see information concerning the patterns of the verb transform in a pop-up window (shown in Figure 4). The teacher would click on the pattern “V n into n” and the ‘CHANGE’ group
combination and then example verbs (e.g., convert, merge, render, and transform) to highlight them.

![transform](image)

**Figure 4** A pop-up window for teachers to highlight patterns, meaning groups, and example verbs.
Students who are registered in this teacher’s class and choose to Practice in Class are able to view the vocabulary list the teacher has posted at the top of their page (see Figure 5). For instance, the student may be required to construct sentences with the verb transform or use transform in his/her writing assignments. Following the requirement, the student may type a sentence, such as “These people want us to believe that joining the EU will transform us to some grey, faceless mass or Europeans.” Since only verbs that the teacher added to the class are highlighted, when the student writes a sentence in the text-box, only believe and transform (as shown in Figure 5) are highlighted, because among possible verbs in this sentence, only these two verbs have been added to the class by the teacher.

![Figure 5](image)

*Figure 5* Students’ page when practicing in class with a sentence containing two words in the list.

After the student clicks on the verb transform, he/she is able to view the pattern-meaning group combinations and example verbs associated with transform, as highlighted by the teacher, in a pop-up window. (Figure 6 is a screenshot of a pop-up window). The students could also access the same information by clicking on individual verbs listed at the top of their page. In this case, the pattern “V n into n” and THE ‘CHANGE’ GROUP combination and example verbs (convert, merge, render, and transform) are highlighted to draw special attention from students.
The example sentences demonstrate how some of the example verbs, including change, screw, render, and form, in the pattern “V n into n” are used in real sentences. Not every example verb is shown being used in an example sentence for two reasons. (For example, no example sentence is using the verb transform in the pattern “V n into n.”) First, the database that this tool is based on does not include example sentences for each verb (see the next section on Database of PAT GRAM for details). Second, given that some pattern-meaning group combinations are associated with a long list of verbs, example sentences for all verbs are not convenient for display. It is also important to notice that verbs that appear in the example verb list but are not used in the pattern “V n into n,” such as work and turn, are also highlighted in the example sentences. In this situation, students’ judgment is needed to confirm which verbs are used in the target pattern in the example sentences.

PAT GRAM could also serve as a reference tool for self-learning without the presence of a teacher, which is accomplished by clicking on the button Practice on your own on the front page (See Figure 2). If students choose to practice on their own, they will access all information concerning a verb without any highlighted portions that indicate learning priorities. In addition, all words in a sentence typed by a student and covered in the book Collins COBUILD Grammar Patterns 1: Verbs will be highlighted, indicating that students can click on these words to learn about patterns of these words when used as verbs.
Figure 6 A pop-up window showing students the highlighted pattern, meaning group, and example verbs.
As shown in Figure 7, all possible verbs in the sentence “These people want us to believe that joining the EU will transform us to some grey, faceless mass or Europeans” are highlighted. Although in this specific sentence, some words, including *people, will, and mass*, do not function as verbs, they are still highlighted, because they could be verbs in other contexts.

![PRACTICE](image)

*Figure 7 Words in Collins COBUILD Grammar Patterns 1: Verbs and in students’ sentence highlighted for students’ practice on their own.*

**Development of PAT GRAM**

Raw data of PAT GRAM were built by translating information covered in *Collins COBUILD Grammar Patterns 1: Verbs* into machine-readable text. A Perl script was created to (1) match each verb covered in this book with the patterns and meaning groups with which it is associated, and (2) link example verbs belonging to a meaning group and example sentences nested under each meaning group to the target verbs. *Collins COBUILD Grammar Patterns 1: Verbs*, a reference book targeting intermediate and advanced students and teachers of English, does not include all English verbs. PAT GRAM, therefore, has a limited coverage of English verbs.

Raw data was then imported into MySQL, a relational database management system. The user web-based interface and the database were connected through the Apache HTTP server. The overview of PAT GRAM system is presented in Figure 8.
When intending to view patterns of a verb, the student user sends a request to the web server through the browser. Then the web server queries the database to retrieve the information about patterns of the specific verb and presents information in the user interface. Highlighting functions performed by teacher users are also realized through this process involving query and respond. The teacher user sends a request of highlighting to the web server, which in turn returns information with highlighting to the user interface.

3.4.1.2. Verbs selected for instruction

This section presents the thirteen academic verbs and their patterns covered in the treatment for this dissertation project and explains the rationale underlying the selection of these verbs and patterns. The treatment was designed to improve students’ knowledge of grammar patterns of academic verbs. To represent the target language domain, English for academic purposes, the 115 verbs ranking among the top 500 words of the Academic Vocabulary List (AVL) generated by Gardner and Davies (2013) were selected as candidates for instruction. The AVL is appropriate for settings where academic English is the focus of instruction, since it is based on a large corpus containing 120 million words of academic texts from the Corpus of Contemporary American English (COCA) (Gardner & Davies, 2013). In addition, during the process of generating the AVL, multiple strategies were employed to achieve an academic core.
list by excluding general high-frequency words, technical words, and words that occur mainly in one or two disciplines (Gardner & Davies, 2013).

Given the limited time for the treatment, further steps were taken to narrow down the list to 16 verbs. First, verbs not included in Collins COBUILD Grammar Patterns 1: Verbs were removed, since PAT GRAM used for instruction can only provide knowledge of verb patterns covered in this specific volume. Further, the researcher examined the existence of each pattern of 30 verbs (with only two to four patterns each) in the academic sub-corpus of the COCA. This step was necessary given the danger that some patterns of a specific verb may not be used in academic prose. Patterns not located in the academic sub-corpus were removed. Afterwards, verbs with only one pattern in the academic sub-corpus were eliminated in view of one of the important observations of pattern grammar that different meanings for polysemous words are associated with different patterns. As a result, a list of 16 verbs with two or three patterns each was selected for instruction.

Finally, due to item deletion in the process of test validation and revision in the pilot study, three verbs (define, explore, and influence) were excluded from the teaching list (see Appendix C for the verb list for the treatment and relevant pattern-meaning group combinations). The remaining 13 verbs for instruction were then added to the virtual class that was created by the researcher with PAT GRAM for data collection.

3.4.1.3. Information highlighted for the treatment

Given that “CALL materials with carefully highlighted target forms can offer superior language learning potential than those in which learners’ attention is not directed to form” (Chapelle, 2001, p. 70), information requiring students’ special attention needed to be highlighted for the treatment. Besides the 13 target verbs (attempt, associate, consist, construct,
display, ensure, imply, include, interpret, lack, result, transform, yield) that were automatically highlighted after students type sentences with these verbs in the interface, certain pattern-meaning group combinations and example verbs belonging to the same meaning group with the target verbs were highlighted to enhance students’ learning gains.

Based on the results of a pilot study, some items testing students’ receptive and productive knowledge of patterns of academic verbs were deleted to achieve a higher reliability. This caused certain pattern-meaning group combinations not covered in the pretest and posttest. Therefore, these pattern-meaning group combinations were not highlighted for the students, so that they could pay more attention to those being highlighted.

In addition, since scholars interested in the pedagogical use of grammar patterns, such as Hunston and Francis (1998), believe that the example verbs under the same meaning group with the target verbs could help students extend their vocabulary by deducing the meaning of example verbs and learning knowledge of grammar patterns of known and unknown verbs, two verbs nested under highlighted pattern-meaning group combinations were purposefully highlighted to help empirically evaluate the scholars’ assumptions (Sinclair, 1996). For pattern-meaning group combinations not highlighted, no example verbs were highlighted. For pattern-meaning group combinations being highlighted, two example verbs under each of the combinations were highlighted. These two verbs were selected based on the vocabulary lists they belong to in the New General Service List (1000 word level, 2000 word level and 3000 word level), the New Academic Word List, and the Off-list (listed following an order of difficulty). All example verbs under each pattern-meaning group combination were submitted to Lextutor, an online-based vocabulary-learning tool, to locate them in these lists. Two verbs under each pattern-meaning group combination at two extreme levels of difficulty were highlighted. (See Appendix C for
pattern-meaning group combinations highlighted and not highlighted, and example verbs highlighted). Highlighting example verbs through this method could provide students opportunities of encountering verbs that were both known and unknown to them. This design, therefore, made it possible to test whether the explicit instruction offered by PAT GRAM helped students increase their vocabulary size and knowledge of grammar patterns.

3.4.1.4. Exercises for the contrast group

To ensure that the contrast group was exposed to knowledge of grammar patterns only through immersion in the ESL context, the exercises were carefully constructed to ensure that the target grammar patterns for treatment were not included. The exercises for the contrast group focused on vocabulary and grammar rules, including prepositions, subject-verb agreement, coordinating conjunctions, and subordinating conjunctions that participants were supposed to learn in this writing composition course. Appendix K covers all exercises designed for the contrast group. This design allowed the researcher to draw the conclusion that the experience of using PAT GRAM’s explicit instruction rather than teachers’ normal instruction and materials or natural acquisition was responsible for any improvements made by the treatment group participants. Another research design would be to have the contrast group study the grammar patterns included in the treatment through different materials (e.g., paper-based materials, dictionaries, or concordancers). However, this research design would investigate the difference between PAT GRAM and other invented materials, which was not the purpose of the study. The purpose of this study was to investigate whether the addition of explicit instruction through PAT GRAM materials to the writing class could result in more effective learning of the grammar patterns than implicit learning of grammar patterns, not whether PAT GRAM would teach grammar patterns better than other materials that teach grammar patterns.
3.4.2. Data collection materials

Various materials were employed to collect data for this case study. Quantitative data were collected using a pretest and posttest gauging knowledge of grammar patterns, a sentence construction sheet, and a Likert-scale questionnaire, while qualitative data were collected with the facility of a list of interview questions and the instruction sheet for the retrospective verbal protocols.

3.4.2.1. Pretest & posttest

This section provides detailed information on the design of the pretest and posttest, grading methods for test items, and validity evidence for the tests. The twenty test items that were used to assess students’ knowledge of patterns of academic verbs before and after the treatment (see the validated 20 items in Appendix D) were pretested in the pilot study. The 20 items included seven multiple-choice questions, four grammatical judgment items, seven fill-in-the-blank items, and two sentence construction items. The receptive items, including multiple-choice questions and grammatical judgment items, were graded dichotomously with a maximum score of 11 points. The productive items included seven fill-in-the-blank items graded dichotomously with 0s and 1s and two polytomously graded sentence construction items valued at two points each. Each of the sentence construction items required students to make two sentences with different patterns of the target verb. The scoring rationale for the polytomously items is presented in Table 6.

Table 6
Grading Criteria for Polytomous Items

<table>
<thead>
<tr>
<th>Point</th>
<th>Explanations</th>
<th>Example Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A sentence uses a wrong grammar pattern of the target verb (e.g., consist).</td>
<td>Bear in mind that the non-smokers <strong>consist</strong> about 65% of the Polish society.</td>
</tr>
<tr>
<td>Point</td>
<td>Explanations</td>
<td>Example Sentences</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td>0.5</td>
<td>A sentence uses correct pattern, but the meaning of the pattern does not match the semantic context.</td>
<td>Bear in mind that the non-smokers <strong>consist of</strong> about 65% of the Polish society.</td>
</tr>
<tr>
<td>1</td>
<td>The correct pattern of a specific verb is used with the meaning with which it is associated.</td>
<td>Bear in mind that 65% of the Polish society <strong>consists of</strong> non-smokers.</td>
</tr>
</tbody>
</table>

*Note.* The original example sentence is *Bear in mind that the non-smokers consist about of the 65% Polish society.* This sentence was extracted from the international corpus of learner English (ICLE).

One point was awarded to each sentence if the correct pattern of a specific verb was used with the meaning with which it is associated (e.g., *“Bear in mind that 65% of the Polish society consists of non-smokers.”*). When students produced the correct pattern, but the meaning of the pattern did not match the semantic context, half a point was given to reflect their partial knowledge of grammar patterns (e.g., *“Bear in mind that the non-smokers consist of about 65% of the Polish society.”*). A sentence with a wrong grammar pattern of the target verb received no points (e.g., *“Bear in mind that the non-smokers consist about 65% of the Polish society.”*).

To reduce the possibility of a learning effect on the pretest, two sets of items for the pretest and posttest were created by adding 20 extra items not for evaluation (10 items for each set) to the core test items (see Appendix D and E for the pretest and posttest) and rearranging all items differently for each set (Chan & Liou, 2005; Webb, 2005; Webb & Kagimoto, 2009). In addition, strategies used in previous literature, such as allowing at least three weeks between the pretest and the posttest and not informing students of the upcoming posttest, were used to minimize the test-retest effect (Chan & Liou, 2005; Sonbul & Schmitt, 2009). For both the pretest and posttest, only the test items that were validated in the pilot study were graded. Two raters were employed to rate the polytomous items of the pretest and the posttest. The rater
reliability for the pretest was Kappa = .866 (p = .000), while the rater reliability for the posttest was Kappa = .883 (p = .000).

Evidence for the validity of the 20 test items used for both the pretest and posttest was collected in the pilot study. The pilot study concluded that these 20 test items had an index of dependability value of .86 and discrimination values of .25 and above (Ma, 2014). The validity of the intended test score interpretation was also supported by the evidence that the expert group outperformed the non-expert group significantly in the receptive, productive, and total scores. In addition, the validation efforts also found that the students who received higher grades on their in-class major writing assignments scored significantly higher than those who received lower grades on their major writing assignments. The results of the pilot study suggested that these core test items were qualified as a measure of students’ improvement between the pretest and posttest with an acceptable level of accuracy. Computed based on current participants’ responses, the Cronbach’s $\alpha$ reliability of the pretest and posttest were .529 and .683, respectively.

3.4.2.2. Sentence construction sheet

The sentence construction sheet provided students clear instructions on the procedure of the treatment, and it required students to construct two or three sentences for each verb covered in the treatment teaching process. The number of sentences for each verb was determined by the number of patterns of the verb covered in the treatment/test. According to the instructions, every sentence constructed should use a different pattern of the target verb (see Appendix G for the sentence construction sheet). The same polytomous grading method was used for grading sentence construction items in the pretest and posttest (see 3.4.2.1. Pretest & Posttest). Since the sentence construction sheet required students to create 27 sentences in total, the maximum score a student could receive was 27 points. When the student created a sentence using the target verb
as a noun, the sentence was judged as incorrect (e.g. Her decision seems to show a lack of political judgment.).

In addition, each student’s revision was coded as “successful addition,” “successful correction,” “partially successful addition and repetition,” “partially successful addition and wrong meaning,” “partially successful correction and repetition,” “partially successful correction and wrong meaning,” “partially successful correction and repetition and wrong meaning,” “unnecessary change,” “unnecessary change and repetition,” “unsuccessful addition,” and “unsuccessful change.” The definition and examples of each revision type are shown in Table 7.

Table 7
Definitions and Examples of Each Revision Type

<table>
<thead>
<tr>
<th>Revision types</th>
<th>Definitions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful addition</td>
<td>The student constructed a new sentence (e.g., S2) using a pattern different from the other sentence (e.g., S1), and the new sentence (e.g., S2) was accurate.</td>
<td>S1: They construct a good building.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: Mother explained how to construct a table from wood.</td>
</tr>
<tr>
<td>Successful correction</td>
<td>The student successfully corrected a sentence (e.g., S2), and the corrected sentence used a pattern different from the other sentence (e.g., S1).</td>
<td>S1: His words implied further meaning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: He implied <strong>weirdly</strong>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: <strong>It was implied that</strong> student should have known the basic of the courses.</td>
</tr>
<tr>
<td>Partially successful addition and repetition</td>
<td>The student successfully added one sentence (e.g., S1). However, the added sentence used the same pattern as the other sentence (e.g., S2).</td>
<td>S1: NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: I tell you, people will lack the means to live.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S1: She <strong>lacks</strong> the political judgment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: I tell you, people will lack the means to live.</td>
</tr>
<tr>
<td>Revision types</td>
<td>Definitions</td>
<td>Examples</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Partially successful addition and wrong meaning</td>
<td>The student successfully added a sentence (e.g., S1) using correct form of a pattern. However, this new sentence did not use the pattern in its correct meaning.</td>
<td>S1: NA</td>
</tr>
<tr>
<td></td>
<td>S2: People need more creative ideas to construct a new society.</td>
<td>S1: He had been constructing out of design on that sheet.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: People need more creative ideas to construct a new society.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially successful correction and repetition</td>
<td>The student made changes to a sentence (e.g., S2) using correct form of a pattern. However, this new sentence used the pattern same as the pattern used in the other sentence (e.g., S1).</td>
<td>S1: He lacks this kind of knowledge, so he does not know how to deal with it.</td>
</tr>
<tr>
<td></td>
<td>S2: The lack of imagination lets him failed this competition.</td>
<td>S2: The earthquake was a huge event in that place, food and clothes were largely lacking.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially successful correction and wrong meaning</td>
<td>The student made changes to a sentence (e.g., S2) using correct form of a pattern. However, this new sentence did not use the pattern in its correct meaning.</td>
<td>S1: NA</td>
</tr>
<tr>
<td></td>
<td>S2: Wheat yields doubled last year.</td>
<td>S1: NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: Wheat yield to me.</td>
</tr>
<tr>
<td>Partially successful correction and repetition and wrong meaning</td>
<td>The student attempted to correct a wrong sentence (e.g., S2). However, this new sentence used the same pattern with the other sentence (e.g., S1) but did not use the pattern in its correct meaning.</td>
<td>S1: Don't influence me to your decision.</td>
</tr>
<tr>
<td></td>
<td>S2: His influence is on the ebb.</td>
<td>S2: Don’t influence him to the work.</td>
</tr>
</tbody>
</table>

Table 7 Continued
Table 7 Continued

<table>
<thead>
<tr>
<th>Revision types</th>
<th>Definitions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1st draft</td>
</tr>
<tr>
<td>Unnecessary change</td>
<td>The student made changes to one correct sentence (e.g., S2), and the changed sentence was correct.</td>
<td>S1: They lacked of water in the desert.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: They lack love without parents.</td>
</tr>
<tr>
<td>Unnecessary change and repetition</td>
<td>The student corrected one correct sentence (e.g., S2), and the changed sentence was correct, but used the same pattern with another sentence (e.g., S1).</td>
<td>S1: He attempted to solve the questions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: He attempted this exam for the first time.</td>
</tr>
<tr>
<td>Unsuccessful addition</td>
<td>The student added a sentence (e.g., S2). However, the added sentence used a wrong pattern.</td>
<td>S1: She checks the gas cylinder to ensure that it is closed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: NA</td>
</tr>
<tr>
<td>Unsuccessful Change</td>
<td>The student attempted to change a sentence (e.g., S2). However, the changed version still used a wrong pattern.</td>
<td>S1: I like to associate with all sorts of people.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2: I can send my associate to kill you.</td>
</tr>
</tbody>
</table>

*Note.* S1 refers to the first sentence the student made for a given verb. S2 refers to the second sentence the student made for a given verb.

3.4.2.3. The Likert-scale questionnaire

The six-point Likert-scale questionnaire with 28 questions in total intended to elicit treatment group students’ perceptions of and attitudes towards the treatment. All questions were grouped into different categories based on the evaluation criteria. Each was intended to provide
evidence for language learning potential, learner fit, meaning focus, and impact (see Appendix H for the Likert-scale questionnaire). Nine questions on language learning potential targeted two themes: students’ perception of learning gains (Cronbach’s \( \alpha \) reliability = .85) and students’ attention to patterns (Cronbach's \( \alpha \) reliability = .878). Learner fit included four questions exploring whether the level of difficulty of this treatment fitted the level of the participants in terms of ease of understanding information provided by PAT GRAM and producing/revising sentences with the help of PAT GRAM (Cronbach's \( \alpha \) reliability = .873). Whether the treatment successfully directed participants’ attention to meaning making was assessed through four questions on effects of meaning-based instruction and engagement with meaning (Cronbach's \( \alpha \) reliability = .875). The 10 questions assessing the impact of the treatment targeted four different sub-themes, including awareness raising, confidence building, risk taking, and motivation stimulating (Cronbach's \( \alpha \) reliability = .938).

3.4.2.4. Materials for collecting introspective data

The materials used for collecting introspective data included the instruction sheet for retrospective think-aloud protocols and interview questions for the semi-structured interviews. The instruction sheet for the process of retrospective think-aloud protocol (see Appendix I for the instructions adapted from Cotos, 2010) was created to help students understand clearly the procedure for accomplishing the protocols. The instructions required the researcher to demonstrate the process for each participant and allowed students to pause and play the video showing their own interaction with PAT GRAM throughout the retrospective think-aloud process. In addition, the instructions permitted the researcher to ask students questions to help students clarify the meaning they intended to express.
To obtain evidence about the evaluation criteria, including language learning potential, meaning focus, learner fit, and positive impact, the list of interview questions (see Appendix I) targeting each category of the evaluation criteria served as a guide for the semi-structured interviews. Other questions were also posed to obtain more information on individual interviewees’ attitudes towards learning verb patterns using PAT GRAM. Two coders were employed to code the introspective data. One of the coders was the principle investigator, who was a fifth year Ph.D. student in the English department of the Midwestern University where the data was collected. The other coder was a third year Ph.D. student working in the same department with the principle investigator. Both coders were native speakers of Chinese majoring in applied linguistics.

The introspective data was first separated into different sections, including attention to patterns, perceptions of learning, learner fit, meaning focus, and impact according to the research questions. Each of these sections was then coded separately, as discussed in the subsequent sections.

3.4.2.4.1. Attention to patterns

Each idea unit that was categorized under “attention to patterns” was coded by the principle investigator and another coder as either positive or negative indicating whether participants reported paying attention to the form of patterns. The reliability of the two sets of ratings on the 12 responses was 98.6% agreement. Also, the principle investigator developed initial codes by (1) applying conditions that may influence allocation of attention during L2 tasks summarized in Chapelle (2001) to positive idea units and (2) using key words from the transcripts indicating the reasons for not paying attention to patterns. Another coder then used the initial codes to code the data produced by three participants randomly selected. The second
coder found that the codes covered all idea units under attention to patterns and accurately reflected the content. The codes were categorized into two groups: reasons for positive evidence of attention to patterns (i.e., modified output & support) and reasons for negative evidence of attention to patterns (i.e., unfamiliar signs, patterns not highlighted, attention to meaning, & unidentified reasons). Explanations and examples of the codes are provided as follows:

**Modified output.** Modified output, identified as one of the conditions that may influence allocation of attention during L2 tasks, was defined as “Learners’ correction of their own errors-with self-correction or correction prompted by something else” (Chapelle, 2001, P. 49). During this sentence revision activity using PAT GRAM, participants attempted to locate the errors in their self-produced sentences and produce correct patterns through consulting PAT GRAM.

The pattern is “attempted to do something.” Since I had “attempted to buy something,” I think my sentence was correct. (Student 1, retrospective verbal protocol)

I paid a lot of attention to the patterns when trying to find out my errors. For example, this one [influence], I just matched the structure [in the front page] with my sentence and tried to figure out my errors. I found there was something missing. “To” was missing. I just added that. (Student 3, retrospective verbal protocol)

**Support.** Support was another condition that prompted attention to patterns in this specific case. It refers to “cues or information available to the learner to help in constructing meaning during task completion” (Chapelle, 2001, p. 49). In this study, information provided in PAT GRAM, especially highlighted information, functioned as support.

From reading the example sentences, I learned the pattern of “associate,” “associate with something.” (Student 5, retrospective verbal protocol)

The highlighted verbs in both the example verb list and the example sentences caught my attention. I read them. (Student 9, retrospective verbal protocol)

**Unfamiliar symbols.** Grammar patterns were presented using symbols (e.g., V, n and adj.). Even though most of the symbols also appear in contemporary dictionaries, certain
symbols used exclusive to grammar patterns (e.g., ergative, pron-refl and reciprocal) were not familiar to some participants, thus reduced the chances for attention to patterns.

I read the front page and tried to figure out the patterns for “lack.” It said “ergative,” but I did not understand what was “ergative.” (Student 5, retrospective verbal protocol)

I was looking at the patterns. I was not very familiar with the signals, such as V or n. (Student 7, retrospective verbal protocol)

**Patterns not highlighted.** PAT GRAM provided example sentences exemplifying how verbs categorized under the same meaning group were used in authentic sentences. These verbs, rather than specific patterns, were highlighted. Some participants claimed that this design affected their attention to grammar patterns.

I was reading the example sentences to see how my verb was used in sentences, but suddenly I forgot the pattern, so I had to go back to the front page to see the pattern…I hope the pattern can be highlighted in the sentences directly, so that I don’t have to go back and forth. (Student 5, retrospective verbal protocol)

**Attention to meaning.** Attention to meaning refers to incidences when participants paid attention exclusively to meaning of patterns without focusing on production of correct form.

