CHAPTER II
LITERATURE REVIEW

This chapter presents the review of literature and research that are related to the present study. It covers 5 main areas:

1. **Errors**. This part reviews all aspects that are related to errors: definition, sources, categorization, and types of error. It provides basic information about errors so that the next area 'error treatments' which is the key matter in this study can be linked to.

2. **Error treatments.** This part covers the definition, types of error feedback, criteria for error treatment, timing for error treatment, techniques used in error treatment, learners' attitudes towards error correction, theoretical frameworks of self-correction, and the impact of feedback from a review of the previous studies.

3. **Computer-assisted language learning (CALL)**. The review in this part covers the meaning and related abbreviations, a brief history of CALL, types of CALL, CALL and the learning principles, roles, advantages, and limitations of CALL, CALL feedback and its timing, and a review of previous CALL studies.

4. **English grammar teaching**. Since the CALL contents deal with one of the grammatical topics, this part provides basic information about grammar instruction in relation to the development of CALL. It includes the definition of related terms, the views of experts on grammar teaching, how to assess grammatical ability, and how to integrate these topics into the present study.

5. **Students' language ability.** This part discusses topics regarding the moderator variable 'language ability'; how students with high ability differ from ones with low ability in terms of attitudes, preferences and the effects of language ability factor on the achievement of students.

Since each part contains a large amount of information, a 'summary' is provided at the end of each part.

1. Errors

1.1 Definition of errors

Allwright and Bailey (1991: 84) propose that typical definitions of errors include some reference to the production of a linguistic form which deviates from the correct form that native speakers typically produce. According to some educators, errors differ

from mistakes in that errors are often habitual and systematic, as they often go uncorrected and are in fact frequently reinforced by similar errors made by peers and the mass media (Ellis & Tomlinson, 1980: 259). In other words, errors refer to regular patterns in the learner's speech which consistently differ from the target language model (Coder; cited in Allwright & Bailey, 1991: 91). In contrast, mistakes happen when a learner breaks the rules of the language as a result of non-linguistic factors i.e. tiredness, sickness, carelessness, slips of the tongue, etc. Ellis and Tomlinson (1980) point out that mistakes are inevitable and are frequently made by native speakers. Teachers should not worry about them because the learners can usually correct their own mistakes. Errors are cause for worry since the learners are unaware of them or do not recognize them as incorrect. Therefore, they need help or corrections from the teacher or other sources.

1.2 Sources of Errors

Sources, or causes, of errors are one of the areas of interest. Selinker (1974; cited in Omaggio Hadley, 2001: 259) proposes five potential sources of errors in second language learning and acquisition: language transfer, transfer-of-training, strategies of second language learning, strategies of second language communication, and overgeneralization.

Language transfer. According to Odlin (1989: 27), transfer results from similarities and differences between the target language and any other language that has been previously (and perhaps imperfectly) acquired. The learners may use their knowledge of their L1 to encode or decode L2 without noticing the differences between the two languages. Richards (1974; cited in Omaggio Hadley, 2001: 260) proposes that errors attributed to the influence of another language can be found at the level of pronunciation, morphology, syntax, vocabulary, or meaning. The errors caused by language transfer are sometimes called transfer errors (Odlin, 1989) or interference errors (Richards, 1971; cited in Ellis 1994: 58).

Transfer-of-training. Some errors may be caused by the nature of the language-learning materials and approaches themselves (Selinker, 1974; cited in Omaggio Hadley, 2001: 260). Inappropriate learning procedures or low quality materials may lead to this kind of error.

Strategies of second language learning. Selinker (Ibid.) believes that strategies of second language learning are also potential sources of errors. Language-learning strategies may include procedures such as the use of formal rules, rote memorization, deliberate rehearsal, contextual guessing, looking for recurring patterns, imitating

formulaic routines seeking opportunities to obtain comprehensible input, as well as appealing for assistance from native speakers or teachers. These strategies are attempts to develop competence in the language.

Strategies of second language communication. Selinker (Ibid.) maintains that when learners attempt to negotiate meanings with native speakers in authentic language-use situations, they may frequently find themselves at a loss for words, due to their imperfect knowledge of the target language. Errors can result from heavy communication demands made on their interlanguage, demands that force them to use strategies like approximation, word coinage, translation, language switch, and mime (Tarone, 1980; cited in Omaggio Hadley, 2001: 261).