I noticed now that I used the same pattern for both sentences. I tried to make sentences that fit the meaning, so I forgot to check that. (Student 3, retrospective verbal protocol)

3.4.2.4.2. Perceptions of learning

Idea units categorized under perceptions of learning were first coded as positive perceptions or negative perceptions of PAT GRAM by the principle investigator and another coder. The intercoder reliability of the two sets of ratings on the 12 responses was 97.8% agreement. Afterwards, the introspective data on perceptions of learning were coded following the qualitative content analysis. The principle investigator coded each idea unit by borrowing words from the transcripts. Then, another coder used the codes developed by the principle investigator to code the transcripts of three randomly selected participants’ responses. The
second coder suggested expanding the code “unfamiliarity with related verbs” to “unfamiliarity with related verbs & shared meaning” to better represent idea units nested under this code and add a new code “preference to paper-based learning” to negative perceptions of learning. The principle investigator finalized the codes by adopting the first suggestion only, since students’ preference to paper-based learning was not the current interest and this opinion was only expressed by one participant. In the finalized coding scheme, the codes indicating positive perceptions of learning were patterns, related verbs, and contextual use, referring to three different aspects that participants learned. The code indicating negative perceptions of learning is unfamiliarity with related verbs and shared meaning, referring to the aspect that participants failed to learn or had difficulty of learning. The example comments made by participants for each code are listed below:

**Patterns.** The code “patterns” refers to participants’ comments on learning different patterns of verbs and distinguishing meanings of patterns.

I learned how to use the verbs in their correct patterns. (Student 2, semi-structured interviews)

I learned the concept of verb pattern, and different patterns of a verb are related to different meanings. (Student 3, semi-structured interviews)

**Related verbs.** The code “related verbs” included comments on learning of verbs categorized under the same meaning group. Generally, participants learned that these related verbs share the same pattern and similar meaning.

I learned some verbs that have similar meanings can also be used in the same pattern. These are really useful for me. (Student 6, semi-structured interviews)

I learned verbs with the similar meaning and similar patterns. (Student 9, semi-structured interviews)
**Contextual use.** Participants mentioned that they not only learned receptive knowledge of patterns (coded as “patterns” and “related verbs”), but also transferred receptive knowledge to productive knowledge of using patterns in sentences.

The example sentences helped understand the correct and appropriate use of the patterns. (Student 5, semi-structured interviews)

I like the pattern V n, I examined the object and subject of the example sentences, so I learned where to put the words. The sentences showed me more clearly how the pattern was used in sentences. (Student 7, semi-structured interviews)

**Unfamiliarity of related verbs & shared meaning.** Not understanding the relationship between verbs nested under the same meaning group (i.e., These verbs share the same pattern and similar meaning.) caused confusion and impeded learning patterns.

I learned about the patterns, but I did not understand what the example verbs and the meaning were for. (Student 8, semi-structured interviews)

I read some of the example sentences, but I did not understand why the example sentences were here but my verb was example sentences. I tried to read the example sentences, but after I realized my verb was not here, I ignored them. (Student 8, semi-structured interviews)

3.4.2.4.3. Learner fit

Introspective data on learner fit was first coded by labeling idea units as either positive or negative evidence of learner fit and then coded through qualitative content analysis. Idea units were coded as positive evidence of learner fit when they indicated that PAT GRAM fit participants’ language proficiency level and facilitated participants’ learning in the sentence revision task. Otherwise, the idea units were coded as negative evidence of learner fit. The intercoder reliability for labeling positive or negative idea units of the two coders’ ratings on the 12 responses was 97% agreement. Following the approach of qualitative content analysis, the principle investigator first developed the codes through using words from the transcripts and then
grouped similar codes together to form different themes. The themes with underlying codes listed in parenthesis were: general impressions (ease of use & usefulness), facilitate sentence revision & construction (facilitate judgment of correctness, facilitate identification of unused patterns, and facilitate production), and facilitate vocabulary acquisition. Afterwards, the second coder used the codes to code transcripts produced by three randomly selected participants. The principle investigator did not further revise the codes, because the second coder found the codes adequately represented all item units under learner fit. The following are definitions and example comments for each underlying code:

**Ease of use.** Participants commented on the ease of using PAT GRAM and understanding information provided in PAT GRAM. Both positive comments and negative comments are included.

I did not encounter any significant difficulties when using PAT GRAM. It seems fine. I found it easy to understand and use. (positive, Student 9, semi-structured interview)

When the meaning group was provided, I could understand the difference between patterns. (positive, Student 8, retrospective verbal protocol)

I don’t think “pass” means “exist” or “happen”. I cannot relate past to “exist” or “happens”. (negative, Student 6, retrospective verbal protocol)

**Usefulness.** Another general impression of using PAT GRAM was usefulness of features presented in PAT GRAM. Participants expressed both positive and negative viewpoints.

The structures of the patterns are useful. I think it’s the example verbs like highlighted verbs that gave us an idea of the structure, like what kind of verbs kinda have similar use. (positive, Student 1, semi-structured interview)

Those highlighted verb are really helpful. Otherwise, I have to concentrate on all the highlighted verbs. (positive, Student 2, semi-structured interview)
Facilitate judgment of correctness. The code “facilitate judgment of correctness” refers to comments indicating that PAT GRAM helped participants judge whether their pattern use was correct or incorrect. No negative comment was identified in the introspective data.

It is easy to identify which patterns I used incorrectly. I compared my sentences to example sentences in PAT GRAM. (positive, Student 6, semi-structured interview)

After I clicked on the verb “associate,” I saw two patterns V with n and V n with n. I realized that I made an error. (positive, Student 8, retrospective verbal protocol)

Facilitate identification of unused patterns. Participants also commented on whether using PAT GRAM facilitated their identification of patterns they failed to use in their self-produced sentences.

It was easy to identify which I did not use, because it showed really clear here [the front page showing patterns and meaning groups]. (positive, Student 11, semi-structured interview)

It was not easy for me to identify which patterns I did not use in my sentence, because I could not tell the differences between meanings of one verb. (negative, Student 12, semi-structured interview)

Facilitate production. Comments associated with learner fit also discussed whether PAT GRAM was effective in helping participants produce patterns with correct form and meaning. Both positive and negative comments are located in the introspective data.

I learned the pattern “associate with something” from the example sentences, and I tried to compose a sentence using this pattern. (positive, Student 5, retrospective verbal protocol)

It was easy for me to revise sentences using PAT GRAM. I revised some sentences largely based on information on the front page [showing patterns and meaning groups]. (positive, Student 8, semi-structured interview)

Sometimes I know the patterns and the meaning, but I don’t know how to fit patterns in sentences. (negative, Student 1, semi-structured interview)
Facilitate vocabulary acquisition. Besides general impressions of effectiveness in facilitating sentence revision, comments concerning the quality of learner fit also revolved around to what extent PAT GRAM use facilitated participants’ vocabulary acquisition. Only positive comments were found.

I read the highlighted verbs. I learned that they had similar meaning with “include” and shared the same pattern. (positive, Student 6, retrospective verbal protocol)

3.4.2.4.4. Meaning focus

Introspective data on meaning focus was coded by adopting the method of qualitative content analysis. In addition, each idea unit that was categorized under sources for meaning input was coded as positive or negative evidence indicating whether participants reported success in deducing meaning from each source of meaning input. The intercoder reliability of the two coders’ ratings on the 12 responses was 97.6% agreement.

Following the qualitative content analysis, the principle investigator first coded each idea unit related to meaning focus using key words from the transcripts of semi-structured interviews and retrospective verbal protocols. Afterwards, another coder used the codes developed by the principle investigator to code interview and verbal protocol data produced by three randomly selected participants. The second coder found the initial codes efficiently represented idea units under meaning focus and provided suggestions on regrouping of the initial codes. In the second-level coding, a hierarchy of codes was formed by grouping similar codes together. Instead of grouping the codes into two themes, meaning input (includes sources for meaning input and strategies used to obtain meaning) and meaning making (only includes strategies used to construct sentences), both coders preferred to group the codes into the two themes, sources for meaning input and strategies of meaning making. The principle investigator then checked and confirmed that these two themes applied to all the codes developed from initial coding. The
theme, sources for meaning input, included: meaning group, meaning, example verbs, and example sentences, and referred to sources participants relied on when obtaining the meaning of patterns. The other theme, strategies for meaning making, comprised four codes——compare meanings of patterns, compare example sentences to self-produced sentences, substitute interchangeable verbs, imitate example sentences—and referred to four different strategies participants employed to construct meaning. The following are examples of each of the codes for the meaning focus quality.

**Meaning group.** Based on findings from application of the data-driven approach, researchers in pattern grammar categorized verbs sharing the same pattern into different groups. Verbs in the same group share similar meaning. Each group was named by selecting one or two verbs that may represent the basic meaning of the whole group. The code “meaning group” refers to situations in which participants deduced the meaning of patterns by reading names of meaning groups.

First, I read the verb pattern “V n to n” and then the “show” group. I checked the meaning I know before from there. (positive, Student 1, retrospective verbal protocol)

Associate here belongs to the “associate” group. I don’t know the meaning of associate, so it does not help me. (negative, Student 9, retrospective verbal protocol)

**Meaning.** Besides meaning groups that denoted the meaning of verbs categorized into the same group, PAT GRAM also displayed a meaning section providing more detailed explanations for meaning. Participants also reported utilizing the meaning section to deduce meaning of patterns.

When I read the example sentence, I find that the meaning of the words in the example sentences is not similar to what I thought. So I read the meaning part to clarify. (positive, Student 11, retrospective verbal protocol)

I did not read the meaning section. The explanation was too long (negative, Student 3, retrospective verbal protocol)
**Example verbs.** In pattern grammar, verbs sharing the same pattern were categorized into different groups. Verbs in the same meaning group tend to have similar meanings. Participants reported associating meaning and patterns by reading verbs categorized into the same meaning group.

I read the highlighted verbs. I learned “endeavor” and “attempt” have the same meaning with “try.” (positive, Student 4, retrospective verbal protocol)

This time no, because I did not know that “abandon” has similar meanings with “attempt.” (negative, Student 11, retrospective verbal protocol)

**Example sentences.** For each pattern, PAT GRAM provided example sentences containing patterns of verbs categorized under the same meaning group. Reading these example sentences helped participants establish the association between patterns and meaning.

I went through all the example sentences so that I can make sentences with correct pattern and meaning. (positive, Student 1, retrospective verbal protocol)

I read the example sentences. I was trying to find “interpret” first in the example sentences, but it’s not there. So I’m confused.” (negative, Student 3, retrospective verbal protocol)

The other theme, strategies for meaning making, consisted of four codes: compare meanings of patterns, compare example sentences to self-produced sentences, substitute interchangeable verbs, and imitate example sentences. These codes refer to four different strategies participants employed to construct meaning. The following comments made by participants exemplify each strategy they reported:

**Compare meanings of patterns.** According to pattern grammar, generally patterns of the same verb distinguish from each other in terms of meaning. The strategy of comparing meanings of patterns described participants’ efforts of distinguishing patterns of a certain verb.
I also don’t know what’s the difference between *consist of* and *consist in* so I read the meaning. I tried to figure out the difference between these two patterns. (Student 3, retrospective verbal protocol)

I am looking at another pattern “V n out of n,” I was reading the example sentences to compare the meaning of the two patterns. (Student 6, retrospective verbal protocol)

**Compare example sentences to self-produced sentences.** To ensure that participants used verb patterns correctly in sentences, they compared example sentences with their self-produced sentences.

I was comparing the pattern in the example sentences to my sentence to make sure I have the correct meaning. (Student 5, retrospective verbal protocol)

I compare example sentences with my sentences. I examined whether my sentences were correct or not. (Student 1, semi-structured interview)

**Substitute interchangeable verbs.** The knowledge that verbs in the same meaning group share similar meaning and same pattern enabled participants to substitute verbs covered in example sentences with verbs that they needed to construct sentences (the target verbs). By plugging the target verbs in example sentences, participants learned how to construct sentences using the target verbs.

If the target verb is not in the example sentences, I substitute my word with the underlined verb in the example sentences to understand how to use it. (Student 9, semi-structured interview)

I first looked for the target verb in the example sentences. It was not there. I tried to replace “include” with the highlighted verbs in the sentences and tried to make sense of it. (Student 5, retrospective verbal protocol)

**Imitate example sentences.** When example sentences covered the target verb patterns with which participants were required to construct sentences, they tended to imitate the example sentences.

I learned the meaning of “associate,” but it was difficult to make sentence, so I relied on example sentences to get ideas. (Student 8, retrospective verbal protocol)
I copied the example sentence with “lack,” and then I typed a new sentence with “lack,” kind of similar to the example sentences. (Student 10, retrospective verbal protocol)

3.4.2.4.5. Impact

The introspective data on impact was first coded by labeling each idea unit as either positive or negative impact by both coders. The intercoder reliability of the two coders’ ratings on the 12 responses was 96.4% agreement. Then, the introspective data was coded through qualitative content analysis. In the first phase of the qualitative content analysis, the principle investigator developed the initial codes by borrowing words from the transcripts. In the second phase, the principle investigator grouped similar codes together to form different themes. The other coder coded transcripts of the semi-structured interviews of three participants randomly selected using the initial codes. Based on the second coder’s suggestion, the principle investigator added two codes, “improved language accuracy” and “increased variety of expressions.” The themes and codes finalized were: awareness raising (awareness of patterns and awareness of importance of patterns), autonomy facilitating (comparison to other methods and anticipation of future use), confidence building (confidence in language accuracy and confidence in communication in English), and motivation stimulating (improved language accuracy and increased variety of expressions). The following are example comments of each code:

**Awareness of patterns.** For most participants, this study provided them the first experience of learning patterns through the pattern approach to grammar. According their utterances, PAT GRAM use raised their awareness of grammar patterns.

I never used them [patterns], and also I did not know what are patterns. I learned them from PAT GRAM. I got a lot of things about patterns from PAT GRAM.” (Student 2, semi-structured interview)
I learned that many verbs have the same meaning from using PAT GRAM, so I don’t have to use the same verb [pattern] again and again for the same meaning. I can use different verb [patterns] with the similar meaning.” (Student 5, semi-structured interview)

**Awareness of importance of patterns.** Besides an awareness of basic knowledge of patterns, participants also pointed out that they became aware of the importance of patterns in language production.

I think patterns are important to me.” (Student 3, semi-structured interview)

A single word can be used in different ways it is important to know how to use them. If you don’t use the correct patterns, people misunderstand you. (Student 10, semi-structured interview)

**Comparison with other methods.** Participants judged the explicit instruction offered by PAT GRAM as effective in facilitating their learning autonomy by comparing PAT GRAM use with other methods they used to learn patterns.

It is more time efficient and allows me to figure out the patterns in a more efficient way. Before I have to memorize. If I forgot, it was big problem (Student 3, semi-structured interview).

In the previous learning, if I do not know the patterns I will try to surf the internet to check. However, when I use PAT GRAM, I think it is easier for me to check, because patterns is presented more clear than in PAT GRAM than other online resources. (Student 4, semi-structured interview)

**Anticipation of future use.** The capacity of facilitating autonomy by interaction with PAT GRAM was also reflected in participants’ comments anticipating their future use of PAT GRAM.

I will use PAT GRAM for writing. When reading, you don’t have to remember the patterns to understand, but for writing, I always feel I don’t know the patterns. (Student 8, semi-structured interview)

Sometimes I was not sure whether I use correct patterns in my speech, so by using PAT GRAM I can check patterns. It (PAT GRAM) is also useful for writing an essay or a paper, so I would like to use it as a reference. (Student 9, semi-structured interview)
Confidence in language accuracy. In terms of confidence building, some participants stated that using PAT GRAM helped them become more confident with the accuracy of their language production.

In our writing sometimes we do not know how to use some verbs or use the patterns, so when we want to revise our work, we can check PAT GRAM. That will make me more confident about my pattern use. (Student 1, semi-structured interview)

When I need to produce sentences, speaking and writing, I would like to double check patterns using PAT GRAM, so that I am confident that I am using patterns correctly. (Student 5, semi-structured interview)

Confidence in communication in English. According to participants, PAT GRAM use not only built their confidence in accuracy of their language production, but also promoted their confidence in English communication.

Using PAT GRAM to learn patterns will make me more confident to speak and write. (Student 12, semi-structured interview)

I think I will be more confident to communicate, if I learn more patterns using PAT GRAM. My language will be more understandable. (Student 7, semi-structured interview)

Improved language accuracy. The code “improved language accuracy” under the theme “motivation stimulating” refers to situations where participants were motivated to use PAT GRAM, since they could achieve improved language accuracy.

I am concerned about verb patterns. I think those patterns helped me to write professionally. (Student 2, semi-structured interview)

It (PAT GRAM) will help me to write in a more professional way. (Student 3, semi-structured interview)

Increased variety of expressions. With referring to motivation stimulating, participants also expressed their willingness to continue to use PAT GRAM, because the explicit instruction
realized through PAT GRAM provided them with alternatives of expressing the same concept. Participants judged a variety of expressions as an important aspect of professional writing.

Using PAT GRAM will help me to write more professionally, since it allows me to use different patterns of verbs in my writing rather than sticking to certain verbs and patterns. (Student 3, semi-structured interview)

Sometimes I want to use words that share the same meaning, PAT GRAM will also be helpful to provide me a variety of verbs that serve the same meaning. (Student 5, semi-structured interview)

3.5. Sampling

The sampling procedure adopted in this study was intended to balance the advantage of including a large number of participants with the need to conduct a more in-depth investigation at this stage of piloting the materials. As a result, different data were obtained from different subgroups of participants, as described below. The four cases were four sections of an academic writing class taught by two teachers, totaling 61 participants, with each teacher teaching two sections. Two sections taught by each of the two teachers were assigned to the treatment group (using PAT GRAM) and contrast group (not using PAT GRAM). The specific composition of participants is shown in Table 8.

Table 8 Composition of Participants

<table>
<thead>
<tr>
<th></th>
<th>Teacher A</th>
<th>Teacher B</th>
<th>N of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment group</td>
<td>X</td>
<td>X</td>
<td>31</td>
</tr>
<tr>
<td>Contrast group</td>
<td>X</td>
<td>X</td>
<td>30</td>
</tr>
</tbody>
</table>

All the 61 participants took the pretest and posttest on knowledge of target grammar patterns. The score improvement by the treatment group was compared to that by the contrast group to demonstrate whether the explicit instruction offered by PAT GRAM was effective in teaching grammar patterns.
The Likert-scale questions were answered by 31 participants from the two cases in the treatment group, since the questions required participants to reflect upon their experience of using PAT GRAM. The introspective data included 12 introspective group participants’ (purposefully selected to represent the 31 treatment group participants) responses to semi-structured interviews and retrospective verbal protocols focusing on their perceptions of PAT GRAM and the learning process using PAT GRAM.

To represent the 31 treatment group participants, these 12 introspective group participants were selected from the two cases in treatment group (six participants from each case where PAT GRAM was used) at each level of performance (high, mid, and low) in terms of demonstrated score improvement in tests of grammar patterns (denoted as “Posttest-pretest” in Table 9) and sentence revisions (denoted as “Improvement in sentence revision” in Table 9).

Table 9
Sampling Design for Selecting the Introspective Group Participants

<table>
<thead>
<tr>
<th>Improvement scores</th>
<th>Improvement in sentence revision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Posttest – pretest</td>
</tr>
<tr>
<td></td>
<td>Teacher A</td>
</tr>
<tr>
<td>High</td>
<td>X</td>
</tr>
<tr>
<td>Mid</td>
<td>X</td>
</tr>
<tr>
<td>Low</td>
<td>X</td>
</tr>
</tbody>
</table>

To select participants for the semi-structured interviews and retrospective verbal protocols, participants’ score improvement in two measures were calculated. The students’ score improvement in tests for grammar patterns after receiving the treatment was calculated by subtracting participants’ pretest scores from their posttest scores. Participants’ score improvement in sentence revision was obtained by subtracting students’ scores in sentence construction before using PAT GRAM from their scores in sentence revision after using PAT GRAM.
3.6. Procedure

In this case study, quantitative data and qualitative data were collected sequentially following three steps: collecting data before the treatment, providing the treatment, and collecting data after the treatment. Prior to the data collection, this study was approved by the Institutional Review Board (IRB) as an exempt study (Appendix A). As shown in Figure 9, before the treatment, the pretest was administered to both groups and the treatment group participants were required to construct sentences using target grammar patterns. Within the treatment, the treatment group revised their sentences by using PAT GRAM. The contrast group, rather, did not use PAT GRAM, and they completed grammar exercises that did not include target grammar patterns. After the treatment, the posttest was administered to both groups and sentences revised by the treatment group participants were collected. Also, the treatment group participants answered the Likert-scale questionnaire. Afterwards, the introspective group participants (N=12) attended the semi-structured interviews and retrospective verbal protocol sessions.

![Figure 9 Procedure of the present study (The shaded area indicates collecting data from both the treatment group and the contrast group).]
A more detailed description of each phase of data collection is provided in the subsequent sections.

3.6.1. Collecting data before the treatment

All participants in the treatment group (N = 31) and the contrast group (N = 30) were asked to fill out the demographic survey and take the pretest on their depth of vocabulary knowledge in terms of patterns of academic verbs selected for instruction. This computer-based test was administered using Qualtrics, an internet-based data collection software, and lasted about 20 minutes. Each page of this test was timed, and students were automatically moved to the next page when the amount of designated time had elapsed. Participants were not allowed to search online resources during the test and the timed procedure was intended to help prevent students from searching online resources.

3.6.2. Providing the treatment

The treatment happened in two lab classes with a week interval. The first lab class for the treatment happened two weeks after the pretest, and the second lab class for the treatment, three weeks after the pretest. Each lab class lasted 50 minutes, and the treatment was approximately 75 minutes in length. During the treatment, the treatment group participants’ interaction with the computer was recorded using Camtasia, a screen-capturing tool. First, the treatment group students were provided the sentence construction sheet and were required to create sentences with the 13 target verbs following the instruction in the sentence construction sheet. They were asked to compose two-three sentences for each verb, with each sentence using a different pattern of the verb. They typed their sentences in the sentence construction sheet in the format of Word® document. The sentence construction activity lasted about 25 minutes, and the students submitted their work to their course webpage in Moodle, the course management system used for the
course. The students then watched a five-minute tutorial embedded in the front page of PAT GRAM on how to navigate the PAT GRAM site and understand information provided in PAT GRAM. Afterwards, the students spent about 50 minutes revising their sentences with incorrect patterns and create sentences with patterns that they failed to use in the first draft. To access information on patterns, the students clicked each verb shown at the top of their page or pasted their sentences in the interface of PAT GRAM. For students who chose to paste their sentences in the interface of PAT GRAM, the target verbs appearing in their sentences were automatically highlighted. They then clicked on the target verbs in their sentences to access information on patterns. It was intended that the students would be able to produce meaningful sentences with correct patterns with the help of PAT GRAM. Finally, students included the most updated version of their sentences in the sentence construction sheet and submitted the revised version to their course page in Moodle. While the treatment group was participating in the treatment, constructing sentences of target verbs using PAT GRAM, the contrast group was provided with computer-based grammar exercises to help them review content covered in their curriculum, including vocabulary, prepositions, subject-verb agreement, coordinating conjunctions and subordinating conjunctions. Verb patterns presented to the treatment group were excluded from the exercises for the control group.

3.6.3. Collecting data after the treatment

Three weeks after the pretest and immediately after the treatment group finished the treatment, the posttest was administered to all participants. This computer-based test was administered in exactly the same manner as the pretest and lasted about 20 minutes. Afterwards, all students in the treatment group finished a Likert-scale questionnaire gauging their perceptions of the explicit instruction offered by PAT GRAM. The introspective group participants then
participated in both semi-structured interviews and retrospective verbal protocols. Each interview and verbal protocol lasted approximately 30 minutes to complete. The semi-structured interviews were audio taped, while the retrospective verbal protocols were audio and video taped. Camtasia was used to record the computer screen and the verbal protocols, providing the researcher enough contextual information to interpret the participants’ speech.

3.7. Data Analysis

The data analysis included both quantitative and qualitative methods to yield results pertaining to the evaluation criteria, including learning potential, meaning focus, learner fit, and positive impact, for which it intended to provide evidence (shown in Table 10.).

Table 10
*Evaluation Criteria, Related Data & Data Analysis*

<table>
<thead>
<tr>
<th>Evaluation criteria</th>
<th>Evidence</th>
<th>Data</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning potential</td>
<td>Learning gains</td>
<td>Quan: pretest &amp; posttest</td>
<td>Paired-sample t-tests</td>
</tr>
<tr>
<td></td>
<td>Focus on form</td>
<td>Sentence revision</td>
<td>Paired-sample t-test &amp; percentage of revision types</td>
</tr>
<tr>
<td></td>
<td>Pushed output</td>
<td>Likert-scale questionnaire</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td>Modified output</td>
<td>Qual: interviews &amp; retrospective verbal protocol</td>
<td>Manual analysis</td>
</tr>
<tr>
<td>Learner fit</td>
<td>Level of difficulty</td>
<td>Quan: Likert-scale questionnaire</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Qual: semi-structured interviews &amp; retrospective verbal protocols</td>
<td>Manual analysis</td>
</tr>
<tr>
<td>Meaning focus</td>
<td>Effects of meaning-based instruction</td>
<td>Quan: Likert-scale questionnaire</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td>Engagement with meaning</td>
<td>Qual: semi-structured interviews &amp; retrospective verbal protocols</td>
<td>Manual analysis</td>
</tr>
</tbody>
</table>
3.7.1. Language learning potential (RQ1-4)

In this dissertation project, the overarching quality of the CALL task, language learning potential, was evaluated from several different aspects, including acquisition of patterns, accuracy of pattern use, attention to patterns, and perception of learning gains.

3.7.1.1. Acquisition of patterns (RQ1)

Research Question 1: What evidence suggests that the learners have acquired the patterns of target academic verbs when using PAT GRAM?

This question was answered by comparing participants’ pretest scores with their posttest scores through a paired-sample t-test to discern whether there was improvement on knowledge of grammar patterns within groups. The contrast of score improvement between groups (the treatment group & the contrast group) demonstrated whether the treatment group’s score improvement was attributed to the use of PAT GRAM.

3.7.1.2. Accuracy of pattern use (RQ2)

Research Question 2: What evidence suggests that the accuracy of students’ use of patterns of academic verbs has improved through interaction with PAT GRAM?
The data used to answer this research question included participants’ sentence production before using PAT GRAM and after using PAT GRAM. Participants’ successfulness in sentence revision with PAT GRAM was analyzed in two different ways. The first way of analyzing revision was to compare participants’ scores in the first attempt (without using PAT GRAM) and the second attempt (after using PAT GRAM) using a paired-sample t-test. Second, the percentage of each type of revision (see Section 3.4.2.2. for revision types) was calculated.

3.7.1.3. Attention to patterns (RQ3)

Research Question 3: What evidence indicates that PAT GRAM draws students’ attention to the patterns of target academic words?

Quantitative data, 9 Likert-scale questions, and qualitative data collected through retrospective verbal protocols were used to elicit evidence on whether students paid attention to the patterns of target academic words during the treatment. Descriptive statistics of the Likert-scale questions were provided to demonstrate students’ perceptions of whether PAT GRAM drew their attention to patterns of the academic verbs. To analyze the qualitative data on attention to patterns, I first calculated the percentage and number of idea units for each code, and then for each code I provided an in-depth discussion by citing participants’ utterances as examples. See Section 3.4.2.4.1 for the codes and example utterances.

3.7.1.4. Perceptions of learning (RQ4)

Research Question 4: How do students perceive their learning through using PAT GRAM?

To examine participants’ perceptions of learning through PAT GRAM, data included 31 treatment group participants’ answers to 6 Likert-scale questions and 12 introspective group participants’ responses to semi-structured interviews. The Likert-scale questions were analyzed
by presenting descriptive statistics. I analyzed the introspective data by calculating percentage and number of idea units for each code. I also discussed each code by citing participants’ utterances as examples (see Section 3.4.2.4.2. for explanations for each code and example utterances).

### 3.7.2. Learner fit (RQ5)

Research Question 5: What evidence suggests that the explicit instruction offered by PAT GRAM is appropriate for the target group EAP students?

The extent to which this treatment fit the target group participants was investigated through an analysis of quantitative data, four Likert-scale questions, and qualitative data, retrospective verbal protocols, and semi-structured interviews coded as learner fit. Data collected from the Likert-scale questions were presented using descriptive statistics, while the qualitative data were analyzed by calculating the percentage and number of idea units for each code. Then, each code was discussed by citing participants’ utterances as examples. See Section 3.4.2.4.3. for explanations for the codes and example utterances.

### 3.7.3. Meaning focus (RQ6)

Research Question 6: What evidence indicates that PAT GRAM is able to draw students’ attention to meanings of the grammar patterns of target academic verbs?

Both quantitative, collected through Likert-scale questions and qualitative data, collected through retrospective verbal protocols and semi-structured interviews, were used to investigate whether students’ attention was successfully directed toward meaning making. The Likert-scale questions were analyzed using descriptive statistics. The qualitative data were analyzed by calculating percentage and number of idea units for each code. Then, each code was discussed by
presenting participants’ comments as examples. See Section 3.4.2.4.4 for the explanations for the codes and example utterances.

3.7.4. Impact (RQ7)

Research Question 7: What evidence indicates that learning patterns of academic verbs using PAT GRAM provides students with a positive impact?

Impact of this treatment was investigated through examination of quantitative data, 10 Likert-scale questions, and qualitative data, semi-structured interviews. The Likert-scale questions were analyzed using descriptive statistics, while the qualitative data were first analyzed by calculating percentage and number of idea units for each code, and then each code was discussed by citing participants’ comments as examples. See Section 3.4.2.4.5 for the codes and example utterances.

3.8. Chapter Summary

This chapter provided a detailed description of the methodology of this multiple-case study with qualitative and quantitative data embedded. Following illustration of the research design, it presented demographic information on the participants and the teaching context where this study occurred and argued that the participants’ language learning needs corresponded with the goal of this study. Then, the detailed description of both pedagogical materials (PAT GRAM, verbs selected for instruction, information highlighted for the treatment, and exercises for the control group) and data collection materials (pretest, posttest, sentence construction sheet, the Likert-scale questionnaire, instruction sheet for retrospective verbal protocols, and interview questions) was followed by the sampling procedure, which explained the rationale for including certain participants for different data collection methods. The specific procedure of data
collection was then delineated. Finally, data analysis was explained by referring to each individual research questions. The next chapter presents and interprets the data collected.
CHAPTER 4: RESULTS

This chapter presents the results concerning the quality of the explicit instruction offered by PAT GRAM following the four evaluative criteria: language learning potential, learner fit, meaning focus, and impact. The data included 61 (31 treatment group participants and 30 contrast group participants) participants’ pretest and posttest scores, 31 treatment group participants’ sentence production on their first attempt and second attempt in the sentence revision task and their responses to Likert-scale questions, and 12 introspective group participants’ responses to retrospective verbal protocols and semi-structured interviews.

4.1. Language Learning Potential

The discussion of the quality of language learning potential revolved around the extent to which beneficial opportunities for language learning were provided by the sentence revision activity using PAT GRAM. This was approached from four different aspects of language learning potential quality: (1) acquisition of patterns, (2) accuracy of pattern use, (3) attention to patterns, and (4) participants’ perceptions of learning. Evaluation of these aspects relied on various data sources including all participants’ scores in the pretest and posttest, the treatment group participants’ sentence production in their first attempt (before using PAT GRAM) and second attempt (after revising sentences using PAT GRAM) and responses to Likert-scale questions, and 12 introspection participants’ retrospective verbal protocols and semi-structured interviews.

4.1.1. Acquisition of patterns (RQ1)

Both group participants’ scores on the pretest and posttest were analyzed to answer the first research question. Each group participants’ pretest scores were compared to their posttest...
scores to demonstrate whether there was improvement on knowledge of grammar patterns within groups after using PAT GRAM. A paired sample t-test was used to compare the pretest and posttest scores of each case. The results of the t-test and descriptive statistics of the pretest and posttest scores of each case are shown in Table 11. For both pretest and posttest, the possible lowest and highest scores were 0 and 22 respectively.

Table 11  
Descriptive Statistics of Both Groups’ Pretest & Posttest Scores & T-test Results

<table>
<thead>
<tr>
<th>Cases</th>
<th>Tests</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast group</td>
<td>Pre</td>
<td>16</td>
<td>4</td>
<td>12</td>
<td>7.31</td>
<td>2.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher A</td>
<td>Post</td>
<td>16</td>
<td>5</td>
<td>14</td>
<td>7.41</td>
<td>2.36</td>
<td>.193</td>
<td>15</td>
<td>.85</td>
</tr>
<tr>
<td>Teacher B</td>
<td>Pre</td>
<td>14</td>
<td>3</td>
<td>12</td>
<td>6.93</td>
<td>2.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td></td>
<td>14</td>
<td>3</td>
<td>18</td>
<td>8.18</td>
<td>3.65</td>
<td>1.42</td>
<td>13</td>
<td>.18</td>
</tr>
<tr>
<td>Treatment group</td>
<td>Pre</td>
<td>17</td>
<td>3</td>
<td>12</td>
<td>7.21</td>
<td>2.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher A</td>
<td>Post</td>
<td>17</td>
<td>7</td>
<td>17</td>
<td>11.32</td>
<td>3.24</td>
<td>4.27</td>
<td>16</td>
<td>.001</td>
</tr>
<tr>
<td>Teacher B</td>
<td>Pre</td>
<td>14</td>
<td>3</td>
<td>13</td>
<td>8.64</td>
<td>2.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post</td>
<td></td>
<td>14</td>
<td>6</td>
<td>17</td>
<td>11.14</td>
<td>3.29</td>
<td>2.23</td>
<td>13</td>
<td>.04</td>
</tr>
</tbody>
</table>

As shown in Table 11, both treatment groups scored significantly higher in the posttest than in the pretest (class taught by teacher A: p < .05, class taught by teacher B: p < .05). This means that despite the potential differences between two teachers’ instruction, the treatment group participants’ knowledge of grammar patterns improved significantly after using PAT GRAM. However, the posttest scores of the two contrast group cases were not significantly higher than their pretest scores (class taught by teacher A: p = .85, class taught by teacher B: p = .18), indicating that the two contrast group participants’ knowledge of grammar patterns did not improve significantly regardless of different teachers’ instruction. The different outcomes for treatment and contrast groups in terms of their score improvements indicated that the explicit instruction offered by PAT GRAM was effective in promoting participants’ knowledge of
grammar patterns of academic verbs. This conclusion can be safely drawn due to the inclusion of
the contrast group, which were doing grammar exercises irrelevant to grammar patterns covered
in the treatment, while the treatment group was using PAT GRAM. Since the two group
participants can be judged as homogenous in terms of their English language proficiency,
exposure to language instruction (taught by the same two teachers) and natural English language
environment, and possible effects from taking the test twice, the difference between the two
groups’ scores over the pretest and posttests cannot be explained by main effects of these
variables. Therefore, it is reasonable to attribute the difference between the two groups’ score
improvements between the pretest and posttest to the difference between the treatment, the
explicit instruction using PAT GRAM and implicit learning through immersion in English
language.

Another research design would be to have the contrast group study the grammar patterns
included in the treatment through different materials (e.g., paper-based materials, dictionaries, or
concordancers). However, this research design would investigate the difference between PAT
GRAM and other invented materials, which was not the purpose of the study. The purpose of this
study was to investigate the effectiveness of the explicit instruction provided by PAT GRAM.
Exercises irrelevant to the grammar patterns covered in the treatment, therefore, are most
appropriate for the contrast group and function most effectively to serve the purpose of this
current research. In summary, the inclusion of the contrast group and the grammar exercises
designed for the contrast group made the conclusion that the explicit instruction realized through
PAT GRAM was effective in promoting participants’ knowledge of grammar patterns of
academic verbs trustworthy.
4.1.2. Accuracy of pattern use (RQ2)

The treatment group participants’ degree of improvement in accuracy of pattern use in the sentence revision task was demonstrated through the analysis of their written production before and after using PAT GRAM. The analysis was based on two measures: (1) a comparison of 31 treatment group participants scores on their first (before using PAT GRAM) and second attempts (after using PAT GRAM), and (2) calculation of the number of incidences and percentage of each revision type (see the revision types in Section 3.4.2.2.).

Regarding the first measure, the sentence revision task consisted of 27 sentences, polytomously scored on a three-point scale 0, .5, or 1, so the total scores would be 27, but this includes a 54-point scale. A paired sample t-test was conducted to compare the difference between participants’ scores in their first and second attempts. Table 12 presents the descriptive statistics of participants’ scores on both attempts and the t-test results.

<table>
<thead>
<tr>
<th>Attempts</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>T</th>
<th>Df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; attempt</td>
<td>31</td>
<td>4.5</td>
<td>14</td>
<td>9.27</td>
<td>2.57</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; attempt</td>
<td>31</td>
<td>7</td>
<td>23</td>
<td>15.9</td>
<td>5.15</td>
<td>8.04</td>
<td>30</td>
<td>.000</td>
</tr>
</tbody>
</table>

The results suggested that participants’ scores on the second attempt after using PAT GRAM were significantly higher than their scores on the first attempt before using PAT GRAM \[t(30) = 8.04, p < .05\]. In other words, participants’ accuracy of pattern use improved significantly after using PAT GRAM.

The participants’ revision between the first and the second attempts was also analyzed more in-depth by calculating the number of incidences and percentages of all the revision types. The revision types were identified by first coding each incidence of revision and then
categorizing these incidences into different revision types. Definitions and examples of all the revision types made by participants are provided in Section 3.5. Table 13 summarizes all the revision types identified in participants’ written production and provides the number of incidences and percentages of all the revision types.

Table 13

*Incidences and Percentages of Revision Types from the Sentence Revision Task*

<table>
<thead>
<tr>
<th>Revision types</th>
<th>Number of incidences</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful addition</td>
<td>108</td>
<td>40.75%</td>
</tr>
<tr>
<td>Successful correction</td>
<td>98</td>
<td>36.98%</td>
</tr>
<tr>
<td>Partially successful addition &amp; repetition</td>
<td>16</td>
<td>6.04%</td>
</tr>
<tr>
<td>Partially successful addition &amp; wrong meaning</td>
<td>6</td>
<td>2.26%</td>
</tr>
<tr>
<td>Partially successful correction &amp; repetition</td>
<td>11</td>
<td>4.15%</td>
</tr>
<tr>
<td>Partially successful correction &amp; wrong meaning</td>
<td>6</td>
<td>2.26%</td>
</tr>
<tr>
<td>Partially successful correction &amp; repetition &amp; wrong meaning</td>
<td>1</td>
<td>.38%</td>
</tr>
<tr>
<td>Unnecessary change</td>
<td>5</td>
<td>1.89%</td>
</tr>
<tr>
<td>Unnecessary change &amp; repetition</td>
<td>2</td>
<td>.76%</td>
</tr>
<tr>
<td>Unsuccessful change</td>
<td>7</td>
<td>2.64%</td>
</tr>
<tr>
<td>Unsuccessful addition</td>
<td>5</td>
<td>1.89%</td>
</tr>
<tr>
<td>Total</td>
<td>265</td>
<td>100%</td>
</tr>
</tbody>
</table>

As Table 13 illustrates, successful addition (40.75%) and successful correction (36.98%) ranked among the most frequent revision types. The percentages of other partially successful and unsuccessful revision types were noticeably lower than successful revisions. It, therefore, can be deduced that PAT GRAM was sufficient in facilitating successful revision and production of accurate grammar patterns.

4.1.3. Attention to patterns (RQ3)

The question of the extent to which PAT GRAM drew participants’ attention to the patterns of target academic words was addressed by collecting evidence from 31 treatment group
participants’ answers to four Likert-scale questions and 12 introspection participants’ responses to retrospective verbal protocols.

4.1.3.1. Questionnaire data on attention to patterns

Participants’ perceptions of the degree to which different features of PAT GRAM attracted their attention to patterns in the sentence revision activity were collected through four Likert-scale questions: 1) “The highlighted patterns attracted my attention,” 2) “The highlighted verbs attracted my attention,” 3) “The highlighted verbs drew my attention to these verbs together with the pattern they share,” 4) “The example sentences with target verbs highlighted drew my attention to how these verbs are used in sentences.” Table 14 presents summary statistics of participants’ responses to the Likert-scale questions concerning attention to patterns.

Table 14
Participants’ Responses to Questions on Attention to Patterns (n=31)

<table>
<thead>
<tr>
<th>Attention to Form</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The highlighted patterns attracted my attention.</td>
<td>0%</td>
<td>0%</td>
<td>6.5%</td>
<td>6.5%</td>
<td>41.93%</td>
<td>29.03%</td>
<td>5.23</td>
<td>.84</td>
</tr>
<tr>
<td>2. The highlighted verbs attracted my attention.</td>
<td>0%</td>
<td>0%</td>
<td>6.5%</td>
<td>19.3%</td>
<td>32.26%</td>
<td>25.81%</td>
<td>5.06</td>
<td>.93</td>
</tr>
<tr>
<td>3. The highlighted verbs drew my attention to these verbs together with the patterns they share.</td>
<td>0%</td>
<td>0%</td>
<td>12.9%</td>
<td>22.58%</td>
<td>38.71%</td>
<td>16.13%</td>
<td>4.68</td>
<td>.94</td>
</tr>
<tr>
<td>4. The example sentences with target verbs highlighted drew my attention to how these verbs are used in sentences.</td>
<td>0%</td>
<td>3%</td>
<td>6.5%</td>
<td>22.58%</td>
<td>38.71%</td>
<td>16.13%</td>
<td>4.87</td>
<td>1.01</td>
</tr>
</tbody>
</table>

The Cronbach’s α reliability of the four questions was .878, which indicates that these questions measured the same construct. The mean of the item means was 4.94 (SD = .805).

According to the scaling of this questionnaire, the mean of 4.94 suggested that participants generally agreed that PAT GRAM attracted their attention to grammar patterns during this
sentence revision activity. To understand reasons for various degrees of attention attracted to verb patterns, the analysis of introspective data is discussed in the following section.

4.1.3.2. Introspective data on attention to patterns

Introspective data on participants’ attention to patterns in the sentence revision activity were collected from 12 introspective group participants’ responses to retrospective verbal protocols. First, the verbal protocol data were analyzed to identify comments pertaining to the noticing of grammar patterns. Comments about noticing were interpreted as positive if they suggested that the participants paid attention to the pattern and recognized the pattern. They were interpreted as negative if the participants failed to recognize the pattern or pay attention to the pattern. In the second phase of coding, the principle researcher identified the reasons that led to positive and negative evidence of attention to patterns. Through an application of the conditions that may influence allocation of attention during L2 tasks summarized in Chapelle (2001), two different conditions, modified output and support, were identified as the two conditions that resulted in the positive evidence of attention to patterns during this specific sentence construction task. Modified output was defined as “learners‘ correction of their own errors-with self-correction or correction prompted by something else,” while support refers to “cues or information available to the learner to help in constructing meaning during task completion” (Chapelle, 2001, p. 49). The principle researcher coded the reasons for idea units that were identified as negative evidence on attention to patterns. Three reasons were identified with one idea unit not specifying the reason: 1) participants were not familiar with the symbols representing verb patterns; 2) in the example sentences, the target verbs rather than the target verb patterns were highlighted; 3) participants paid primary attention to intended meaning, thus failed to attend to patterns. These reasons were shortened to “unfamiliarity with symbols,”
“patterns not highlighted,” and “attention to meaning.” Table 15 presents the number and percentage of idea units indicating positive and negative incidences of attention to patterns.

Table 15

<table>
<thead>
<tr>
<th>Idea Units on Attention to Patterns (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention to Patterns</strong></td>
</tr>
<tr>
<td><strong>Positive</strong></td>
</tr>
<tr>
<td><strong>97.60%</strong></td>
</tr>
<tr>
<td>206 idea units</td>
</tr>
<tr>
<td>Modified output</td>
</tr>
<tr>
<td>23.70%</td>
</tr>
<tr>
<td>50 idea units</td>
</tr>
<tr>
<td>Support</td>
</tr>
<tr>
<td>73.90%</td>
</tr>
<tr>
<td>156 idea units</td>
</tr>
<tr>
<td><strong>Negative</strong></td>
</tr>
<tr>
<td><strong>2.4%</strong></td>
</tr>
<tr>
<td>5 idea units</td>
</tr>
<tr>
<td>Unfamiliarity with</td>
</tr>
<tr>
<td>.96%</td>
</tr>
<tr>
<td>2 idea units</td>
</tr>
<tr>
<td>Symbols</td>
</tr>
<tr>
<td>.48%</td>
</tr>
<tr>
<td>1 idea unit</td>
</tr>
<tr>
<td>Patterns not highlighted</td>
</tr>
<tr>
<td>.48%</td>
</tr>
<tr>
<td>1 idea unit</td>
</tr>
<tr>
<td>Attention to meaning</td>
</tr>
<tr>
<td>.48%</td>
</tr>
<tr>
<td>1 idea unit</td>
</tr>
<tr>
<td>Unidentified</td>
</tr>
<tr>
<td>.48%</td>
</tr>
<tr>
<td>1 idea unit</td>
</tr>
</tbody>
</table>

As shown in Table 15, 97.60% idea units on participants’ attention to patterns were coded as positive evidence, while only 2.40% idea units were identified as negative evidence of attention to patterns. This result indicates that PAT GRAM successfully drew participants’ attention to patterns during the sentence construction activity. Specific to conditions that facilitated positive experiences of attention to patterns, the majority of idea units (73.9%) mentioned support as the cause for attention to patterns, while 23.7% idea units referred to modified output as the condition for attention to patterns. Although idea units on reasons for negative evidence of attention patterns only accounts for 0.96%, 0.48%, and 0.48% respectively (shown in Table 15) of the total idea units on reasons for attention to patterns, it is still worthwhile to investigate the reasons so as to reduce or prevent these negative incidences in future research and tool development.
Even though these conditions for successful and unsuccessful incidences of attention to patterns cannot be used directly as a means for evaluating the sentence revision activity with PAT GRAM, deep understanding of these conditions is necessary for achieving an improved manipulation of learners’ attention. A detailed discussion of the conditions that contributed to successful and unsuccessful incidences of attention to patterns is unfolded in the subsequent section with comments made by participants cited as supporting examples. The specific comments by participants were selected, because they have clear meaning and are representative of all similar comments.

4.1.3.2.1. Attention to patterns: Positive evidence

In this specific sentence revision activity using PAT GRAM, two conditions were identified as the triggers of attention to patterns: modified output and support.

**Modified output.** Attention to patterns happened when participants intended to identify the errors in their sentences or identify the patterns that they failed to use in their sentence production. Both situations required participants to attend to patterns presented in PAT GRAM and patterns used in their own sentences. The following utterances illustrated how attention to patterns occurred as a result of output modification:

The pattern is “attempted to do something.” Since I had “attempted to buy something,” I think my sentence was correct. (Student 1, retrospective verbal protocol)

I paid a lot of attention to the patterns when trying to find out my errors. For example, this one [influence], I just matched the structure [in the front page] with my sentence and tried to figure out my errors. I found there was something missing. “To” was missing. I just added that. (Student 3, retrospective verbal protocol)

I noticed that both of my sentences were using the pattern V n. I knew I need to make sentence with the other pattern, but I could not make the sentence. (Student 4, retrospective verbal protocol)

Because I didn’t use this pattern, so I wanted to use this pattern in my sentence construction. (Student 5, retrospective verbal protocol)
“Schools were largely lacking.” [reading from the screen] This is the pattern V, and the other pattern of “lack” is V n. Then I went back to look at my own sentences. One of my sentences had an additional “of,” so I deleted it. (Student 7, retrospective verbal protocol)

I compared the patterns with my sentences…I noticed my patterns were wrong. I was thinking of changing my sentences to this pattern in the example sentences. The pattern shown in PAT GRAM was V n with n, however I used V n to n, so I changed “to” to “with.” (Student 6, retrospective verbal protocol)

**Support.** Besides modified output, support, including information on patterns provided in PAT GRAM and important information cued through highlighting/underlying, also successfully drew participants’ attention to patterns. This activity of sentence revision pushed participants to rely on PAT GRAM for information on patterns, since “written communication typically affords more opportunity for attention to form” (Chapelle, 2001, p. 49). The following examples demonstrated the incidences when participants attend to patterns in their attempts to fulfill the requirements of this sentence revision activity:

I went back to the structure “construct table from wood”… Now I looked at another pattern that I did not use. The pattern was “construct something out of something.” (Student 1, retrospective verbal protocol)

While I was reading this page [the front page showing patterns and meaning groups], I found something that was unfamiliar to me using “construct n out of n.” I just wanted to know more. (Student 3, retrospective verbal protocol)

I clicked on the pattern [Imply that] and the “say” group to learn more about this pattern…I only knew “consist of,” but I did not know “consist in,” so I decided to read more. (Student 4, retrospective verbal protocol)

From reading the example sentences, I learned the pattern of “associate,” “associate with something.” (Student 5, retrospective verbal protocol)

I read the example sentences to figure out the correct pattern, and then I remembered that for writing my own sentence. (Student 6, retrospective verbal protocol)

In addition to information on patterns available to participants, the highlighting/underlying function of PAT GRAM also served to attract participants’ attention.
The following quotes by participants exemplified situations where participants’ attention was allocated due to highlighting/underlying:

I looked at the highlighted example verbs. I learned that they had the same pattern with the target verb. (Student 2, retrospective verbal protocol)

I was reading the highlighted example verbs. They had similar meaning with “include” and shared the same pattern with “include.” (Student 6, retrospective verbal protocol)

The highlighted verbs in both the example verb list and the example sentences caught my attention. I read them. (Student 9, retrospective verbal protocol)

I got a lot of clues with the highlighted patterns and meaning groups. The patterns like [V n with n] was really clear and helpful. I also went through the highlighted verbs. I knew that the verbs had similar patterns. (Student 10, retrospective verbal protocol)

I first read the highlighted verbs and then randomly picked other verbs. When I had little time, I looked at highlighted verbs only. (Student 12, retrospective verbal protocol)

4.1.3.2.2. Attention to patterns: Negative evidence

Three reasons were identified as leading to unsuccessful incidences of attention to patterns: unfamiliarity with symbols, patterns not highlighted, and attention to meaning.

**Unfamiliarity with symbols.** Even though training was provided to familiarize participants with the terms and symbols used to indicate patterns, two idea units suggested that some participants were still not very familiar with this basic information. The following two comments reported how a lack of the knowledge of terms and symbols prevented participants from paying attention to and understanding patterns.

I read the front page and tried to figure out the patterns for “lack.” It said “ergative,” but I did not understand what was “ergative.” (Student 5, retrospective verbal protocol)

I was looking at the patterns. I was not very familiar with the signals, such as V or n. (Student 7, retrospective verbal protocol)

**Patterns not highlighted.** In the example sentences, all the verbs under the specific pattern and meaning group (e.g., construct, make, fabricate), rather than verb patterns (e.g., construct n from n, make n from n, and fabricate n from n), were automatically highlighted.
Therefore, when reading the example sentences, participants needed to study how a specific pattern was used and embedded in an authentic sentence. One participant reported that when reading the example sentences, she forgot the specific pattern that she was trying to focus on. She said, “I was reading the example sentences to see how my verb was used in sentences, but suddenly I forgot the pattern, so I had to go back to the front page to see the pattern…I hope the pattern can be highlighted in the sentences directly, so that I don’t have to go back and forth” (Student 5, retrospective verbal protocol).

Attention to meaning. During the sentence revision activity, attention to the intended meaning also distracted participants from focusing on patterns. When asked whether a participant noticed that she used the same pattern for both sentences, she answered, “Yeah, I noticed now. I tried to make sentences that fit the meaning, so I forgot to check that” (Student 3, retrospective verbal protocol).

Overall, both the quantitative data—31 participants’ responses to 4 Likert-scale questions—and the qualitative data, in the 12 retrospective verbal protocols, demonstrated that participants’ attention was successfully attracted to patterns. Specific to responses to the Likert-scale questions, participants generally agreed that highlighted patterns and highlighted example verbs and sentences with example verbs highlighted drew their attention to patterns. Also, analysis of the retrospective data implied that a dominant number of idea units (97.6%) were reported as successful incidences of attention to patterns.

4.1.4. Perceptions of learning (RQ4)

Participants’ perceptions of their learning experience with PAT GRAM served as another important component of evidence used for evaluating the language learning potential quality of the explicit instruction offered by PAT GRAM. In this study, participants’ perceptions were
collected through 31 participants’ responses to six Likert-scale questions and 12 introspective group participants’ responses to semi-structured interviews.

4.1.4.1. Questionnaire data on perceptions of learning

Questionnaire data on participants’ perceptions of their learning experience with PAT GRAM was gathered from their responses to six six-point Likert-scale questions: 1) “PAT GRAM helped me write sentences with correct verb patterns,” 2) “PAT GRAM helped me revise sentences with wrong verb patterns,” 3) “PAT GRAM helped me learn that one verb can be used with different patterns,” 4) “PAT GRAM helped me learn different patterns of verbs,” 5) “PAT GRAM helped me learn that meanings of different patterns of a verb may be different,” and 6) “PAT GRAM helped me learn new verbs with the same patterns as the verbs I know.”

Participants’ responses to each of the questions are shown in Table 16.

Table 16
Participants’ Perceptions of Learning: Responses to Likert-scale Questions (n = 31)

<table>
<thead>
<tr>
<th>Perceptions of Learning</th>
<th>Strongly disagree (1)</th>
<th>Disagree (2)</th>
<th>Slightly disagree (3)</th>
<th>Slightly agree (4)</th>
<th>Agree (5)</th>
<th>Strongly agree (6)</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PAT GRAM helped me write sentences with correct verb patterns.</td>
<td>0%</td>
<td>0%</td>
<td>6.5%</td>
<td>16.13%</td>
<td>41.94%</td>
<td>22.58%</td>
<td>4.98</td>
<td>.87</td>
</tr>
<tr>
<td>2. PAT GRAM helped me revise sentences with wrong verb patterns</td>
<td>0%</td>
<td>0%</td>
<td>6.5%</td>
<td>19.35%</td>
<td>41.94%</td>
<td>22.58%</td>
<td>4.94</td>
<td>.85</td>
</tr>
<tr>
<td>3. PAT GRAM helped me learn that one verb can be used with different patterns.</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>12.90%</td>
<td>41.94%</td>
<td>35.48%</td>
<td>5.23</td>
<td>.72</td>
</tr>
<tr>
<td>4. PAT GRAM helped me learn different patterns of verbs.</td>
<td>0%</td>
<td>0%</td>
<td>3.22%</td>
<td>9.68%</td>
<td>41.94%</td>
<td>38.71%</td>
<td>5.26</td>
<td>.77</td>
</tr>
<tr>
<td>5. PAT GRAM helped me learn that meanings of different patterns of a verb may be different.</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16.13%</td>
<td>35.48%</td>
<td>25.81%</td>
<td>5.05</td>
<td>.73</td>
</tr>
</tbody>
</table>
Table 16 Continued

<table>
<thead>
<tr>
<th>Perceptions of Learning</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. PAT GRAM helped me learn new verbs with the same patterns as the verbs I know.</td>
<td>0%</td>
<td>0%</td>
<td>9.68%</td>
<td>6.45%</td>
<td>48.39%</td>
<td>25.81%</td>
<td>5.03</td>
<td>.87</td>
</tr>
</tbody>
</table>

The mean of item means was 5.08 (SD = .805), indicating that participants agreed they learned important knowledge of patterns, including production of correct patterns, revision of wrong patterns, multiple patterns of one verb, and expansion of vocabulary knowledge. The Cronbach's \( \alpha \) reliability of the measure was .85, which demonstrated that these questions largely measured one construct.

4.1.4.2. Introspective data on perceptions of learning

Besides questionnaire data, participants’ perceptions of their learning experience were also collected from 12 semi-structured interviews. All the idea units on participants’ perceptions of learning were first coded as positive and negative referring to comments on success in learning knowledge of grammar patterns and difficulties in learning grammar patterns respectively. Afterwards, all idea units were coded for what participants learned (for positive idea units) and not learned (for negative idea units). Analysis of the transcripts of the 12 semi-structured interviews suggested that participants learned patterns of the target verbs, the relationship between verbs under the same meaning group, and the contextual use of patterns. These aspects were tagged as “patterns,” “related verbs,” and “contextual use.” The negative comments on learning experience with PAT GRAM indicated that unfamiliarity with the relationship between verbs under the same meaning group, tagged as “unfamiliarity with related verbs,” caused confusion for one participant. Percentages of positive and negative idea units on
participants’ perceptions of learning and percentages of idea units on what participants learned (patterns, related verbs and contextual use) and did not learn (unfamiliarity with related verbs) are presented in Table 17.

Table 17
Participants’ Perceptions of Learning: Interview Data (n = 12)

<table>
<thead>
<tr>
<th>Perceptions of Learning</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>95.65%</td>
<td>4.35%</td>
</tr>
<tr>
<td></td>
<td>44 idea units</td>
<td>2 idea units</td>
</tr>
<tr>
<td>Patterns</td>
<td>34.78%</td>
<td>Unfamiliarity with related verbs</td>
</tr>
<tr>
<td></td>
<td>16 idea units</td>
<td>4.35%</td>
</tr>
<tr>
<td>Related verbs</td>
<td>30.43%</td>
<td>2 idea units</td>
</tr>
<tr>
<td></td>
<td>14 idea units</td>
<td></td>
</tr>
<tr>
<td>Contextual use</td>
<td>30.43%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 idea units</td>
<td></td>
</tr>
</tbody>
</table>

As Table 17 shows, the majority of the idea units (95.65%) were positive, indicating that participants learned knowledge of patterns, whereas only a very small portion of the idea units (4.35%) were tagged as negative, suggesting that participants encountered difficulties in learning grammar patterns. This result suggested that participants’ perceptions of learning through PAT GRAM were largely positive based on evidence collected from the semi-structured interviews. Specific to participants’ reports on what they learned through using PAT GRAM, patterns (37.48%), verbs under the same pattern and meaning group (tagged as “related verbs,” 30.43%), and contextual uses of verb patterns (tagged as “contextual uses,” 30.43%) received an approximately equal percentage of comments, with patterns being mentioned slightly more frequently. Both the two negative idea units (4.35%) attributed unsuccessful learning to unfamiliarity with the relationship between verbs nested under the same pattern and meaning group. A detailed discussion on participants’ positive and negative learning experiences is
provided in the following sections in citing examples of participants’ utterances that are easy to interpret and representative of all other similar utterances.

4.1.4.2.1. Participants’ positive perceptions

The positive idea units on participants’ perceptions of learning clustered around three different aspects of knowledge of patterns: patterns as a combination of their specific structure and meaning, verbs grouped under the same meaning group sharing the same pattern and similar meaning, and contextual uses of patterns in authentic sentences. These aspects are referred to as patterns, related verbs, and contextual uses and discussed in the subsequent paragraphs.

Patterns. Participants reported most frequently that they learned multiple patterns of the target verbs. All participants reported that they learned different patterns. For example, one student mention, “I learned how to use the verbs in their correct patterns” (Student 2, semi-structured interview). Another student emphasized the association between patterns and meaning: “I learned the concept of verb pattern, and different patterns of a verb are related to different meanings” (Student 3, semi-structured interview). Two participants related their acquisition of patterns to the skill of revising wrong patterns: “I just learned to fix my wrong patterns” (Student 4, semi-structured interview) and “I learned how to change my verb patterns” (Student 6, semi-structured interview).

Related Verbs. Participants also learned that verbs categorized under the same meaning group share the same pattern and meaning. This knowledge, one of the important observations of the theory of pattern grammar, has the potential of helping participants expand vocabulary knowledge based on the assumption that these verbs share the same meaning. Additionally, participants not only expanded their vocabulary size, but also they learned patterns of newly
acquired words. The following utterances convey how participants expanded their vocabulary size and depth simultaneously:

I learned that some verbs are similar with the highlighted verbs. The highlighted verbs have similar meaning and share the same pattern. You can learn more at once. It is easier to learn. (Student 1, semi-structured interview)

I knew those highlighted verbs are same as my verbs in meaning and pattern, so I also learned how to use these highlighted verbs as well at the same time. (Student 2, semi-structured interview)

I learned patterns of the target verbs and the patterns of the example verbs, since they have the same pattern. For example, “attempt something,” I also learned “manage something.” (Student 4, semi-structured interview)

I learned some verbs that have similar meanings can also be used in the same pattern. These are really useful for me. (Student 6, semi-structured interview)

I learned verbs with the similar meaning and similar patterns. (Student 9, semi-structured interview)

**Contextual Use.** In addition to basic knowledge of patterns covered in the previous two codes, participants also pointed out that PAT GRAM provided contextual use of patterns by presenting useful example sentences with the example verbs highlighted. A few examples of comments made by participants on their understanding contextual uses of patterns are presented below:

I compared my sentences with the example sentences, and I learned how to use the pattern in the sentences. (Student 2, semi-structured interview)

The example sentences helped understand the correct and appropriate use of the patterns. (Student 5, semi-structured interview)

Like the pattern V n, I examined the object and subject of the example sentences, so I learned where to put the words. The sentences showed me more clearly how the pattern was used in sentences. (Student 7, semi-structured interview)

PAT GRAM is very good, I mean it gave me something more than the patterns. It also showed me how to use the patterns in a sentence or even an article. (Student 9, semi-structured interview)
4.1.4.2. Participants’ negative perceptions

The only two idea units on negative perceptions of learning suggested that confusion in learning with PAT GRAM was caused by unfamiliarity with the related verbs. These two idea units were reported by Student 8, who admitted that she did not understand that the example verbs shared the same pattern and similar meaning. For the first incidence, she said, “I learned about the patterns, but I did not understand what the example verbs and the meaning were for.” Due to the same reason, unfamiliarity with related verbs, this participant also reported having difficulty in utilizing example sentences that did not include the target verb: “I read some of the example sentences, but I did not understand why the example sentences were here but my verb was not in the example sentences. I tried to read the example sentences, but after I realized my verb was not here, I ignored them.”

4.1.5. Overall evaluation of language learning potential

Overall, the above findings suggested that the explicit instruction provided by PAT GRAM achieved high language learning potential quality, since all four aspects underlying the language learning potential quality, including acquisition of patterns, accuracy of pattern use, attention to patterns, and perceptions of learning were evaluated positively by participants.

First, evaluation of the aspect, acquisition of patterns, relied on 61 participants’ (from four different classes) performances in the pretest and posttest as sources of evidence. T-test results showed that the two treatment group cases improved significantly after revising their sentences using PAT GRAM (class taught by teacher A: p < .05, class taught by teacher B: p < .05). The two control group cases, on the other hand, did not improve significantly between the pretest and posttest (class taught by teacher A: p = .85, class taught by teacher B: p = .18).
Therefore, it was reasonable to assume that the explicit instruction realized through PAT GRAM was effective in assisting participants to acquire grammar patterns of academic verbs.

The second aspect of language learning potential quality, accuracy of pattern use, was investigated by analyzing the 31 treatment group participants’ sentence production in their first attempt (before using PAT GRAM) and second attempt (after revising sentences using PAT GRAM). Since they scored significantly higher in the second attempt \( t(30) = , p < .05 \) than in their first attempt, and that the majority of revisions made by participants (77.73%) were successful, participants’ accuracy of pattern use was greatly improved after using PAT GRAM.

Next, evidence collected from 31 treatment participants’ responses to Likert-scale questions and 12 introspective group participants’ responses to retrospective verbal protocols were used to examine to what extent participants paid attention to patterns when using PAT GRAM for sentence revision. The summary statistics of the data are presented in Table 18.

### Table 18

**Summary Statistics of Attention to Pattern**

<table>
<thead>
<tr>
<th>Data source</th>
<th>N of participants</th>
<th>Data Evidence for attention to patterns</th>
<th>No evidence for attention to patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likert-scale questions</td>
<td>31</td>
<td>Responses to:</td>
<td>Mean = 4.94 SD=.948</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n1: The highlighted patterns attracted my attention.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 2: The highlighted verbs attracted my attention.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 3: The highlighted verbs drew my attention to these verbs together with the patterns they share.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 4: The example sentences with the target verb highlighted drew my attention to how these verbs are used in sentences.</td>
<td></td>
</tr>
</tbody>
</table>
As presented in Table 18, evidence collected from both data sources supports the assumption that PAT GRAM attracted participants’ attention to patterns. The mean of item means for Likert-scale questionnaire data was 4.94, indicating that participants generally agreed that PAT GRAM drew their attention to patterns during the sentence revision activity. In addition, a majority of the idea units (97.6%) in retrospective verbal protocols showed evidence of attention to patterns. Therefore, the conclusion can be drawn that PAT GRAM successfully drew participants’ attention to the grammar patterns.

Finally, participants’ perceptions of learning were investigated through analyzing 31 treatment group participants’ responses to 6 Likert-scale questions and 12 introspective group participants’ responses semi-structured interviews. The summary statistics (shown in Table 19) demonstrated a substantially higher percentage of evidence for positive perceptions of learning than evidence for negative perceptions in both data sources.

Table 19
Summary Statistics of Perceptions of Learning

<table>
<thead>
<tr>
<th>Data source</th>
<th>N of participants</th>
<th>Data</th>
<th>Evidence for positive perceptions</th>
<th>No evidence for positive perceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likert-scale questions</td>
<td>31</td>
<td>Responses to:</td>
<td>Mean = 5.08</td>
<td>SD = .805</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 5: PAT GRAM helped me write sentences</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>with correct verb patterns.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 6: PAT GRAM helped me revise sentences</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>with wrong verb patterns.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retrospective verbal protocols</td>
<td>12</td>
<td>Transcripts of 12 verbal protocol recordings</td>
<td>206 idea units 97.6%</td>
<td>5 idea units 2.4%</td>
</tr>
</tbody>
</table>
Table 19 Continued

<table>
<thead>
<tr>
<th>Data source</th>
<th>N of participants</th>
<th>Data</th>
<th>Evidence for positive perceptions</th>
<th>No evidence for positive perceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likert-scale questions</td>
<td>31</td>
<td>Responses to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 7: PAT GRAM helped me learn that one verb can be used with different patterns.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 8: PAT GRAM helped me learn different patterns of verbs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 9: PAT GRAM helped me learn that meanings of different patterns of a verb.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 10: PAT GRAM helped me learn new verbs with the same patterns as the verbs I know</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>12</td>
<td>Transcripts of: 12 semi-structured interviews</td>
<td>44 idea units 95.65%</td>
<td>5 idea units 4.35%</td>
</tr>
</tbody>
</table>

As shown in Table 19, the mean of items means for the questionnaire data was 5.08, suggesting that participants generally agreed that they learned knowledge of patterns by using PAT GRAM. Furthermore, 95.65% of the idea units in the transcript of semi-structured interviews demonstrated positive perceptions of learning patterns through PAT GRAM. Given that all four aspects of the language learning potential quality of PAT GRAM provided supportive evidence, the assumption that PAT GRAM has a high quality of language learning potential was convincingly warranted.

4.2. Learner Fit (RQ5)

The learner fit quality of PAT GRAM, referring to the appropriateness of the CALL activity for the target group participants, was examined through both questionnaire and introspective data. Questionnaire data included 31 treatment group participants’ responses to five Likert-scale questions concerning their perceptions of learner fit, while introspective data included 12 introspective group participants’ responses to retrospective verbal protocols and semi-structured interviews.
4.2.1. Questionnaire data on learner fit

Questionnaire data on learner Fit quality of PAT GRAM was collected from 31 participants’ responses to five six-point Likert-scale questions: 1) “I understood the general meaning of meaning groups very well,” 2) “I understood the example sentences very well,” 3) “It was easy to guess the meaning of unknown verbs in the example verb list,” 4) “I was able to write sentences with different verb patterns using PAT GRAM,” 5) “I was able to identify wrong patterns in my sentences using PAT GRAM.” Table 20 presents the results of the Likert-scale questions, including percentages of participants’ choices, item means, and standard deviations.

Table 20

<table>
<thead>
<tr>
<th>Perceptions of learner fit</th>
<th>Strongly disagree 1</th>
<th>Disagree 2</th>
<th>Slightly disagree 3</th>
<th>Slightly agree 4</th>
<th>Agree 5</th>
<th>Strongly agree 6</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. I understood the general meaning of meaning groups very well.</td>
<td>0%</td>
<td>0%</td>
<td>3.23%</td>
<td>2.58%</td>
<td>5.48%</td>
<td>6.45%</td>
<td>4.68</td>
<td>.65</td>
</tr>
<tr>
<td>16. I understood the example sentences very well.</td>
<td>0%</td>
<td>0%</td>
<td>9.68%</td>
<td>3.87%</td>
<td>2.58%</td>
<td>12.90%</td>
<td>4.48</td>
<td>.93</td>
</tr>
<tr>
<td>17. It was easy to guess the meaning of unknown verbs in the example verb list.</td>
<td>0%</td>
<td>3.23%</td>
<td>9.68%</td>
<td>3.26%</td>
<td>2.90%</td>
<td>19.35%</td>
<td>4.55</td>
<td>1.03</td>
</tr>
<tr>
<td>18. I was able to write sentences with different verb patterns using PAT GRAM.</td>
<td>0%</td>
<td>3.23%</td>
<td>6.45%</td>
<td>19.35%</td>
<td>45.16%</td>
<td>16.13%</td>
<td>4.74</td>
<td>.96</td>
</tr>
<tr>
<td>19. I was able to identify wrong patterns in my sentences using PAT GRAM.</td>
<td>0%</td>
<td>6.45%</td>
<td>3.23%</td>
<td>3.23%</td>
<td>32.26%</td>
<td>19.35%</td>
<td>4.58</td>
<td>1.06</td>
</tr>
</tbody>
</table>

The Cronbach's $\alpha$ reliability of the five questions was .873, indicating that the questions largely measure the same construct. The mean of item means was 4.74 ($SD = .929$), between “4 slightly agree” and “5 agree.” suggesting that participants agreed to some extent that the sentence revision activity with PAT GRAM was appropriate for their proficiency level.
4.2.2. Introspective data on learner fit

The learner fit quality of PAT GRAM was also evaluated qualitatively through retrospective verbal protocols and semi-structured interviews. All the idea units in the transcripts of the retrospective verbal protocols and semi-structured interviews were tagged as positive, if they indicated that the explicit instruction provided by PAT GRAM was appropriate for the participants’ proficiency level. The idea units were tagged as negative if they indicated that participants found PAT GRAM difficult to use. The idea units were then grouped into three themes: general impressions, facilitate sentence revision and construction, and facilitate vocabulary acquisition. Under general impressions lied two categories, ease of use and usefulness, referring respectively to ease of understanding and usefulness of information provided in PAT GRAM. The second theme, facilitate sentence revision and construction, consisted of three categories: facilitate judgment of correctness, facilitate identification of unused patterns, and facilitate production, referring to whether the explicit instruction provided by PAT GRAM sufficiently supported participants’ judgment of correctness of their pattern use, identification of patterns that they did not use and construction of new sentences. The last theme, facilitate vocabulary acquisition, covered comments indicating whether the explicit instruction provided by PAT GRAM scaffolded participants’ expansion of vocabulary knowledge. Table 21 displays percentages of idea units of each category of the three themes, general impression, facilitate sentence revision and production, and facilitate vocabulary acquisition, per data source.
As presented in Table 21, generally the percentages of positive idea units (verbal protocols: 83.81%, interviews: 85.38%) were considerably higher than percentages of negative idea units (verbal protocols: 16.19%, interviews: 14.62%) in transcripts of retrospective verbal protocols and semi-structured interviews. In addition, a much higher percentage of positive idea units than negative idea units can be identified in both data sources across all categories. To provide more in-depth information, the following paragraphs discuss the themes identified in the introspective data by citing participants’ comments that are expressed clearly and representative of all similar comments.

**General Impressions.** Participants’ two general impressions of learner fit quality of PAT GRAM revolved around 1) ease of accessing and understanding information provided in PAT GRAM (i.e. ease of use) and 2) helpfulness of the explicit instruction provided by PAT GRAM in the sentence revision and construction activity (i.e. helpfulness).
In terms of ease of accessing information provided in PAT GRAM, all participants found it easy to navigate the site for PAT GRAM to access information they needed. For example, one participant commented that, “It is easy to find the information I need, because all the example sentences and all verb patterns are shown here [the front page] as V n or V as n. When I click on the verb, all information is here” (Student 2, semi-structured interview).

For ease of understanding information provided in PAT GRAM, both positive and negative idea units were identified. Positive comments from participants suggested that information in PAT GRAM fit participants’ language proficiency and caused no difficulty of comprehension. Participants’ ease of understanding information is expressed in the following comments:

I think it is easy to understand information provided in PAT GRAM, because it is complete and clear. Generally I can understand the symbols for patterns. Some symbols I did not really understand, but I was able to figure out by examining the example sentences. The meaning groups, meaning sections and example sentences are generally very understandable. (Student 6, semi-structured interview)

I did not encounter any significant difficulties when using PAT GRAM. It seems fine. I found it easy to understand and use. (Student 9, semi-structured interview)

When the meaning group was provided, I could understand the difference between patterns. (Student 8, retrospective verbal protocol)

I am reading the example sentences [of display]. I was able to understand the example sentences very well. I was easy. (Student 12, retrospective verbal protocol)

Negative comments, on the other hand, reported difficulties in understanding information provided in PAT GRAM. Complexity of language in explanations for meaning and example sentences challenged some participants’ proficiency level and impeded their understanding of meaning of patterns. For example, one participant commented that “I think sometimes the sentences were very long and difficulty for me to understand” (Student 3, semi-structured interview). Furthermore, even though participants admitted that grouping verbs under different
meaning groups helped them expand their vocabulary and learn patterns of newly acquired verbs, absence of the exact meaning of verbs and patterns caused confusion. For example, one participant emphasized the necessity of including specific meaning of verbs, “Because PAT GRAM did not tell me the meaning of every word, so although I saw the example sentences, I sometimes felt a little confused. Because I don’t know the exact meaning of the verb, I don’t know how to use it in writing” (Student 5, semi-structured interview). Another participant reported incidences when he found meaning groups confusing, “I don’t think ‘pass’ means ‘exist’ or ‘happen.’ I can relate past to ‘exist’ or ‘happens’ ” (Student 6, retrospective verbal protocol). In addition to difficulties in grasping the exact meaning of patterns, some participants also experienced difficulties distinguishing structures of patterns. Two participants reported their difficulties of distinguishing patterns: “I was stuck because I think the two patterns [interpret n as n & interpret n as adj] are the same” (Student 4, retrospective verbal protocol), and “Sometimes I think some patterns looked so same, so I felt a little confused” (Student 3, semi-structured interview).

Besides ease of accessing and understanding information in PAT GRAM, participants also commented on the usefulness of information provided in PAT GRAM. According to participants, PAT GRAM was useful in assisting them to learn patterns and transfer receptive knowledge of patterns into productive knowledge. The following comments by participants illustrate their perceptions of usefulness of different features of PAT GRAM in facilitating acquisition of receptive and productive knowledge of patterns:

The structures of the patterns are useful. I think it’s the example verbs like highlighted verbs that gave us an idea of the structure, like what kind of verbs kinda have similar use. (Student 1, semi-structured interview)

Those highlighted verb are really helpful. Otherwise, I have to concentrate on all the highlighted verbs. (Student 2, semi-structured interview)
Information provided in PAT GRAM was helpful, especially the example sentences. The structure of patterns directly helps. If it is not, I go to the example sentences. That helps too. Also the page showing patterns and meaning groups together are really helpful. Especially, when we are not familiar with the meaning of the verbs, it can help us to have an idea what the word means. (Student 3, semi-structured interview)

I always read the example sentences. They gave a lot of clues in terms of how to use patterns in sentences. I just read it, repeat, read it, and try to understand the patterns correctly. (Student 4, retrospective verbal protocol)

I found verbs sharing similar meaning are really useful, because when I learn about one verb, I also learn how to use other verbs. (Student 7, semi-structured interview)

I got a lot of clues with the highlighted patterns and meaning group. (Student 10, retrospective verbal protocol)

I kina got the meaning from the meaning group and I read the first example sentence with the target verb “display.” That directly helped me compose my own sentence. (Student 11, retrospective verbal protocol)

I think the example sentences are really helpful. Also, the list of patterns is also helpful. (Student 12, semi-structured interview)

Facilitate sentence revision & construction. Specific to how PAT GRAM was successful and appropriate in facilitating participants in revising and constructing sentences, comments centered around three categories: facilitate judgment of correctness, facilitate identification of unused patterns, and facilitate production.

Comments nested under the first category, facilitate judgment of correctness, reported how participants utilized information in PAT GRAM to judge whether patterns in their sentences were accurate and meaningful. Except for one participant (Student 12) who considered it difficult to judge the correctness of patterns, all other participants judged the task as easy or challenging, but achievable with PAT GRAM. For example, one participant commented that, “It is easy to identify which patterns I used incorrectly. I compared my sentences to example sentences in
PAT GRAM” (Student 6, semi-structured interview). Another participant (Student 9, semi-structured interview), rather, found the task challenging, but achievable using PAT GRAM. The following utterances exemplify positive evidence demonstrating that the explicit instruction provided by PAT GRAM facilitated participants’ judgment of correctness of their pattern use:

I was looking at the meaning to make sure I expressed correct meaning. (Student 1, retrospective verbal protocol)

I know that my pattern of “attempt” was wrong, so I am thinking of changing it. (Student 2, retrospective verbal protocol)

I found I used the incorrect pattern in the second sentence. (Student 5, retrospective verbal protocol)

It is easy to identify which patterns I used incorrectly because just from the front page [showing patterns and meaning groups], I can tell whether I used the wrong pattern. I just compared my sentences with patterns and meaning groups in the front page (Student 1, semi-structured interview)

My target verb “include” was included in the example sentences, so I tried to replace “include” with the highlighted verbs in the sentences and tried to make sense of it. I think my sentence was correct, so I closed the page. (Student 6, retrospective verbal protocol)

After I clicked on the verb “associate,” I saw two patterns V with n and V n with n. I realized that I made an error. (Student 8, retrospective verbal protocol)

**Facilitate identification of unused patterns.** Proceedings to sentence revision, participants were also supposed to identify which patterns they failed to use. Idea units under the category “facilitate identification of unused patterns” either commented on the easiness of identifying unused patterns or reported incidences of successful/unsuccessful incidences of identifying unused patterns. Two participants expressed their difficulties in identifying patterns they failed to use. Student 12 attributed his failure to identify unused patterns to difficulty in distinguishing the differences between meanings of different patterns of the same verb; “It was not easy for me to identify which patterns I did not use in my sentence, because I could not tell
the differences between meanings of one verb” (Student 12, semi-structured interview). Another participant reported that even though he could differentiate patterns of the same verb, he still found identification of unused patterns was difficult, stating “I think I could distinguish different patterns here, but I was not able identify which one I did not use” (Student 8, retrospective verbal protocol).

Except for the above two comments, all other participants considered identification of unused patterns as easy or manageable when using PAT GRAM. The following comments illustrated how most of the participants were able to achieve this task in a manageable manner:

- It was easy to identify which I did not use, because it showed really clear here [the front page showing patterns and meaning groups]. (Student 11, semi-structured interview)
- For some patterns, it was easy to identify [unused patterns]. For other times, it was not that easy, but I could do it. (Student 9, semi-structured interview)
- While I was reading the front page, I found the pattern “construct out of” was unfamiliar to me. (Student 3, retrospective verbal protocol)
- I realized that I did not use this pattern [attempt to-inf], so I wanted to use this pattern in my sentence construction. (Student 5, retrospective verbal protocol)
- I noticed that I did not use “result from.” I think I used result in again here. I was trying to make a sentence with “result from.” (Student 10, retrospective verbal protocol)

**Facilitate production.** After identifying unused patterns and incorrect patterns, production of sentences with meaningful and accurate patterns was another challenge that participants faced. Whether using PAT GRAM could facilitate participants with sentence production was another important aspect of the appropriateness of the sentence revision task with PAT GRAM. Positive evidence consisted of participants’ comments on the manageability of and reports on incidences in producing sentences with accurate patterns. These comments and reports are exemplified in the following utterances:
When I read the example sentences, I could get things together [patterns and how to use patterns in sentences], so that I could get an idea of how create sentences. (Student 3, semi-structured interview)

I learned the pattern “associate with something” from the example sentences, and I tried to compose a sentence using this pattern. (Student 5, retrospective verbal protocol)

It was easy for me to revise sentences using PAT GRAM. I revised some sentences largely based on information on the front page [showing patterns and meaning groups]. (Student 8, semi-structured interview)

PAT GRAM provides each verb a lot of information, like patterns and meanings. Those features helped me with my own sentence production. I think I was sufficiently supported to create my own sentences. (Student 9, semi-structured interview)

I read the example sentences and I was thinking of what sentence to construct [with consist in] while reading the sentences. “The beauty of the queen consist in her inside…” (Student 10, retrospective verbal protocol)

Despite the majority of comments being positive, two negative comments by participants revealed the reasons underlying unsuccessful sentence production. For one participant, the difficulty of language production caused her unsuccessful revision; “Sometimes I know the patterns and the meaning, but I don’t know how to fit patterns in sentences” (Student 1, semi-structured interview). Another participant, on the other hand, related his failure to compose sentences to the difficulty in identifying the pattern he used, suggesting the necessity of more detailed training on patterns; “It was not very easy to revise sentences using PAT GRAM. Because I did not know what was the pattern I was using, I could not easily revise” (Student 12, semi-structured interview).

**Facilitate vocabulary acquisition.** The prosperous significance of teaching patterns through introducing the two important observations of pattern grammar lies in not only relating different patterns of a verb to its different meanings, but also facilitating vocabulary acquisition through listing verbs with similar meanings and patterns. Whether participants were able to expand their vocabulary using PAT GRAM is, therefore, an important aspect in determining the
quality of learner fit. The following comments by participants explained how they learned new verbs and their patterns simultaneously by consistently applying the rule that verbs under the same meaning group share the same pattern and similar meaning:

I read the highlighted verbs. I learned that they had similar meaning with “include” and shared the same pattern. (Student 6, retrospective verbal protocol)

PAT GRAM made learning more efficient, because while learning the pattern I could learn verbs that had the same usage with the highlighted verbs. (Student 9, semi-structured interview)

I learned the highlighted verbs, because I knew these two verbs have similar structure and meaning with “associate.” (Student 11, retrospective verbal protocol)

### 4.2.3. Overall evaluation of learner fit

Data collected from three different sources, Likert-scale questionnaire, retrospective verbal protocols and semi-structured interviews, suggested that the learner fit quality of the explicit instruction provided by PAT GRAM was evaluated positively. Overall evidence of learner fit is presented in Table 22.

Table 22

*Overall Evidence of Learner Fit*

<table>
<thead>
<tr>
<th>Data sources</th>
<th>N of participants</th>
<th>Data</th>
<th>Evidence for LF</th>
<th>No evidence for LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likert-scale questionnaire</td>
<td>31</td>
<td>Responses to Q-n 15: I understood the general meaning of meaning groups very well. Q-n 16: I understood the example sentences very well. Q-n 17: It was easy to guess the meaning of unknown verbs in the example verb list. Q-n 18: I was able to write sentences with different verb patterns using PAT GRAM. Q-n 19: I was able to identify wrong patterns in my sentences using PAT GRAM.</td>
<td>Mean = 4.74</td>
<td>SD = .929</td>
</tr>
</tbody>
</table>
Table 22 Continued

<table>
<thead>
<tr>
<th>Data sources</th>
<th>N of participants</th>
<th>Data</th>
<th>Evidence for LF</th>
<th>No evidence for LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrospective verbal protocols</td>
<td>12</td>
<td>Transcripts of: 12 retrospective verbal protocols</td>
<td>83.81% 88 idea units</td>
<td>16.19% 17 idea units</td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>12</td>
<td>Transcripts of: 12 semi-structured interviews</td>
<td>85.38% 111 idea units</td>
<td>14.62% 19 idea units</td>
</tr>
</tbody>
</table>

As shown in Table 22, evidence collected from all three data sources demonstrated that the learner fit quality of the explicit instruction provided by PAT GRAM was evaluated positively, because (1) the mean of items means for questionnaire data was 4.74, indicating participants’ agreement of positive learner fit quality, and (2) a majority of idea units in transcripts in retrospective verbal protocols (83.81%) and semi-structured interviews (85.38%) were positive comments regarding the learner fit quality.

Furthermore, introspective data provided valuable insight into 1) participants’ general impressions of the appropriateness of the sentence revision task with PAT GRAM and 2) the extent to which PAT GRAM facilitated sentence revision, including judgment of correctness of pattern use, identification of unused patterns and production of sentences with correct patterns, and 3) to what degree PAT GRAM assisted participants in expanding their vocabulary in terms of knowledge of meaning and patterns. Generally, participants perceived information provided in PAT GRAM as easy to understand and helpful. In addition, PAT GRAM was largely reported as successful in facilitating judgment of correctness, identification of unused patterns, and production of accurate patterns. Finally, participants viewed the explicit instruction provided by PAT GRAM as effective in promoting their semantic knowledge of verbs and patterns of verbs simultaneously.
4.3. Meaning Focus (RQ5)

To evaluate the meaning focus quality of the explicit instruction provided by PAT GRAM, evidence was collected to demonstrate the extent to which the explicit instruction realized through PAT GRAM was able to draw participants’ attention to meanings of the targeted academic verb patterns during their process of sentence revision and construction. Evidence of meaning focus quality included 31 participants’ responses to four Likert-scale questions and introspective data consisting of 12 participants’ comments elicited through retrospective verbal protocols and semi-structured interviews. Analysis of the questionnaire data suggested that participants agreed that they focused on meaning during the sentence revision activity using PAT GRAM. Corresponding with this finding, a considerably higher percentage of positive idea units than negative idea units was found in the introspective data concerning participants’ experience of consulting PAT GRAM for meaning of patterns. In addition, four strategies used by participants to construct meaning were identified in the introspective data.

4.3.1. Questionnaire data on meaning focus

Evidence of learner perceptions on meaning focus was gathered from participants’ responses to four six-point Likert-scale questions: 1) “PAT GRAM helped me write meaningful sentences using verb patterns,” 2) “PAT GRAM helped me revise my sentences when I used patterns that did not make sense,” 3) PAT GRAM helped me express meanings I intended,” and 4) “PAT GRAM helped me write sentences that other people can understand.” Participants’ responses to these four questions are summarized in Table 23.
Table 23
Participants’ Responses to Likert-scale Questions on Meaning Focus (n = 12)

<table>
<thead>
<tr>
<th>Perceptions of meaning focus</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. PAT GRAM helped me write meaning sentences using verb patterns.</td>
<td>0%</td>
<td>0%</td>
<td>6.45%</td>
<td>29%</td>
<td>41.90%</td>
<td>12.90%</td>
<td>4.74</td>
<td>.82</td>
</tr>
<tr>
<td>12. PAT GRAM helped me revise my sentences when I used patterns that did not make sense.</td>
<td>0%</td>
<td>3%</td>
<td>6.45%</td>
<td>9.68%</td>
<td>54.84%</td>
<td>16.13%</td>
<td>4.90</td>
<td>.94</td>
</tr>
<tr>
<td>13. PAT GRAM helped me express meanings I intended.</td>
<td>0%</td>
<td>0%</td>
<td>6.45%</td>
<td>29.03%</td>
<td>35.48%</td>
<td>19.35%</td>
<td>4.81</td>
<td>.87</td>
</tr>
<tr>
<td>14. PAT GRAM helped me write sentences that other people can understand.</td>
<td>0%</td>
<td>0%</td>
<td>6.45%</td>
<td>16.13%</td>
<td>51.61%</td>
<td>16.13%</td>
<td>4.87</td>
<td>.81</td>
</tr>
</tbody>
</table>

The Cronbach’s $\alpha$ reliability of the four questions was .875 indicating that the questions measure the same construct. The mean of the item means was 4.83 with a standard deviation of .85. Based on the scale of the questions ranging from “1 strongly disagree” to “6 strongly agree,” the mean of 4.83 approximates “5 agree,” which indicates that participants generally agreed that the explicit instruction provided by PAT GRAM drew their attention to meaning during the sentence revision and construction activity.

4.3.2. Introspective data on meaning focus

Besides 4 Likert-scale questions, the meaning focus quality of the explicit instruction provided by PAT GRAM was also evaluated based on evidence collected through 12 retrospective verbal protocols and 12 semi-structured interviews. The introspective data adds to the survey results by providing in-depth evidence in terms of how the participants associated meaning with form through reading information provided by PAT GRAM and constructed meaning comprehensible to the potential audience. The idea units on meaning focus consisted of two broader codes (themes): sources for meaning input and strategies of meaning making. The
theme “sources for meaning input” covered four categories—meaning group, meaning, example verbs, example sentences—referring to sources where the participants obtained the meaning of patterns. The idea units under sources for meaning input were also coded as positive or negative depending on whether participants successfully deduced the meaning from these sources. The theme “strategies of meaning making” included four categories—compare meanings of patterns, compare example sentences to self-produced sentences, substitute interchangeable verbs, and imitate example sentences—referring to strategies that participants used to deduce the meaning of patterns or to construct meaning. Percentages of idea units of each category of the two themes, sources for meaning input, and strategies of meaning making, per data source, are provided in Table 24.

Table 24
Themes and Categories of Meaning Focus Identified in Introspective Data (n = 12)

<table>
<thead>
<tr>
<th>Themes</th>
<th>Categories</th>
<th>Verbal protocols</th>
<th>Semi-structured interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sources for meaning input</td>
<td>Meaning group</td>
<td>11.7% (26 idea units)</td>
<td>1.8% (4 idea units)</td>
</tr>
<tr>
<td></td>
<td>Meaning</td>
<td>17% (38 idea units)</td>
<td>3.6% (8 idea units)</td>
</tr>
<tr>
<td></td>
<td>Example verbs</td>
<td>21% (47 idea units)</td>
<td>1.3% (3 idea units)</td>
</tr>
<tr>
<td></td>
<td>Example sentences</td>
<td>41.7% (93 idea units)</td>
<td>1.8% (4 idea units)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>91.4% (223 idea units)</td>
<td>8.6% (4 idea units)</td>
</tr>
<tr>
<td>Strategies for meaning making</td>
<td>Compare meanings of patterns</td>
<td>34% (15 idea units)</td>
<td>11.5% (3 idea units)</td>
</tr>
<tr>
<td></td>
<td>Compare example sentences to self-produced sentences</td>
<td>27.3% (12 idea units)</td>
<td>11.5% (3 idea units)</td>
</tr>
<tr>
<td></td>
<td>Substitute interchangeable verbs</td>
<td>22.7% (10 idea units)</td>
<td>69% (18 idea units)</td>
</tr>
<tr>
<td></td>
<td>Imitate example sentences</td>
<td>15.9% (7 idea units)</td>
<td>7.7% (2 idea units)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>44 idea units</td>
<td>26 idea units</td>
</tr>
</tbody>
</table>
As shown in Table 24, under the theme “sources for meaning input,” participants reported predominantly more incidences of positive experience in building form-meaning associations than negative experience across all four sources in both verbal protocols and interviews. As for total idea units of “sources for meaning input,” verbal protocol data included 91.4% positive idea units and only 8.6% negative idea units. Similarly, 98.7% idea units from interview data were positive in contrast to only 1.3% negative idea units. These findings suggested that participants generally had predominantly more positive experiences of building meaning-form association using the four sources of meaning in PAT GRAM than negative experiences.

In addition, even though the explicit instruction provided by PAT GRAM provided participants four different sources for building form-meaning associations so as to facilitate their output, these sources were not equally commented on by participants. An examination of percentages of idea units of the four sources for meaning input revealed that reliance on example sentences reported by participants was remarkably higher (verbal protocols: 41.7% & semi-structured interview: 42.5%) than other sources of meaning input.

The idea units distribution in the four strategies participants mentioned under the theme “strategies of meaning making” are also presented in Table 24. Among the four strategies identified, comparing meanings of patterns (verbal protocols: 34%) and substituting interchangeable verbs (semi-structured interviews: 69%) were reported as the most frequently used strategies in verbal protocols and semi-structured interviews, respectively. The strategy of imitating example sentences was least reported in both verbal protocols (15.9%) and semi-structured interviews (7.7%).
The subsequent sections provide detailed discussion on sources for meaning input and strategies for meaning making. To relate the discussion to specific data, examples of participants’ utterances that were easy to interpret and representative of all other similar utterances were selected.

4.3.2.1. Sources for meaning input

In terms of sources of meaning input, participants relied on meaning group, meaning, example verbs, and example sentences. For each source, participants indicated both positive and negative experiences of meaning construction, as illustrated in the following examples:

**Meaning group.** The introspective data suggested that participants learned the meaning of the patterns or confirmed their prior knowledge of patterns by reading the page containing the meaning groups. The following comments from students’ retrospective verbal protocols and semi-structured interviews illustrate how students recalled their use of the meaning group help:

First, I read the verb pattern “V n to n” and then the “show” group. I checked the meaning I know before from there. (Student 1, retrospective verbal protocol)

I know the meaning of this verb. I read the meaning group. It helped me double check my knowledge of the meaning. (Student 7, retrospective verbal protocol)

While I am reading this front page, I found something that was unfamiliar to me using “out of” of construct. I learned the meaning here, but I just want to know more. (Student 2, retrospective verbal protocol)

I read the pattern and meaning group in the front page together so that I can know the general meaning of the pattern (Student 12, semi-structured interview)

Despite the abundance of positive evidence, there were a few examples of negative evidence. Such evidence revealed two reasons why participants might have failed to obtain meaning of the patterns from the meaning groups. The first reason centered on limited vocabulary knowledge. One participant indicated that having no knowledge of the vocabulary in
one of the meaning groups caused the failure; “Associate here belongs to the ‘associate’ group. I don’t know the meaning of associate, so the it does not help me” (Student 9, retrospective verbal protocol). The other reason indicated that meaning presented in PAT GRAM contradicted participants’ prior knowledge. In this regard, one student reported that the information about the meaning group provided contrasted his/her prior knowledge of patterns’ meaning. This student reported, “I read the meaning group, but I didn’t understand why the verb ‘display’ belongs to ‘the clean group’ ” (Student 11, retrospective verbal protocol). This statement indicated that the participants seemed to lack flexibility when understanding the category of the meaning group, or participants need more exposure to explicit instruction provided by PAT GRAM so as to become more familiarize with the differences between meaning in the dictionary and meaning in PAT GRAM.

**Meaning.** Besides meaning groups, participants also relied on the meaning section in PAT GRAM to obtain the meaning of patterns. Different from meaning groups, which used one or two verbs in a meaning group to represent the whole group, the meaning section provided more detailed explanation of the meaning of a group. Some participants commented on their experience of relying on the meaning sections to build an association between patterns and meaning. Generally, all participants indicated that they were able to understand the meaning of the patterns or confirm the information they obtained from the meaning groups. The following utterances from verbal protocols and interviews exemplify how participants reported their use of the meaning sections in PAT GRAM:

I read “showing something to someone.” It is same to the meaning group and what I expected. (Student 7, retrospective verbal protocol)
When I read the example sentence, I find that the meaning of the words in the example sentences is not similar to what I thought. So I read the meaning part to clarify. (Student 11, retrospective verbal protocol)

When I didn’t know the pattern I definitely read the meaning to understand it. (Student 3, retrospective verbal protocol)

I also relied on the meaning section to make sure I used it in a right way. (Student 10, semi-structured interview)

As reported in the above comments, when reading the meaning section, participants directly extracted the meaning of patterns, compared the meaning section with their prior knowledge, or associated the meaning section with the meaning group.

However, when the meaning section was too long or participants had no knowledge of vocabulary used for explaining the meaning of certain patterns, participants failed to read or understand the meaning of some patterns. One participant reported that he did not read the meaning section, since the explanation was too long (Student 3, retrospective verbal protocol). Another participants failed to understand the meaning of the pattern “associate with n,” due to limited vocabulary; “‘These word are concerned with associating with someone’ I don’t know the meaning of associate, how can I know what associating with someone mean, so that confused me a little” (Student 9, retrospective verbal protocol).

**Example verbs.** According to the introspective data, participants considered example verbs useful in assisting them to (1) expand their vocabulary knowledge and (2) deduce the meaning of the target verb patterns by applying the knowledge that verbs under the same meaning group share a similar meaning. The utterances below demonstrate how participants commented on the usefulness of example verbs:

I read the highlighted verbs. I learned “endeavor” and “attempt” have the same meaning with “try.” (Student 4, retrospective verbal protocol)
I learned that they (“construct” & “fabricate”) have similar meaning with “make” and share the same pattern. It’s efficient to learn. (Student 5, retrospective verbal protocol)

I read the highlighted verbs to get the meaning of the target verbs. (Student 1, semi-structured interview)

If I couldn’t figure out the meaning from meaning and example sentences, I would read example verbs to look at other verbs that can be replaced. (Student 2, semi-structured interview)

Participants also reported failure to relate the target verbs to other example verbs, because 1) participants did not agree that the example verbs should be categorized into the same meaning group or because 2) participants failed to understand the observation of pattern grammar that verbs nested under the same meaning group share a similar meaning. These two reasons can be identified in the following comments made by two participants:

This time no, because I did not know that “abandon” has similar meanings with “attempt”. (Student 11, retrospective verbal protocol)

I did not understand what are the verbs for, so I did not read any of the verbs. (Student 7, retrospective protocol)

**Example sentences.** The introspective data suggested that example sentences provided participants with positive learning experiences by providing contextual meaning of verb patterns. Participants’ comments presented below illustrate how they learned practical use of patterns in sentences by reading example sentences:

I was reading the example sentences. It has “lack” here, so I get some ideas of its meaning and how to use it. (Student 7, retrospective verbal protocol)

I looked at the example sentences directly to get an idea of how to use this pattern, because I know the meaning of this pattern. (Student 5, retrospective verbal protocol)

I went through all the example sentences so that I can make sentences with correct pattern and meaning. (Student 1, retrospective verbal protocol)

I also read the example sentences to learn how to use my verb in sentences. (Student 1, semi-structured interview)
It seemed that when attending to example sentences, participants not only extracted the meaning of target patterns, but also learned how to produce sentences with correct pattern and meaning. This observation suggested that, different from other sources for meaning input, which facilitated learning of receptive knowledge of patterns, example sentences assisted participants in transferring receptive knowledge of patterns to productive knowledge.

However, extracting meaning from example sentences was sometimes frustrating. One participant indicated that he avoided reading example sentences with excessive length; “I remember just like one sentence I didn’t really understand because it was very long” (Student 10, semi-structured interview). Another participant reported that example sentences with high difficulty level prevented him from understanding the meaning, commenting “I read the example sentences, but I could not understand the sentences, so I had to go back to the meaning” (Student 6, retrospective verbal protocol). Also, when the example sentences did not exemplify patterns of the target verb, one participant felt confused, remarking “I read the example sentences. I was trying to find ‘interpret’ first in the example sentences, but it’s not there. So I’m confused” (Student 3, retrospective verbal protocol).

All participants reported that, even though they clearly understood the meaning of the patterns, creating correct and meaningful sentences was still a difficult task. The example sentences provided them with rich contextual meaning, and was thus ranked among the most helpful sources for meaning construction. For this specific study, participants reported having some prior knowledge of the meanings of most patterns, so they tended to skip the other sources, including meaning group, meaning, and example verbs. For instance, Student 8 reported “When I know the meaning of the patterns, I went to the example sentences direct to see how they can be used in real sentences” (Student 8, semi-structured interview). Despite other sources of meaning
being reported less frequently, 11 participants expressed the necessity of keeping them, since when they did not know the meaning of the patterns, they needed to rely on these sources as well.

4.3.2.2. Strategies for meaning making

Besides commenting on the above sources for meaning making, participants also reported using different strategies while navigating through PAT GRAM. To be more specific, they compared meanings of patterns, compared example sentences to their self-produced sentences, substituted interchangeable verbs, and imitated example sentences:

**Compare meanings of patterns.** To compose sentences with different patterns of a verb, participants attempted to compare and distinguish the meaning of patterns. Utilization of this strategy demonstrated that participants understood one of the observations of pattern grammar that different patterns of a verb may have different meanings. The following comments produced by participants in verbal protocols and interviews illustrate their efforts of comparing and contrasting meanings of patterns of a verb:

I also don’t know what’s the difference between *consist of* and *consist in* so I read the meaning. I tried to figure out the difference between these two patterns. (Student 3, retrospective verbal protocol)

I am looking at another pattern “V n out of n,” I was reading the example sentences to compare the meaning of the two patterns. (Student 6, retrospective verbal protocol)

I went back to the front page to compare the two patterns, because I thought the two patterns were similar. (Student 11, retrospective verbal protocol)

I tried to compare the patterns and write different sentences with different pattern and different meanings. (Student 3, semi-structured interview)

I tried to tell the differences between patterns so as to make different sentences. (Student 4, semi-structured interview)
Compare example sentences to self-produced sentences. In the sentence construction activity, participants also applied the strategy of comparing example sentences to their self-produced sentences. This strategy was used by participants to ensure that they composed sentences with the correct meaning of the patterns. The comments listed below were selected from verbal protocol and interview data to illustrate how participants tried to make sure they produced patterns with correct meaning by comparing example sentences to their self-produced sentences:

I was comparing the pattern in the example sentences to my sentence to make sure I have the correct meaning. (Student 5, retrospective verbal protocol)

I read all the example sentences. Every time I read, I compare that to my sentence. I tried to see wrong meaning or pattern, and make change to my sentence. (Student 6, retrospective verbal protocol)

I compare example sentences with my sentences. I examined whether my sentences were correct or not. (Student 1, semi-structured interview)

I just compared my sentence directly with the example sentences to see whether I used correct meaning. (Student 9, semi-structured interview)

Substitute interchangeable verbs. When the target verb pattern was not included in the example sentences, participants attempted to obtain inspiration for constructing sentences by substituting verbs in the example sentences with the target verbs. Utilization of this strategy indicated that participants understood one of the observations of pattern grammar, and that verbs under the same meaning group share a similar meaning. The following utterances selected from verbal protocols and interviews exemplify how participants utilized their knowledge of pattern grammar to facilitate their meaning making:

“Yield” is not there, but I know these verbs have same meaning with “yield,” so I tried to put “yield” in these sentences. (Student 2, retrospective verbal protocol)

I just read the sentences in the paragraph. And find another similar word. (Student 3, retrospective verbal protocol)
I first looked for the target verb in the example sentences. It was not there. I tried to replace “include” with the highlighted verbs in the sentences and tried to make sense of it. (Student 5, retrospective verbal protocol)

I tried to put the highlighted verbs in the example sentences to understand the meaning. (Student 6, retrospective verbal protocol)

If the target verb is not in the example sentences, I substitute my word with the underlined verb in the example sentences to understand how to use it. (Student 9, semi-structured interview)

**Imitate Example sentences.** Even though participants were aware of meaning of patterns, constructing sentences was still difficult for them. For many cases, students composed their own sentences by imitating the example sentences. The following utterances demonstrated participants’ use of the strategy of imitating example sentences:

I learned the meaning of “associate,” but it was difficult to make sentence, so I relied on example sentences to get ideas. (Student 8, retrospective verbal protocol)

I copied the example sentence with “lack,” and then I typed a new sentence with “lack,” kind of similar to the example sentences. (Student 10, retrospective verbal protocol)

I knew the meaning, so I went to the example sentences directly. From there, I learned to how to make sentences with similar meaning. (Student 3, retrospective verbal protocol)

If I can find similar meaning between the target verb and verbs in the example sentences, I will make a sentence based on the example sentence. (Student 10, semi-structured interview)

Evidence of strategies collected from introspective data indicated that participants understood the two important observations of pattern grammar and attempted to use this knowledge actively while consulting PAT GRAM. First, participants were aware that different patterns tend to be associated with different meanings. Therefore, they compared the meanings of the patterns by consulting various sources so as to produce sentences that were comprehensible to others. Also, participants’ knowledge of the principle of pattern grammar, that verbs under the same meaning group tend to share similar meaning, has been demonstrated
through the strategy of substituting interchangeable verbs. Specifically, when the example sentences did not include the target verb, but incorporated other verbs in the same meaning group, participants chose to replace these verbs with the target verb to deduce how the target verb could be used in an authentic context. However, all participants emphasized the importance of providing example sentence(s) for the target verb. When the target verbs were absent from the example sentences, nine participants reported that they were still able to extract meaning from the example sentences by replacing the highlighted verbs in the example sentences with the target verbs, because they grasped the idea that the highlighted verbs and the target verb belong to the same meaning group. One participant, however said, “When the target verb was not in the example sentences, I feel confused” (Student 7, retrospective verbal protocol). Despite the fact that the majority of the participants were able to process meaning embedded in example sentences, they all agreed that the provision of sentences for the target verbs more strongly supported their meaning construction. Besides utilization of the other strategies, “compare example sentences to self-produced sentences” and “imitate the example sentences” also reflected the importance of providing example sentences with the target verb. As reported by six participants in the semi-structured interviews, providing example sentences with the target verb could promote the efficiency of sentence construction, since they would not have to “substitute interchangeable verbs.”

4.3.3. Overall evaluation of meaning focus

Overall, the meaning focus quality of the explicit instruction provided by PAT GRAM was positively evaluated given the evidence collected from Likert-scale questionnaire, retrospective verbal protocols, and semi-structured interviews. Table 25 provides an overview of the overall findings.
Table 25
*Overall Evidence of Meaning Focus*

<table>
<thead>
<tr>
<th>Data source</th>
<th>N of participants</th>
<th>Data</th>
<th>Evidence for MF</th>
<th>No evidence for MF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liker-scale questionnaire</td>
<td>31</td>
<td>Responses to:</td>
<td>Mean = 4.83</td>
<td>Std. = .85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 11: PAT GRAM helped me write meaningful sentences using verb patterns.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 12: PAT GRAM helped me revise my sentences when I used patterns that did not make sense.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 13: PAT GRAM helped me express meanings I intended.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 14: PAT GRAM helped me write sentences that other people can understand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retrospective verbal protocols</td>
<td>12</td>
<td>Transcripts of: 12 verbal protocol recordings</td>
<td>248 idea units (92.8%)</td>
<td>19 idea units (7.2%)</td>
</tr>
<tr>
<td>Interviews</td>
<td>12</td>
<td>Transcripts of: 12 interviews</td>
<td>98 idea units (99%)</td>
<td>1 idea unit (1%)</td>
</tr>
</tbody>
</table>

The Likert-scale questionnaire data showed that generally the participants agreed that the explicit instruction provided by PAT GRAM drew their attention to meaning (mean = 4.83, std. = .85). The meaning focus quality of the explicit instruction provided by PAT GRAM was also evaluated positively according to the introspective data showing a dominant number of idea units as positive evidence (shown in Table 25). Specifically, 92.8% idea units in retrospective verbal protocols were positive, while only 7.2% idea units were negative. Data collected from semi-structured interviews consisted of 99% positive idea units and only 1% negative idea unit. The introspective data also provided in-depth information as to how participants utilized features in PAT GRAM to construct meaning. Generally, to ensure meaningful output, participants relied on all the four sources, especially the example sentences, to establish a form-meaning association. Furthermore, participants actively employed different strategies to ensure that they produced meaningful sentences. In conclusion, the data sources suggested that the meaning focus quality
of explicit instruction provided by PAT GRAM was positively evaluated and explained how a focus on meaning occurred.

4.4. Impact (RQ7)

The impact quality of the explicit instruction provided by PAT GRAM examines the extent to which the sentence revision activity using PAT GRAM positively affects participants. Evidence on the impact quality of the explicit instruction offered by PAT GRAM consisted of 31 participants’ responses to 10 Likert-scale questions and 12 introspective group participants’ responses to semi-structured interviews regarding their perceptions of the impact of the explicit instruction realized through PAT GRAM. Participants’ responses to the questionnaire data indicated that the impact of the explicit instruction offered by PAT GRAM was largely positive. In addition, all idea units in the introspective data suggested a positive impact of the explicit instruction provided by PAT GRAM, including awareness raising, autonomy facilitating, confidence building, and motivation stimulating.

4.4.1. Questionnaire data on impact

Evidence on participants’ perceptions of the impact of the explicit instruction provided by PAT GRAM was first collected from participants’ responses to 10 six-point Likert-scale questions: 1) “PAT GRAM made me realize that knowledge of patterns is important for the correct use of verbs,” 2) I would like to use PAT GRAM to check the patterns of verbs that I know,” 3) “I would like to use PAT GRAM to help me produce correct verb patterns in English,” 4) “I would like to use PAT GRAM to learn about correct patterns of verbs I encounter when reading or listening in English,” 5) “I am more confident in using the verbs covered in the training than I was in the past,” 6) “PAT GRAM encouraged me to use verbs in the future that I was not very confident of using in the past,” 7) “I believe using PAT GRAM frequently can help
me increase the accuracy of my English writing,” 8) “I believe using PAT GRAM frequently can increase my vocabulary size,” 9) “I believe using PAT GRAM frequently can help me learn more patterns of verbs,” and 10) “I believe using PAT GRAM frequently can motivate me to increase my knowledge of verbs and patterns.” Participants’ responses to the Likert-scale questions are presented in Table 26.

Table 26
Participants’ Responses to the Likert-scale Questions (n = 31)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Strongly disagree</th>
<th>Disagree 2</th>
<th>Slightly disagree 3</th>
<th>Slightly agree 4</th>
<th>Agree 5</th>
<th>Strongly agree 6</th>
<th>Mean 6</th>
<th>Std. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. PAT GRAM made me realize that knowledge of patterns is important for the correct use of verbs.</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>12.90%</td>
<td>51.61%</td>
<td>19.35%</td>
<td>5.13</td>
<td>0.67</td>
</tr>
<tr>
<td>21. I would like to use PAT GRAM to check the patterns of verbs that I know.</td>
<td>0%</td>
<td>0%</td>
<td>9.68%</td>
<td>19.35%</td>
<td>51.61%</td>
<td>9.68%</td>
<td>4.77</td>
<td>0.84</td>
</tr>
<tr>
<td>22. I would like to use PAT GRAM to help me produce correct verb patterns in English.</td>
<td>0%</td>
<td>0%</td>
<td>3.23%</td>
<td>19.35%</td>
<td>48.39%</td>
<td>19.35%</td>
<td>5.03</td>
<td>0.79</td>
</tr>
<tr>
<td>23. I would like to use PAT GRAM to learn about correct patterns of verbs I encounter when reading or listening in English.</td>
<td>0%</td>
<td>3.23%</td>
<td>6.45%</td>
<td>19.35%</td>
<td>51.61%</td>
<td>9.68%</td>
<td>4.74</td>
<td>0.93</td>
</tr>
<tr>
<td>24. I am more confident in using the verbs covered in the training than I was in the past.</td>
<td>0%</td>
<td>0%</td>
<td>6.45%</td>
<td>25.81%</td>
<td>45.16%</td>
<td>9.68%</td>
<td>4.74</td>
<td>0.82</td>
</tr>
<tr>
<td>25. PAT GRAM encouraged me to use verbs in the future that I was not very confident of using in the past.</td>
<td>0%</td>
<td>0%</td>
<td>3.23%</td>
<td>29.03%</td>
<td>38.71%</td>
<td>16.13%</td>
<td>4.84</td>
<td>0.82</td>
</tr>
<tr>
<td>26. I believe using PAT GRAM frequently can help me increase the accuracy of my English writing.</td>
<td>0%</td>
<td>0%</td>
<td>3.23%</td>
<td>12.90%</td>
<td>45.16%</td>
<td>25.81%</td>
<td>5.10</td>
<td>0.79</td>
</tr>
</tbody>
</table>
The Cronbach’s \( \alpha \) reliability of the ten questions was .938, indicating that the questions largely measure the same construct. The mean of item means (\( M = 4.93, \ SD = .806 \)) was between “4 slightly agree” and “5 agree,” indicating that participants generally agreed that the explicit instruction using PAT GRAM positively affected their learning of patterns.

### 4.4.2. Introspective data on impact

In addition to 10 Likert-scale questions, the impact of the explicit instruction using PAT GRAM was also assessed through evidence collected from 12 semi-structured interviews. Analysis of the introspective data yielded four different themes, referring to four different impacts of the explicit instruction using PAT GRAM: awareness raising, autonomy facilitating, confidence building, and motivation stimulating. Awareness raising refers to situations where participants became aware of patterns and the importance of grammar patterns in language production. Autonomy facilitating indicates that participants perceived PAT GRAM as useful in facilitating their future individual learning of patterns. Confidence building happened when participants found themselves more confident in using appropriate patterns by consulting PAT GRAM.

Table 26 Continued

<table>
<thead>
<tr>
<th>Impact</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Mean</th>
<th>Std.</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. I believe using PAT GRAM frequently can increase my vocabulary size.</td>
<td>0%</td>
<td>0%</td>
<td>3.23%</td>
<td>12.90%</td>
<td>51.61%</td>
<td>19.35%</td>
<td>5.03</td>
<td>0.75</td>
</tr>
<tr>
<td>28. I believe using PAT GRAM frequently can help me learn more patterns of verbs.</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>16.13%</td>
<td>51.61%</td>
<td>19.35%</td>
<td>5.06</td>
<td>0.68</td>
</tr>
<tr>
<td>29. I believe using PAT GRAM frequently can motivate me to increase my knowledge of verbs and patterns.</td>
<td>0%</td>
<td>0%</td>
<td>9.68%</td>
<td>12.90%</td>
<td>45.16%</td>
<td>19.35%</td>
<td>4.90</td>
<td>0.91</td>
</tr>
</tbody>
</table>
GRAM. Motivation stimulating suggests that the explicit instruction using PAT GRAM motivated participants to use PAT GRAM to learn more grammar patterns. Percentages of idea units under each of the themes and categories underlying each theme are presented in Table 27.

Table 27
Themes and Categories of Impact Identified in Introspective Data (n = 12)

<table>
<thead>
<tr>
<th>Themes</th>
<th>Categories</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness raising (12 idea units, 21.4%)</td>
<td>Awareness of patterns</td>
<td>6 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.71%)</td>
<td>(0%)</td>
</tr>
<tr>
<td></td>
<td>Awareness of importance of patterns</td>
<td>6 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.71%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Autonomy facilitating (22 idea units, 39.3%)</td>
<td>Comparison to other methods</td>
<td>10 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(17.86%)</td>
<td>(0%)</td>
</tr>
<tr>
<td></td>
<td>Anticipation of future use</td>
<td>12 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(21.43%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Confidence building (5 idea units, 8.9%)</td>
<td>Confidence in language accuracy</td>
<td>2 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.57%)</td>
<td>(0%)</td>
</tr>
<tr>
<td></td>
<td>Confidence in communication in English</td>
<td>3 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5.36%)</td>
<td>(0%)</td>
</tr>
<tr>
<td>Motivation stimulating (17 idea units, 30%)</td>
<td>Improved language accuracy</td>
<td>9 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.07%)</td>
<td>(0%)</td>
</tr>
<tr>
<td></td>
<td>Increased variety of expressions</td>
<td>8 idea units</td>
<td>0 idea units</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(14.29%)</td>
<td>(0%)</td>
</tr>
</tbody>
</table>

As shown in Table 27, all of the idea units on impact quality of the explicit instruction using PAT GRAM were identified as positive, strongly supporting the positive impact of using PAT GRAM for learning grammar patterns. A more insightful discussion on impact of using PAT GRAM is presented and discussed in the subsequent paragraphs, referring to each theme identified in the introspective data. Participants’ comments that were easy to interpret and representative of all related comments were cited.

**Awareness raising.** The awareness raising impact of the explicit instruction using PAT GRAM indicates that the sentence revision activity using the system raised students’ awareness of patterns and their importance in language learning. Analysis of the introspective data
suggested that explicit instruction using PAT GRAM was successful in this regard, since all participants reported that their awareness of patterns and importance of patterns was increased by the explicit instruction provided by PAT GRAM to some extent.

Participants’ report of their awareness of patterns included their first realization of what the patterns are and the two important observations of pattern grammar. Ten out of 12 participants pointed out that they were introduced to the concept of patterns for the first time. For example, one remarked “I never used them [patterns], and also I did not know what are patterns. I learned them from PAT GRAM. I got a lot of things about patterns from PAT GRAM” (Student 2, semi-structured interview). When discussing the awareness of patterns, another participant emphasized the awareness of two observations of pattern grammar, saying “I learned one verb has different meanings and under what situations it has different meanings” (Student 12, semi-structured interview). Further, other participants added that awareness of the two observations of pattern grammar provided them alternatives of expressions for an intended meaning, and thus increased the variety of participants’ language repertoire. This point of view can be illustrated in Student 5’s utterance, “I learned that many verbs have the same meaning from using PAT GRAM, so I don’t have to use the same verb [pattern] again and again for the same meaning. I can use different verb [patterns] with the similar meaning” (Student 5, semi-structured interview).

Besides the awareness of patterns, all participants realized the importance of patterns after using PAT GRAM. For example, one participant pointed out “I think patterns are important to me” (Student 3, semi-structured interview). Participants also mentioned their perceptions of the importance of patterns, including the ubiquity of patterns in the English language and their importance to meeting communicative needs.
Ten participants reported their realization of the ubiquity of patterns in the English language and judged patterns as the fundamentals of English language. For example, one participant emphasized “As a language learner, I think knowledge of patterns is important, because that’s the basis of sentences and paragraphs” (Student 1, semi-structured interview). Four participants, on the other hand, related the importance of knowledge of patterns to communicative needs. Student 10 pointed out that incorrect pattern use may cause miscommunication, stating “A single word can be used in different ways it is important to know how to use them. If you don’t use the correct patterns, people misunderstand you” (Student 10, semi-structured interview). Two other participants perceived knowledge of patterns as fundamental to productive skills, including speaking and writing: “Patterns are really important because if we know how to use the pattern you can use it in different ways, and you can use it when talking or writing,” (Student 2, semi-structured interview) and “PAT GRAM made me realize the importance of patterns, because it is connected to our daily life. When we speak or write, we need to use correct patterns” (Student 4, semi-structured interview). Specific to students learning English for academic purpose, one participant found it “important for language learners to learn patterns because he [I] think the knowledge of patterns can make our writing more academic and formal” (Student 11, semi-structured interview).

**Autonomy facilitating.** In addition to raising participants’ awareness of patterns and the importance of patterns, introduction to PAT GRAM was also considered helpful in facilitating autonomy of learning patterns by nine out of the 12 participants. First, participants appraised the autonomy facilitating impact of the explicit instruction using PAT GRAM by comparing it to their previous methods of learning patterns. Participants suggested that the explicit instruction using PAT GRAM showed great potential for facilitating autonomous learning of patterns, since
the program provides convenient access to explicit knowledge of patterns. Before this training, most participants learned patterns by either checking online resources or memorizing the patterns that their teachers highlighted from textbooks. However, both methods had limitations in facilitating participants’ autonomy of learning patterns, limitations that PAT GRAM could potentially contribute to resolving. As reported by participants, checking online resources, such as online dictionaries, required them to spend more time and effort to identify patterns, but for patterns not explicitly specified, they expressed lower confidence in identifying patterns correctly. PAT GRAM, on the other hand, presented patterns explicitly and provided sentences as examples which, participants claimed, helped to more sufficiently facilitate their self-learning. Although, compared to checking online resources, patterns highlighted by teachers in traditional classrooms tended to be more explicit, participants found it difficult to retrieve knowledge of patterns when they forgot. The following comments reflect these assumptions by participants:

PAT GRAM can make us learn by ourselves and you can just choose the verb that you want to know about and learn it. Previously, the teacher gave me a lot of patterns to memorize. (Student 1, semi-structured interview)

It is more time efficient and allows me to figure out the patterns in a more efficient way. Before I have to memorize. If I forgot, it was big problem. (Student 3, semi-structured interview)

In the previous learning, if I do not know the patterns I will try to surf the internet to check. However, when I use PAT GRAM, I think it is easier for me to check, because patterns are presented clearer in PAT GRAM than other online resources. (Student 4, semi-structured interview)

Besides the advantages of explicit instruction using PAT GRAM over participants’ traditional methods of learning patterns noted above, learners also pointed out that meaning groups made the explicit instruction provided by PAT GRAM unique in promoting the efficiency of self-learning since participants could simultaneously learn related verbs with the same meanings and patterns. For instance, Student 5 mentioned “we used to learn patterns from
textbooks, which told us the meaning of patterns and provide us with examples. However, the explicit instruction provided by PAT GRAM offered a more efficient way of learning patterns through introducing the groups of related verbs [meaning groups]” (Student 5, semi-structured interview). Student 6 perceived the feature offering meaning groups as “professional,” “PAT GRAM is more professional because it has related verbs grouped under meaning groups” (Student 6, semi-structured interview).

In addition to emphasis on the advantages of PAT GRAM, participants also anticipated their future use of PAT GRAM to facilitate their autonomy of learning patterns. They related learning patterns using PAT GRAM to contexts where they need to produce. The following comments expressed participants’ picturing of their future use of PAT GRAM to construct meaning and learn grammar patterns:

When writing an essay, I can check PAT GRAM for correct patterns and use them in my writing. (Student 6, semi-structured interview)

I will use PAT GRAM for writing. When reading, you don’t have to remember the patterns to understand, but for writing, I always feel I don’t know the patterns. (Student 8, semi-structured interview)

Sometimes I was not sure whether I use correct patterns in my speech, so by using PAT GRAM I can check patterns. It (PAT GRAM) is also useful for writing an essay or a paper, so I would like to use it as a reference. (Student 9, semi-structured interview)

**Confidence building.** Another impact of the explicit instruction using PAT GRAM identified from the interview data is that participants’ confidence in pattern use was promoted. Confidence building involved (1) confidence in the accuracy of specific patterns and (2) confidence in communication in English. Three participants reported that when writing an essay, it occurred to them frequently that they did not know how to use certain verbs or patterns. They could foresee themselves using PAT GRAM to make grow confidence in their use of patterns. For example, Student 1 mentioned that “In our writing sometimes we do not know how to use
some verbs or use the patterns, so when we want to revise our work, we can check PAT GRAM. That will make me more confident about my pattern use” (Student 1, semi-structured interview). Another comment resonated this assumption; “When I need to produce sentences, speaking and writing, I would like to double check patterns using PAT GRAM, so that I am confident that I am using patterns correctly” (Student 5, semi-structured interview).

Besides the fact that participants indicated their confidence in the accuracy of specific patterns was successfully built, they also suggested that their confidence in communication using English was promoted. For example, participants stated that “Using PAT GRAM to learn patterns will make me more confident to speak and write” (Student 12, semi-structured interview), and “I think I will be more confident to communicate, if I learn more patterns using PAT GRAM. My language will be more understandable” (Student 7, semi-structured interview).

Motivation stimulating. Most of the participants (nine out of 12) indicated that the sentence revision activity using PAT GRAM successfully motivated them to continue to use PAT GRAM to learn patterns in their future study. Participants attributed the motivation of learning patterns to their realization that using PAT GRAM can help them express themselves in a more professional manner. The following comments illustrate this viewpoint: “I am concerned about verb patterns. I think those patterns helped me to write professionally” (Student 2, semi-structured interview),” and “It (PAT GRAM) will help me to write in a more professional way” (Student 3, semi-structured interview).

Participants further explained that the explicit instruction using PAT GRAM could help them write more professionally, since the explicit instruction provided by PAT GRAM could assist their production of accurate patterns and increase the variety of their expressions. Some participants emphasized their motivation for using PAT GRAM in checking accurate patterns.
For example, Student 1 commented “I think PAT GRAM is really helpful so I will continue to use it to make sure I use correct patterns” (Student 1, semi-structured interview). Another participant also expressed similar thoughts; “I think PAT GRAM helped me to write professionally because I could check if I used patterns correctly” (Student 2, semi-structured interview).

According to participants, they could write more professionally using PAT GRAM also because the explicit instruction provided by PAT GRAM increased the variety of patterns in participants’ writing by helping them learn more patterns of individual verbs and more patterns sharing similar meanings. This perception is illustrated in the following comments:

Using PAT GRAM will help me to write more professionally, since it allows me to use different patterns of verbs in my writing rather than sticking to certain verbs and patterns. (Student 3, semi-structured interview)

Sometimes I want to use words that share the same meaning, PAT GRAM will also be helpful to provide me a variety of verbs that serve the same meaning. (Student 5, semi-structured interview)

I would like to continue to use PAT GRAM to memorize more patterns, so that I can use different patterns of certain verbs. For example, before, if I use “adapt”, I would use “adapt something”. If I have access to PAT GRAM, I can use different patterns of adapt. (Student 9, semi-structured interview)

4.4.3. Overall evaluation of impact

Overall, evidence collected from Likert-scale questions and semi-structured interviews positively supports the impact quality of the explicit instruction using PAT GRAM, suggesting that generally the sentence revision activity using PAT GRAM positively affected participants’ learning of grammar patterns. Table 28 summarizes the supporting evidence:
Table 28  
*Summary of Evidence on Impact*

<table>
<thead>
<tr>
<th>Data source</th>
<th>N of participants</th>
<th>Data</th>
<th>Evidence for impact</th>
<th>No evidence for impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likert-scale questionnaire</td>
<td>31</td>
<td>Responses to:</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 20: PAT GRAM made me realize that knowledge of patterns is important for the correct use of verbs.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 21: I would like to use PAT GRAM to check the patterns of verbs that I know.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 22: I would like to use PAT GRAM to help me produce correct verb patterns in English.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 23: I would like to use PAT GRAM to learn about correct patterns of verbs I encounter when reading or listening in English.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 24: I am more confident in using the verbs covered in the training than I was in the past.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 25: PAT GRAM encouraged me to use verbs in the future that I was not very confident of using in the past.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 26: I believe using PAT GRAM frequently can help me increase the accuracy of my English writing.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 27: I believe using PAT GRAM frequently can increase my vocabulary size.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 28: I believe using PAT GRAM frequently can help me learn more patterns of verbs.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Q-n 29: I believe using PAT GRAM frequently can motivate me to increase my knowledge of verbs and patterns.</td>
<td>Mean = 4.935</td>
<td></td>
</tr>
<tr>
<td>Semi-structured interviews</td>
<td>12</td>
<td>Transcripts of: 12 semi-structured interviews</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>56 idea units</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0%</td>
<td>0 idea units</td>
</tr>
</tbody>
</table>

As summarized in Table 28, data collected from the Likert-scale questionnaire yielded positive evidence for impact, since the mean of item means (*Mean* = 4.93) was slightly lower than “5 agree.” All idea units in the introspective data indicated positive evidence for impact. In addition, qualitative analysis of the introspective data suggested that the explicit instruction using PAT GRAM positively affected participants’ learning of patterns in four aspects: awareness raising, autonomy facilitating, confidence building, and motivation stimulating.
4.5. Chapter Summary

This chapter presented results concerning four qualities of the explicit instruction provided by PAT GRAM: language learning potential, learner fit, meaning focus, and impact. The data used to evaluate these qualities included 61 participants’ pretest and posttest scores on knowledge of grammar patterns, 31 treatment group participants’ responses to Likert-scale questions, and 12 introspective group participants’ responses to retrospective verbal protocols and semi-structured interviews.

All sources of evidence suggested that the four qualities of the explicit instruction provided by PAT GRAM were positively evaluated. The quality of language learning potential was evaluated through four aspects: acquisition of patterns, accuracy of pattern use, attention to patterns, and perceptions of learning. Since the treatment group participants’ test scores improved significantly and the contrast group participants’ test scores did not improve significantly, it can be concluded that the explicit instruction offered by PAT GRAM was effective in helping participants learn grammar patterns. The explicit instruction provided by PAT GRAM also facilitated accurate pattern use, because the treatment group participants’ scores on their second attempt (after using PAT GRAM) in the sentence revision task were significantly higher than scores from their first attempt (before using PAT GRAM). In addition, 77.73% of revisions were successful. The other two aspects, attention to patterns and perceptions of learning, were also greatly supported, given that participants generally “agreed” (1) that the explicit instruction provided by PAT GRAM drew their attention to patterns, and (2) that they successfully learned knowledge of grammar patterns, according to the questionnaire data. Additionally, the majority of the idea units in the introspective data supported these two aspects of language learning potential quality.
The learner fit, meaning focus, and impact qualities were also evaluated positively in both the questionnaire data and the introspective data. The questionnaire data suggested that the participants generally acknowledged that the explicit instruction provided by PAT GRAM (1) was appropriate for their proficiency level, (2) drew their attention to meaning of patterns, (3) and had a positive impact on their language learning. Also, a dominant number of idea units in the introspective data revealed that the explicit instruction using PAT GRAM (1) generally fitted the participants’ proficiency level and facilitated their needs for sentence revision and construction, (2) successfully drew participants’ attention to patterns and their meaning simultaneously, and (3) had the following positive impact on participants: awareness raising, autonomy facilitating, confidence building, and motivation stimulating.
CHAPTER 5: CONCLUSION

The purpose of this multiple-case study was to evaluate the appropriateness of using PAT GRAM to help participants learn grammar patterns of academic verbs through sentence revision. Following Chapelle’s (2001) evaluation framework, this final chapter summarizes the findings with reference to four aspects of appropriateness of CALL tasks: language learning potential, learner fit, meaning focus, and impact. Positive evidence collected in these interdependent aspects strongly supported the appropriateness of using PAT GRAM. Following the summary of findings, the limitations of this study are discussed to facilitate a more comprehensive understanding of the results. Afterwards, implications for theory, research, language pedagogy, and tool development are presented. Finally, possible future research is recommended and final conclusions are drawn.

5.1. Evaluation of PAT GRAM Following Four Criteria

The appropriateness of the explicit instruction provided by PAT GRAM for the target participants was evaluated following four criteria in Chapelle’s (2001) framework for CALL tasks appropriateness. The quality of the explicit instruction realized through PAT GRAM in terms of the four criteria—language learning potential, learner fit, meaning focus, and impact—is summarized in the subsequent sections.

5.1.1. Language learning potential

To explore the language learning potential quality of the explicit instruction provided by PAT GRAM, the following four research questions were raised: (1) What evidence suggests that the learners have acquired the patterns of target academic verbs when using PAT GRAM? (2) What evidence suggests that the accuracy of students’ use of patterns of academic verbs has
improved through interaction with PAT GRAM? (3) What evidence indicates that PAT GRAM draws students’ attention to the patterns of target academic words? (4) How do students perceive their learning through using PAT GRAM? These research questions were addressed by collecting and analyzing quantitative and qualitative data. Quantitative data included all 61 participants’ (31 treatment group participants and 30 contrast group participants) pretest and posttest scores and the 31 treatment group participants’ sentence revisions and responses to Likert-scale questions. Qualitative data consisted of semi-structured interviews and retrospective verbal protocols produced by 12 introspective group participants purposefully selected from the treatment group. Generally, all data sources yielded evidence supporting the language learning potential quality of the explicit instruction offered by PAT GRAM in terms of four different aspects: acquisition of patterns, accuracy of pattern use, attention to patterns, and perceptions of learning. Some negative evidence, nevertheless, emerged and shed light on future tool and activity development.

The first supporting evidence of the language learning potential quality of the explicit instruction provided by PAT GRAM demonstrated that the sentence revision activity using PAT GRAM successfully facilitated treatment group participants’ acquisition of patterns. This evidence was based on the results that the treatment group improved significantly between the pretest and the posttest, whereas the contrast group showed no significant improvement.

The second aspect of the language learning potential quality of the explicit instruction provided by PAT GRAM, accuracy of pattern use, was also evaluated positively, given (1) participants’ significant higher grades on their second attempt (after using PAT GRAM) in the sentence revision task than their first attempt (before using PAT GRAM), and (2) a high percentage (77.73%) of successful revision.
In terms of the third aspect, attention to patterns, the questionnaire data indicated that participants agreed that the explicit instruction offered by PAT GRAM successfully drew their attention to grammar patterns in the sentence revision task. Also, a dominant number of idea units (97.6%) in the introspective data supported the aspect of attention to patterns. Evidence collected from the retrospective verbal protocols also suggested that the features of PAT GRAM, highlighted patterns and verbs, and the example sentences with target verbs highlighted were able to direct participants’ attention to verb patterns. Besides these supports, introspective data also identified modified output as the condition that directed participants’ attention to target forms. However, a small portion of idea units (2.4%) pointed out reasons that PAT GRAM failed to draw participants’ attention to patterns. These reasons included: (1) participants were not familiar with the symbols of grammar patterns; (2) the target verbs, rather than patterns in the example sentences, were highlighted; and (3) participants were paying full attention to meaning and did not have a chance to attend to patterns.

Finally, participants’ perceptions of learning were largely positive given high ratings in Likert-scale questions (Mean = 5.08) and 95.65% idea units in introspective data indicating positive perceptions of learning experience with PAT GRAM. The introspective data also suggested that participants learned knowledge of patterns, the observation of patterns under the same meaning group from pattern grammar perspective (i.e. “The different senses of words will tend to be distinguished by different patterns, and particular patterns will tend to be associated with lexical items that have particular meanings” (Hunston & Francis, 1999, p. 83).), and contextual uses of patterns from the explicit instruction using PAT GRAM. Only one participant failed to understand that the verbs under the same meaning group share the same pattern and similar meaning.
5.1.2. Learner fit

The discussion of the learner fit quality of the explicit instruction realized through PAT GRAM intended to address the research question: What evidence suggests that the explicit instruction provided by PAT GRAM is appropriate for the target group EAP students? Both positive and negative evidence was found in participants’ responses to Likert-scale questions, semi-structured interviews, and retrospective verbal protocols. Positive evidence surpassed negative evidence in that (1) participants generally “agreed” that the explicit instruction offered by PAT GRAM fit their proficiency level (and that (2) the number of idea units supporting the learner fit quality greatly exceeded those suggesting non-fit.

According to the introspective data, the majority of the participants perceived the explicit instruction provided by PAT GRAM as easy to understand, useful, and facilitative for sentence revision and construction and vocabulary acquisition. Nevertheless, a small percentage of idea units (16.19% in retrospective verbal protocols and 14.62% in semi-structured interviews) suggested that participants sometimes found words in PAT GRAM difficult to understand. They also encountered difficulties in judging the correctness of patterns they produced, identifying unused patterns and producing sentences with target patterns.

5.1.3. Meaning focus

In terms of the meaning focus quality of the explicit instruction provided by PAT GRAM, the research question posed was: What evidence indicates that PAT GRAM is able to draw students’ attention to meanings of the grammar patterns of the academic verbs? All data sources, including Likert-scale questions, retrospective verbal protocols, and semi-structured interviews, yielded positive evidence concerning the meaning focus quality of the explicit instruction provided by PAT GRAM. Specific to Likert-scale question responses, participants
generally agreed that the sentence revision activity using PAT GRAM attracted their attention to meanings of patterns. Also, a dominant percentage of idea units (91.4% in the retrospective verbal protocols and 98.7% in the semi-structured interview) in introspective data were identified as positive evidence of meaning focus.

Analysis of the introspective data further revealed that participants relied on four different sources in PAT GRAM for meaning input: meaning group, meaning, example verbs, and example sentences. In addition, since meaning of patterns was not always straightforward, participants utilized four different strategies to deduce meaning of patterns and construct meaning. These strategies included: comparing meanings of patterns, comparing example sentences to self-produced sentences, substituting interchangeable verbs, and imitating example sentences. Utilization of these strategies indicated that even though the explicit instruction realized through PAT GRAM provided sufficient support for focus on meaning, knowledge of the two important observations of pattern grammar was also indispensable for participants to use PAT GRAM efficiently.

5.1.4. Impact

The research question targeting the impact quality of the explicit instruction provided by PAT GRAM was: What evidence indicates that learning patterns of academic verbs using PAT GRAM provides students with a positive impact? Both data sources, Likert-scale questions and semi-structured interviews, yielded positive evidence. First, results from an analysis of the questionnaire data indicated that participants generally acknowledged that the explicit instruction using PAT GRAM positively affected their language learning. According to the interview data, the sentence revision activity using PAT GRAM positively affected participants’ language learning in several aspects: awareness-raising, autonomy-facilitating, confidence-building, and
motivation-stimulating. To be more specific, the experience of using PAT GRAM raised participants’ awareness of grammar patterns and their importance in the English language. Participants also foresaw that the explicit instruction realized through PAT GRAM would facilitate their self-learning of grammar patterns and help them build confidence in pattern use and communication. Finally, participants perceived PAT GRAM as effective in stimulating their motivation for expressing themselves in a more professional manner.

5.2. Limitations

Despite that positive evidence was collected to support the appropriateness of PAT GRAM use, low generalizability restricts findings on the treatment group’s improvement in knowledge of grammar patterns to this specific context only. Since there were only four sections offered in the semester during which this study took place in this first-year college level writing class, random assignment of groups was not achievable. The current design of assigning two sections taught by the same teacher to the treatment group and the contrast group separately was the most appropriate based on the context. Although compared to most case studies, this study included a comparatively larger number of participants (31 treatment group participants and 30 control group participants), a lack of randomization in assigning groups still restricted the generalizability of the results.

Another limitation with this dissertation was the limited amount of time devoted to treatment and data collection. To achieve a context-specific evaluation of the explicit instruction provided by PAT GRAM, this study was conducted in a real, first-year college level writing class. This class already had in place an intensive curriculum, so the time granted for treatment and data collection was highly compressed. Due to these time limits, instruction accomplished in this study only covered patterns of 13 verbs. Despite the target verbs and their patterns being
carefully selected to be representative of frequent academic verbs, inclusion of more patterns will function more effectively in representing the frequent academic verbs. Finally, if more time would be granted to this study, a delayed posttest could be administered to track participants’ long-term retention of grammar patterns.

5.3. Implications and Recommendations

This dissertation project yields implications for theory, research, language pedagogy, and language learning tool modification. First, utilization of SLA theories in the design of PAT GRAM emphasizes the importance of combining theories to understand language learning, demonstrates the usefulness of cognitive interactionist theories in explaining language learning in CALL contexts, and predicts long-term benefits of learning grammar patterns through PAT GRAM. Second, the successful evaluation of the explicit instruction offered by PAT GRAM highlighted the necessity of using Chapelle’s (2001) framework in CALL evaluation research. Then, following the pedagogical implications for future use of PAT GRAM, implications on further development of PAT GRAM are discussed.

5.3.1. Implications for theory

This dissertation has established that input processing theory only explains language learning partially and needs to be understood together with other theories on language learning (VanPatten, 2007). Input processing theory suggests that learners, as limited capacity processors, prioritize content words over noncontent words during moment-by-moment processing. Even though the learner does process noncontent words, processors responsible for data storage may not be ready to utilize them (VanPatten, 2007). Findings in this research add to this understanding of how learners make form-meaning connections by demonstrating that explicit instruction offered by PAT GRAM scaffolded learners’ successful processing of content words.
and noncontent words simultaneously as units for meaning-making. Accordingly, explicit instructions can be designed following language learning theories to promote learners’ processing ability.

Findings from this dissertation further demonstrated that the cognitive interactionist theories can be applied to explain language learning in computer-assisted language learning contexts. The process of learning specified in cognitive interactionist theory, including input, pushed output, feedback, modified output, and noticing, was clearly reflected in this study. As observed in this study, modified output, cues (highlighting functions), and information provided in PAT GRAM successfully drew participants’ attention to the target patterns during the sentence revision activity. Also, triggered by noticing of patterns absent from participants’ output or used incorrectly, participants attempted to produce sentences (pushed output) and revise sentences (modified output). Prior to sentence production and revision, participants made efforts to understand feedback provided by PAT GRAM by reading and applying different strategies. These scenarios of the learning offered causal explanations of treatment group participants’ significant improvement in knowledge of grammar patterns.

Although the general human learning theories were not directly observed in this study, incorporation of these theories supports long-term use of PAT GRAM and many other CALL tools in general. The Associative-Cognitive CREED states that explicit learning establishes the initial form-meaning mappings, which are gradually integrated into learners’ interlanguage through subsequent input, where frequency plays a role. Skill acquisition theory, on the other hand, indicates that skills, including language, are learned through practice, which scaffolds development of knowledge first from declarative knowledge to procedural knowledge, and finally to automatic knowledge. Corresponding to these theories, participants commented that
adopting PAT GRAM in future independent use could help them produce more accurate and professional writing. A more direct utilization of these theories may occur in longitudinal studies that relate participants’ devotion to practice using PAT GRAM to their improvement in pattern production.

5.3.2. Implications for research

This dissertation calls for context-specific CALL evaluation by adopting Chapelle’s (2001) framework of CALL appropriateness. Previous studies on CALL evaluation that intended to generalize results to other similar contexts yielded contradictory results (effective or ineffective) and attributed the contradictory results to learner variables, including learners’ different learning styles, cultural background, age, and other linguistic or non-linguistic characteristics. Such research, therefore, failed to provide a clear answer in terms of quality of CALL applications. Context-specific evaluation, on the other hand, investigates whether a certain CALL material or activity is appropriate for a certain group of participants, thus obviates the need of controlling or explaining various learner variables.

Further, the comprehensive evaluation of the explicit instruction realized through PAT GRAM manifests the usefulness of Chapelle’s (2001) framework in incorporating both judgmental evaluation and empirical evaluation, which includes learning outcome data and learning process data, in a systematic manner. Specifically, the inclusion of retrospective verbal protocols allowed a timely response to the call for learning process data. Learners’ self-report of what they were doing during the sentence revision activity using PAT GRAM provided insight into their use of PAT GRAM. In addition, learning process data served to explain in what aspects the explicit instruction provided by PAT GRAM was appropriate or not appropriate for the target
group learners. This information is invaluable for further tool development, activity design, and user training.

5.3.3. Implications for pedagogy

In addition to implications for research, this dissertation carried pedagogical implications. Contemporarily, data driven learning (DDL) is recognized as a method available for teaching phraseological features, including grammar patterns. Nevertheless, the inductive approach associated with DDL may not cater to learners who prefer explicit instruction. Therefore, the introduction of PAT GRAM, which provides explicit knowledge of grammar patterns, may complement the DDL approach so as to benefit learners of different cognitive styles.

Another important pedagogical implication derived from this dissertation is the necessity of treatment prior to using PAT GRAM to learn patterns. The term grammar pattern is new to most language learners. In this study, there were incidences when some participants failed to tell the difference between two similar patterns. Therefore, time needs to be devoted to familiarizing students with the definitions of patterns. In addition, the two important observations of pattern grammar are indispensable for fully utilizing PAT GRAM. Even though a short training was provided, some participants could not utilize the two observations. Given that most students had very little previous experience in learning patterns in a manner specified by pattern grammar, careful training or teacher intervention are necessary for successful implementation of PAT GRAM.

5.3.4. Implications for tool development

Findings from this study hold important implications for further development of and modification to PAT GRAM. First, highlighting the target patterns in example sentences not just the target verbs may increase the chances of allocating learners’ attention to patterns greatly.
participant commented on the necessity of highlighting patterns, because she found herself forgetting the specific pattern she focused on when reading example sentences. Even though this unsuccessful experience was not reported by other participants, highlighting the target patterns should be able to direct more participants’ attention to the target patterns, and thus enhance their learning.

Providing the exact meaning of patterns is another implication for tool modification. There were incidences when participants found some meaning groups confusing, because (1) some participants preferred exact meanings for clear understanding, and (2) some meaning groups did not fully represent the meanings of all verbs under the same meaning group. Therefore, adding exact meanings of patterns could promote PAT GRAM to reach a wider audience.

In addition to adding exact meanings of patterns, further development of PAT GRAM may seek to flag suspicious pattern use so as to help learners achieve a higher rate of successful sentence production or revision. Modification to PAT GRAM following this implication can be beneficial, since some participants expressed their difficulties in identifying the patterns that they failed to use or used incorrectly. Computational methods that are widely used in current automated writing evaluation systems are likely to contribute to the goal of locating suspicious pattern use.

Finally, results from this dissertation emphasize the importance of adding example sentences to facilitate the learning of grammar patterns. The introspective data suggested that participants relied heavily on example sentences to understand the practical use of patterns and construct sentences with appropriate patterns. The current version of PAT GRAM did not provide example sentences for patterns of each verb covered, because either (1) the book that
PAT GRAM is based on did not do so, or (2) the developer of PAT GRAM truncated the example sentences for simplicity of display. When the patterns of target verbs were not provided any example sentences, participants found it more challenging to construct their own sentences. To support learning of grammar patterns more effectively, inclusion of more example sentences in future versions of PAT GRAM is definitely essential. This could be achieved by linking patterns of each example verb to an external concordancer where concordance lines of the target patterns are extracted automatically using computational language.

5.4. Directions for Future Research

Future research should continue to explore different pedagogical uses of PAT GRAM beneficial to L2 students, since the successfulness of language learning largely depends on pedagogical use of CALL tools (Chen & Cheng, 2008; Hyland, 2003). The specific activity in this study, sentence revision using PAT GRAM, exemplified only one possibility for implementing this newly developed CALL tool. There are, however, various uses of this tool that have yet to be explored and evaluated. Since learning of grammar patterns has not yet been incorporated into the authentic classroom, this current study was actually somewhat detached from the instructional context. Therefore, it will be interesting to explore how students use PAT GRAM to revise their in-class writing assignments. Also, reading comprehension accompanied by glossary functions of CALL tools has been one of the most frequently reported activities for facilitating vocabulary acquisition. The value of the combination of PAT GRAM and reading comprehension activity in vocabulary learning is also worth further exploration.

Future context-specific evaluation of the explicit instruction provided by PAT GRAM could also consider collecting other stakeholders’ perceptions of the usefulness of PAT GRAM in promoting students’ productive vocabulary knowledge. Widespread acceptance of PAT
GRAM and pattern grammar has always been the ultimate goal of this research, whereas, achievement of this goal needs to be proceeded by hearing voices of other stake-holders, such as teachers, course coordinators, and administrators. Perspectives from different stakeholders are likely to provide a more comprehensive evaluation of the explicit instruction realized through PAT GRAM and more clear suggestions on modification of PAT GRAM.

Moreover, future studies should investigate the effectiveness of PAT GRAM in promoting other aspects of language learning besides accuracy. It is claimed that learning patterns has the potential of promoting four crucial aspects of language learning: understanding, accuracy, fluency, and flexibility (Hunston et al., 1997). This current study, focusing exclusively on accuracy, was somewhat narrow in terms of research scope. It is, therefore, expected to see more studies exploring the extent to which learning patterns using PAT GRAM improves students’ English in terms of understanding, fluency, and flexibility.

One difficulty that emerged from constructing the methodology of this current study may also inspire future studies on teaching and learning grammar patterns. From the perspectives of corpus linguistics and language pedagogy, frequency plays an essential role in prioritizing certain language elements. The ideal plan of selecting verb patterns for instruction was to select the most frequent verb patterns in an academic context. However, currently there exists no such pattern list that can be used to inform teaching and learning of patterns. In alignment with other attempts to create lists of multiple word units (e.g., lists of frequent collocations and lexical bundles), future research on grammar patterns can endeavor to empirically derive lists of grammar patterns that frequently occur in various contexts so as to inform students’ learning of grammar patterns. Specific to an EAP context, a list of frequent patterns will function to complement the widely used EAP word lists (e.g., the Academic Word List and the New
Academic Vocabulary List) that organize individual word forms based on their frequency. Furthermore, comparisons between experts’ and learners’ use of patterns and comparisons of frequent patterns across disciplines can better guide teaching and learning of patterns, and thus deserves future attention.

5.5. Conclusion

In conclusion, this dissertation contributes to the teaching of English vocabulary, specifically grammar patterns, by creating a pattern grammar-inspired, CALL tool—PAT GRAM. PAT GRAM has shown promise, since the explicit instruction it provided was positively evaluated, as revealed in evidence collected following the criteria specified in Chapelle’s (2001) framework. Adoption of Chapelle’s (2001) evaluation criteria for CALL task appropriateness in this dissertation sets an example for future CALL evaluation studies. This framework guides researchers to conduct context-specific evaluation and incorporate learning process data, both of which were sparsely covered in current CALL evaluation literature. The context-specific evaluation of the explicit instruction realized through PAT GRAM responded to a very meaningful question of whether the explicit instruction offered by PAT GRAM was appropriate for the current participants, and learning process data provided in-depth knowledge pertaining to the appropriateness of the explicit instruction using PAT GRAM.

The current successful implementation of PAT GRAM contributed to connecting important findings in corpus linguistics and language teaching. Although the theory of pattern grammar has been claimed as effective in promoting learners’ knowledge of grammar patterns, no empirical study, to the researcher’s knowledge, reported on the effectiveness of teaching grammar patterns following the pattern grammar theory. This dissertation filled this gap and adventured to using technology to realize the goal of teaching grammar patterns.
Finally, The explicit instruction realized through PAT GRAM provides an alternative to inductively learning grammar patterns, as exemplified in DDL. Inductive learning of an aspect of phraseology (including grammar patterns) can be very problematic (Vannestal & Lindquist, 2007), since it is difficult for students to extrapolate the tendencies in language given conflicting examples that students may encounter (Flowerdew, 2009; Hunston & Francis, 2000) and the daunting number of concordance lines required for the extrapolation (Coxhead, 2008). Explicit instruction provided by PAT GRAM, therefore, may contribute to solving these issues and complement inductive learning of grammar patterns.
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APPENDIX A: IRB APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

Date: 10/10/2014
To: Hong Ma
439 Ross Hall

From: Office for Responsible Research
Title: Evauate a Pattern Grammar Inspired CALL Gloss Tool
IRB ID: 14-489

Study Review Date: 10/9/2014

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
  - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
  - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- You do not need to submit an application for annual continuing review.

- You must carry out the research as described in the IRB application. Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. Only the IRB or designees may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

Please be aware that approval from other entities may also be needed. For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.
APPENDIX B: DEMOGRAPHIC SURVEY

Your age:  Gender:  Nationality:  Native language:

Degree pursuit:  Major:  TOEFL score:  Years of English learning:

What level is your knowledge of academic verbs?

Excellent  very good  good  fair  poor
APPENDIX C: TARGET VERBS, PATTERN-MEANING GROUP COMBINATIONS & EXAMPLE VERBS

attempt, associate, consist, construct, display, ensure, imply, include, interpret, lack, result, transform, yield.

- V: a verb group
- Be V-ed: a passive consisting of any form of the verb be and a past participle
- n: a noun group
- wh: a finite clause beginning with a wh-word
- to-inf: the to-infinitive form of a verb or a clause beginning with a to-infinitive form
- ergative: verbs can be used as transitive and intransitive

Pattern-meaning Groups Combinations and example verbs highlighted for the treatment are shown in bold. Those not being highlighted are not bolded.

**Attempt (2)**

V n (THE ‘START’ and ‘STOP’ GROUP) abandon stop

V to-inf (THE ‘TRY’ GROUP) endeavor try

**Ensure (2)**

V n (THE ‘ALLOW’ GROUP) encourage invite

V that (THE ‘ARRANGE’ GROUP) fix ordain

**Include (2)**

V n (THE ‘INCLUDE’ GROUP)

V n in n (THE ‘INVOLVE’ GROUP) implicate involve

**Lack (2)**

V (THE ‘OCCUR’ GROUP) exist obtain

Ergative (verb with other meanings)
Consist (2)

\textit{V in n}
\textit{V of n}

Construct (2)

\textit{V n from n} (THE ‘MAKE’ GROUP) create fabricate
\textit{V n out of n} (THE ‘MAKE’ GROUP) conjure make

Display (3)

\textit{V adv} (THE ‘CLEAN’ GROUP)
\textit{V n to n} (THE ‘SHOW’ GROUP) demonstrate show

Imply (3)

\textit{V that} (THE ‘SAY’ GROUP) proclaim say

\textit{it be V-ed that} (THE ‘THINK’ and ‘DISCOVER’ GROUP) accept envisage

Include (2)

\textit{V n} (THE ‘INCLUDE’ GROUP)
\textit{V n in n} (THE ‘INVOLVE’ GROUP) involve implicate

Result (3)

\textit{V} (THE ‘OCCUR’ GROUP) happen obtain
\textit{V from n} (THE ‘RESULT’ GROUP) develop stem
\textit{V in n} (verbs with other meanings)

Transform (2)

\textit{V n from n; V n from n into n; V n into n}

\textit{V n from n into n} (‘changing something from one thing into another’) metamorphose turn
\textit{V n into n} (THE ‘CHANGE’ GROUP) change metamorphose
Interpret (2)

V n as adj (regarding someone or something as having a particular quality) consider construe

V n as n (THE ‘NAME’ and ‘CONSIDER’ GROUP) conceptualize consider

Yield (2)

V to n (THE ‘SUBMIT’ GROUP) submit surrender

V n to n (THE ‘GIVE’ GROUP) give sacrifice

- Pattern-meaning group combinations and example verbs highlighted for the treatment are shown as bolded.
APPENDIX D: THE VALIDATED TEST ITEMS

Part 1: Do you recognize common grammar patterns?

Choose the one sentence in each set of sentences below that uses the most frequent/correct verb grammar pattern.

1. attempt

A. 15% of high school teenagers surveyed had **attempted suicide**.

B. The author **attempted at explaining** different issues of the Web and its contents.

C. In this study the researcher **attempted with assessing** the effect of computer-aided instruction.

D. We **attempt for** communication about our future.

2. lack

A. Many students **lack of the skills** to effectively use online tools for learning.

B. If outside opportunities **are lacking**, the teacher may start a community group for adults.

C. The results may **lack in** sufficient details.

D. About half of all farmworkers **lack for** appropriate documents to work in the United States.

3. imply

A. **It is implied to** restrict the use of the term "travel document."

B. **It is implied that** the advertisement is designed to serve government interests.

C. They **imply to focus** on the "ideal places."

D. In sum, these benefits **imply energy efficiency as** the answer.
Choose the one sentence in each set of sentences below that uses the least frequent (correct) verb grammar pattern.

4. interpret

A. We interpret music as a force for bringing people together. (V n as n)
B. Lack of agreement in outcomes may be more difficult to interpret.
C. It is useful to interpret a difficult situation into an opportunity to problem-solve.
D. The two writers interpreted repetition in language as meaningful. (V n as adj)

5. result

A. Being overweight may also result from lack of activity.
B. I will estimate the temperature changes on earth that will result.
C. They disagrees that population pressures result in agricultural advancement.
D. Increasing social services enable women to result with work and family.

Each of the verbs below commonly appears in the grammar pattern indicated. For each verb, identify one other verb that commonly appears in the same grammar pattern.

6. result

e.g. ‘In this situation, stress may result from feelings of being lost’.

V from

A. imply (from)
B. derive (from)
C. yield (from)
D. influence (from)
7. translate
e.g. Well-educated workers are needed to translate ideas into useful technologies.

A. interpret (n into n)
B. shape (n into n)
C. account (n into n)
D. include (n into n)

II. Grammatical judgment: Some of the sentences below use highly frequent grammar patterns. Mark these sentences as ‘Y’ (yes). Other sentences use very unlikely grammar “patterns” that native English speakers are likely to consider “incorrect.” Mark these sentences as “N” (no).

1. This study suggested that this disease was associated to polluted water. ( )
2. In most cases, the teams consist the student and her or his parent(s). ( )
3. University authority should ensure stress free. ( )
4. It appears unlikely that he will yield for the leader’s demands. ( )

Part 2: Can you use common English grammar patterns?

I. Fill in the blanks to complete a common grammar pattern for the bolded verb. If no word is needed to complete a common grammar pattern, mark “X” in the blank.

1. Liberty does not consist _______ living with absolute freedom.
2. The focus of teaching is to help students construct knowledge ___________ their learning experience.
3. The company has displayed dedication ________ this community.
4. The concept can be a tough one to understand if you associate the taste of olive oil with pasta and salads.

5. Those countries lack the land to grow food for animals.

6. The author wishes to transform students into activists.

II. Sentence production

Write two sentences with the verbs provided. You should use different patterns appropriate to the target verb for each of your sentences.

e.g. stop

Sentence 1: I stopped to work for a month. (V to-inf)

Sentence 2: Let’s stop for lunch. (V for n)

1. result

Sentence 1:

Sentence 2:

2. lack

Sentence 1:

Sentence 2:
APPENDIX E: TEN EXTRA ITEMS FOR PRETEST

Part 1: Do you recognize common grammar patterns?

Choose the one sentence in each set of sentences below that uses the most frequent/correct verb grammar pattern.

1. construct

A. Service-learning experiences that construct on the experiences and expertise of students with disabilities can be invaluable.
B. Teachers can construct into their teaching the concept of what the university requires.
C. The entire building was constructed out of wood.

Each of the verbs below commonly appears in the grammar pattern indicated. For each verb, identify one other verb that commonly appears in the same grammar pattern.

2. lie
e.g. ‘As with so many other aspects of a relationship, the solution lies in communication.’

   V in

A. Influence (in)
B. Constitute (in)
C. Associate (in)
D. consist (in)

3. search
e.g. ‘The police searched her for concealed weapons.’

   V n for n

A. explore (n for n)
B. look (n for n)

C. assess (n for n)

D. ensure (n for n)

I. Grammatical judgment: Put T for the bolded verb used correctly. Put F for the bolded verb used incorrectly.

1. From this highly specific research, we **attempt** at predicting performance about a different group of students. (  )

2. The legal system will continue to **define** what society considers to be appropriate behaviors. (  )

3. **Yield** power to students as they gain self-discipline. (  )

II. Fill in the blanks to complete a common grammar pattern for the bolded verb. If no word is needed to complete a common grammar pattern, mark “X” in the blank.

1. Although we did not **include** these studies ______ our book, they are somewhat relevant here.

2. He and his colleagues were not able to **influence** the political leaders ______ (find) a peaceful solution. (In this blank, please type the correct form of ‘find’.)

3. Although we did not **include** these studies ______ our book, they are somewhat relevant here.

III. Sentence production

Write two sentences with the verbs provided. You should use different patterns appropriate to the target verb for each of your sentences.

* e.g. stop
Sentence 1: I stopped to work for a month. (V to-inf)

Sentence 2: Let’s stop for lunch. (V for n)

1. attempt
   Sentence 1:
   Sentence 2:

2. construct
   Sentence 1:
   Sentence 2:
APPENDIX F: TEN EXTRA ITEMS FOR POSTTEST

Part 1: Do you recognize common grammar patterns?

Choose the one sentence in each set of sentences below that uses the least frequent/correct verb grammar pattern.

1. Produce
   A. Does the treatment produce beneficial outcomes?
   B. We will continue to look for better ways to produce products from organic wastes.
   C. If they get too much, they grow into huge plants that produce way behind schedule.
   D. Internet will produce music into a pure service industry.

2. Limit
   A. We should limit ourselves to impeccable evidence.
   B. Patients fear this disease will limit their options and choices.
   C. An effort should be made to limit production at the global level.
   D. The admissions to colleges limit to some extent.

3. seek
   A. It is helpful to seek feedback.
   B. The learning commons are essential ideas as we seek to meet this goal.
   C. If needed, seek assistance from school staff.
   D. He is the first in the family to seek into higher education.

I. Grammatical judgment: Put T for the bolded verb used correctly. Put F for the bolded verb used incorrectly.

1. Children construct experiential knowledge into their memory. ( )
2. That would influence teachers into performing certain tasks. ( )
3. This instruction will ensure students mastery of the knowledge. ( )
II. Fill in the blanks to complete a common grammar pattern for the bolded verb. If no word is needed to complete a common grammar pattern, mark “X” in the blank.

1. They need education as well as the opportunity to explore life _____ themselves.

2. In general, staff readily agreed to participate ______ the study.

3. Although we did not include these studies ______ our book, they are somewhat relevant here.

4. I would extend protection ______ the universe of reasonable persons.

5. Students can employ technology ______ the development of strategies for solving problems in the real world.

III. Sentence Construction

Write two sentences with the verbs provided. You should use different patterns appropriate to the target verb for each of your sentences.

e.g. stop

Sentence 1: I stopped to work for a month. (V to-inf)

Sentence 2: Let’s stop for lunch. (V for n)

1. associate

Sentence 1:

Sentence 2:

2. limit

Sentence 1:

Sentence 2:
APPENDIX G: SENTENCE CONSTRUCTION SHEET

Your Name/ Criterion User Name:                               Section:

Instruction:

1. You need to create sentences for the academic verbs provided below. These verbs are very frequently used in academic context.
2. You should use different patterns appropriate to the target verb for each of your sentences.
3. Please try you best to finish the assignment, and do not check other resources. Your grades will not be affected by your performance in this task.
4. If you do not know the answer, please write NA.
5. If you find this difficult, do not panic! You will learn about these verbs later.

Example sentences & patterns of the verb ‘stop’:

e.g  stop

Sentence 1: I stopped to work for a month. (V to-inf)

Sentence 2: Let’s stop for lunch. (V for n)

Sentence 3: Please do not stop the music. (V n)

Sentence 4: They stopped suddenly. (V)

I. Write two sentences with the following verbs. Each sentence should use a different pattern of the verb.

Attempt (2)

Associate (2)

Display (2)

Ensure (2)

Include (2)

Imply (2)
Lack (2)
Consist (2)
Construct (2)
Transform (2)
Interpret (2)
Yield (2)

II. Write three sentences with the following verbs. Each sentence should use a different pattern of the verb.

Result (3)
APPENDIX H: THE LIKERT-SCALE QUESTIONNAIRE

Strongly disagree  disagree  Somewhat disagree  Somewhat agree  Agree  Strongly agree

Language Learning Potential

- PAT GRAM helped me write sentences with correct verb patterns.
- PAT GRAM helped me revise sentences with wrong verb patterns.
- PAT GRAM helped me learn that one verb can be used with different patterns.
- PAT GRAM helped me learn different patterns of verbs.
- PAT GRAM helped me learn that meanings of different patterns of a verb may be different.
- PAT GRAM helped me learn new verbs with the same patterns as the verbs I know.
- The highlighted patterns attracted my attention.
- The highlighted verbs attracted my attention.
- The highlighted verbs helped me memorize these verbs together with the pattern they share.
- The example sentences with verbs highlighted helped me learn how to use these verbs in sentences.

Learner fit

- I understood the general meaning of meaning groups very well.
- I understood the example sentences very well.
- It was easy to guess the meaning of unknown verbs in the example verb list.
- I was able to write sentences with different verb patterns using PAT GRAM.

Meaning focus

- PAT GRAM helped me write meaningful sentences using verb patterns.
- PAT GRAM helped me revise my sentences when I used patterns that did not make sense.
- PAT GRAM helped me express meanings I intended.
- PAT GRAM helped me write sentences that other people can understand.

Impact

- PAT GRAM made me realize that knowledge of patterns is important for the correct use of verbs.
- I would like to use PAT GRAM to check the patterns of verbs that I know.
- I would like to use PAT GRAM to help me produce correct verb patterns in English.
- I would like to use PAT GRAM to learn about correct patterns of verbs I encounter when reading or listening in English.
- I am more confident in using the verbs covered in the training than I was in the past.
• PAT GRAM encouraged me to use verbs in the future that I was not very confident of using in the past.
• I believe using PAT GRAM frequently can help me increase the accuracy of my English writing.
• I believe using PAT GRAM frequently can increase my vocabulary size.
• I believe using PAT GRAM frequently can help me learn more patterns of verbs.
• I believe using PAT GRAM frequently can motivate me to increase my knowledge of verbs and patterns.
APPENDIX I: THINK-ALOUD PROTOCOL INSTRUCTIONS

The task for you in this study is to play the video showing your interaction with PAT GRAM at your space and speak out loud what you were thinking, what you were looking at and what you were feeling when you were doing the sentence revision task.

Please be aware that:

1. It is not you who is investigated; it is the program that is being tested and evaluated. Any difficulties that you might be experiencing are not your fault.

2. You can stop the task at any time if you become uncomfortable.

3. The task takes about 30 minutes. Please do the following when interacting with the program:

   4. Say whatever you are looking at
   5. Say whatever you are thinking
   6. Say whatever you are feeling
   7. Say whatever you are doing to go about the writing task

This will enable the researcher to see first-hand the process of task completion rather than only its final product.

The session will be audio and video taped unobtrusively (with screen capturing software) so that developers can go back and refer to what participants did and how they reacted. The purpose of this method is to make explicit what is implicitly present in the process of task completion.
APPENDIX J: EXAMPLE QUESTIONS FOR SEMI-STRUCTURED INTERVIEW

1. How did you learn patterns of verbs before the training?
2. Which way do you prefer, previous methods or using PAT GRAM?
3. What did you learn from using PAT GRAM?
4. Did you experience any difficulties when using PAT GRAM?
5. Are you willing to use PAT GRAM for future study?
6. Do you have any suggestions for improving PAT GRAM?
APPENDIX K: EXERCISES FOR THE CONTROL GROUP

Vocabulary Exercise_1
Fill in blanks with the correct words. The definitions and first letters are provided.

1. Blogs also provide news or political commentary and play an important role in countries where the mainstream (adj. being accepted by most people) media are not free to discuss everything.
2. There, after so many traumatic (a. very painful or upsetting) exercises, I began to see that education was necessary for my survival (n. the status of being alive).
3. Firefighters answer a variety (n. a different form) of emergency calls that can be physically demanding (a. requiring or claiming more than is generally felt by others to be due).
4. Despite the challenges, this deep commitment (n. a promise to do something) to my own education helped me prioritize (v. to put things in order of importance) my time and continue.
5. On tests we had to be able to reproduce (v. produce again) what we had memorized.
6. In addition, because my English not adequate (a. enough), I had to study much more than most of my American classmates.
7. Fortunately, I found that almost everyone at the university was responsive (a. responding readily) to a student like me who worked hard and was so eager to learn.
8. Shift work can span (v. extend over or across) weekends and holidays, while at work, firefighters are always ready to stop whatever they are doing to respond (v. reply) to an emergency.
9. Firefighting can be a challenging (a. testing one’s ability), exciting, and personally fulfilling (a. satisfying) career.
10. Fortunately, the indigenous (a. describing people who have always lived where they are) groups who live in small communities inside or just outside the park, including Leco and Takana.
11. This large area contains fifteen major habitat (n. the environment in which a plant or animal lives) types such as Andean grasslands, mountain forest, and lowland tropical forest.
12. That meant I had to concentrate (v. to pay close attention) on the ideas expressed in a text.

Vocabulary Exercise_2

1. Firefighters assist (v. help) with vehicle accidents, hazardous (a. dangerous) material spills, downed electrical lines, and medical emergencies.
2. The weight of the equipment, combined with the task of performing very strenuous (a. needing great effort or strength) physical activities, can be incredibly (adv. Seem impossible) hard on the average human body.
3. The emotional demands (n. requirement) on firefighters can be significant as well.
4. Loss of property, contamination (n. harm caused by releasing dangerous materials) of the environment, injuries, and possibly death to both citizens and firefighters are all possible results of emergencies.

5. Training and education available (a. ready for use; accessible) to firefighters is another rewarding (a. worthwhile) aspect of the career.

6. Even though I have found firefighting physically (a. relating to the body) and mentally (adv. Relating to the mind) challenging, it has been personally enriching (a. supplying with riches).

7. In order to improve (v. bring to a more desirable condition) my posture, I followed a series of steps.

8. Paula has discovered (v. to see, learn, or find) that some children are better at expressing their feeling than other.

9. Working as a preschool teacher has made Paula more flexible (a. willing to yield, change).

10. Working as a café manager has affected me positively (adv. in a good way) and negatively (adv. in a bad way).

11. As a manager, my main responsibility (n. a particular burden of obligation) is to coordinate (v. to act in harmonious combination) between the owner and the staff.

12. Mumbai Restaurant provides continuous (a. without stop) entertainment (n. something offers pleasure) to diners.

Prepositions

I. Fill in blanks with correct prepositions.

1. Class ends at 3:50pm.
2. At midnight, the next day begins.
3. Jill said she might not be ready as early as 4:30pm but certainly by 6:00pm.
4. Last night Juanita studied until 11:00pm.
5. I will be leaving in five minutes.
6. I studied for two hours.
7. Most people are paid on Friday.
8. The doctor can see you on June 12.
9. I was ill during the night.

II. Complete the passage with the appropriate prepositions. Use the meanings of the prefixes in the sentence to help you.

The rich often compete with one another, and Willam C. Whitney (1841-1904) was no exception. Whitney became a millionaire by investing in many profitable businesses. Now wishing to be excluded from New York City’s high society, he had to own a house that was acceptable to the “right” people. Therefore, he bought a brick mansion at 871 Fifth Avenue and involved in furnishing it fashionably. He spent four years in Europe, looking for furniture, stained-glass windows, and fireplaces that he and his guests would be comfortable with. However, in addition to gathering these furnishings, he did a thorough job of destroying palaces. Not concerned with the expense, he exported an entire ballroom from Bordeaux, France. Because Whitney was always a perfect host, he expanded his facilities from these modest beginnings and kept a staff of servants who could serve one hundred people on an hour’s notice. His friends came to
expect surprises from him, and at one of Whitney’s dinner, which cost $20,000 each guest discovered a black pearl in one of his or her oysters.

Subject-verb agreement
I. Please fill in blanks with the correct form of the verb in the parenthesis. All verbs are in present tense.
   1. The silver earring and the gold ring belong (belong) to me.
   2. There are (be) a few rules that no one can break.
   3. There is (be) a lot of food left from the party.
   4. The class is (be) hearing a lecture on economics.
   5. The hockey team wins (win) most of its games.
   6. The collaborative group usually reviews (review) the material before moving on to the next subject.
   7. A person with eleven dogs is (be) not bored very often.
   8. The hard work of the engineers, drafters, carpenters, and electricians has (have) contributed to creating a beautiful new campus.
   9. An enormous box of pizzas, French fries, garlic bread, onion rings, and nachos usually disappears (disappear) about 15 minutes after Mario and his friends see it.
   10. My teenage son needs to pick up the banana peels, apple cores, and hamburger buns that are (be) rotting on his bedroom floor.

II. Editing: The passage contains 23 errors in subject-verb agreement, noun plurals, missing verbs and gerunds. Please write the correct form in the blank when necessary. If no error is identified, please fill in “X” in the blank.

1. Most animals are afraid of other creature creatures. (2) Therefore, many creatures protects (protect) themselves from attaching by imitating frightening beast. (3) As a result, their predators think twice before eat eating them. (4) Certain animals that lives (live) in holes in the ground (such as certain birds) have the ability to hiss like snakes. (5) A group of hissing bees in a hive makes a bear wonder whether it is a good idea to take their honey. (6) Other animals scare their enemies. (7) Theirs (There is) a type of frog (frogs) that scream so loudly that a predator drop (drops) it out of stock. (8) Texas horned lizards inflate themselves like balloon (balloons). (9) They also explodes (explode) the walls between their sinuses and eye sockets, squirting out fluid from their eyes. (10) An animal that wants to eat the lizzards do (does) not find their appearance too appetizing. (11) Many creatures fool their foes by changing shape. (12) A hawkmoth caterpillar can inflate one end of its body into a “snake head” that move (moves) back and forth. (13) A peacock butterfly combine (combines) strategies. (14) When its (it) threatened by a bird, the butterfly spreads its wing (wings) and exposes large spots that looks like eyes. (15) At the same time, it hisses like a snake. (16) On the other hand, there is (are) those animals that use tricks to get their prey. (17) A snapping turtle has piece of flesh inside its mouth that look (looks) like worm, which attracts fish who are looking for a meal-but end up as the meal instead. (18) One kind of insect called a praying mantis resembles the petals of a flower, and insects that land
on it get a big surprise. (19) Here____(is) a final –and rather disgusting- trick. (20)
Certain beetles look just like bird droppings; they attract flies, which expect a tasty
snack but instead become ____ (X) one.

Coordinating conjunctions & subordinating conjunctions.
Join sentences with coordinating conjunctions and subordinating conjunctions. Please write the
full sentences and provide correct punctuation. The Conjunctions and transition words are given.
Please do not shift the order of these sentences.
1. Very few parents today know the reasons behind these traditional colors. Parents do not
care. (nor)
   Very few parents today know the reasons behind these traditional colors, nor do parents
care.
2. Years ago, people wanted to protect their infant boys from evil spirits. They dressed the
boys in blues. (so)
   Years ago, people wanted to protect their infant boys from evil spirits, so they dressed the
boys in blues.
3. He completed in the Big Ten Championship on May 25, 1935. He had the greatest day in
the history of modern athletics. (when)
   When he completed in the Big Ten Championship on May 25, 1935, he had the greatest
day in the history of modern athletics.
4. He could not even jog at the warm-up before the meet. He decided to compete in the 100-
yard dash. (although)
   Although he could not even jog at the warm-up before the meet, he decided to compete in
the 100-yard dash.
5. I put the pillow over may head. The alarm clock rings in the morning. (when)
   I put the pillow over may head, when the alarm clock rings in the morning.
6. I always get to work on time. My hair may not be combed or my shirt buttoned.
   (although)
   I always get to work on time, although my hair may not be combed or my shirt buttoned.