Overgeneralization of target language rules. This kind of error happens when learners use 'learned' strategies or rules in new situations where that rules do not apply. Generalization is actually a valuable acquisition tool; but when rules are misapplied, this strategy can be a major source of persistent error in interlanguage (Selinker, 1974; cited in Omaggio Hadley, 2001: 260).

Ellis and Tomlinson (1980: 260) identify eight significant causes of errors in an ESL situation as: (1) faulty modeling of an item, (2) poor teaching of an item, (3) interference in the learning process by the systems of the learner's mother tongue, (4) mis-translation from the target language to the mother tongue and vice versa, (5) false assumptions based on knowledge of the target language, (6) exposure to common errors at school, at play, at home and from the mass media, (7) attempting to use items which have not been taught, and (8) using items which have been 'learned' but 'forgotten' as a result of an infrequent need to use them. Most of these causes are similar to what Selinker (Ibid.) has proposed. Interference in item 3 and mis-translation in item 4, for example, are equivalent to Selinker's notion of 'language transfer', while faulty modeling in item 1 and poor teaching in item 2 correspond with Selinker's 'transfer-of-training'.

1.3 Categorization of Errors

Errors can be categorized differently based on alternative criteria. Allwright (1975; cited in Bailey, 1985: 111) has proposed a categorization of errors into four broad areas:

1. Linguistic description. The most basic concepts for the teacher to consider are the mode of expression (written or oral) and the intended meaning (Walz, 1982: 6).

2. Importance. Walz (Ibid.) states that the considerations that may make an error important are: the pedagogical focus at the time it is made, the frequency with which it occurs, the number of learners affected, and its relationship to successful communication.

3. Source. Errors can be caused by intralingual and interlingual inference, learning strategies, communication strategies, teaching, carelessness, stress, and factual ignorance (Allwright, 1975; cited in Bailey, 1985: 111).

4. Ease of correction. Practical considerations include the teacher's competence, resources, and available time (Walz, 1982: 7).

These four categories are not mutually exclusive. The teacher may need to consider all four ways all together before making his/ her decision (Allwright, 1975; cited in Bailey, 1985:111).

1.4 Types of Errors

Richards (1980: 93) distinguishes three types of errors. The first type is *interlingual error*. Interlingual errors, or interference errors, occur as a result of the use of elements from one language while speaking another. It is similar to the term 'language transfer error' used by Selinker and the 'interference by the systems of the learner's mother tongue' used by Ellis and Tomlinson. The second type is *intralingual error*. According to Richards, intralingual errors reflect the general characteristics of rule learning such as faulty generalization, incomplete application of rules and failure to learn conditions under which rules apply. The last error type is called *developmental error*. Richards points out that developmental errors occur when the learner attempts to formulate hypotheses about the target language on the basis of limited experience. An error may be caused by one or a combination of more than one source (Richards, Ibid.). It is thus difficult to identify actual causes of errors. Additionally, it is sometimes difficult to draw a precise distinction between intralingual errors and developmental errors, since they are both internal processes. Most researchers, then, generally put the errors into two categories: transfer error (Richards' category 1) and intralingual errors (Richards' categories 2 and 3) (Ellis, 1994: 59).

Ellis and Tomlinson (1980: 260) propose a different system of categorization that is used in error analysis. The following are examples of the system:

Type of error	Descriptions
Gross errors	A gross error breaks a general rule and therefore involves the generation of many errors. This kind of errors is highly significant because it provides important information about learning problems.
Delicate errors	A delicate error breaks an individual rule and does not lead to the generation of other errors. Therefore, each delicate error is not particularly significant in itself but a learner who makes a large number of such errors will obviously have problems of communication.
Breakdown errors	These are errors capable of causing a breakdown in communication. Thus, they are highly significant and demand urgent remedial attention.
Non-breakdown errors	These are errors which break the rules but which do not interfere with communication. Ellis and Tomlinson then think they are less serious.
Critical errors	A critical error causes another error to be made in the same context and is therefore serious.
Persistent errors:	These errors are errors which continue to be made for a long time despite remedial attention.

Another widely used taxonomy for learner errors is one developed by Burt and Kiparsky (1972; cited in Walz, 1982: 8). They use the term 'global' and 'local' errors. According to Burt and Kiparsky, global errors are those that block communication, while local errors are those that appear in isolated sentence elements. They believe that an utterance becomes much more comprehensible when the teacher corrects one global error rather than several local errors.

Edmondson (1986; cited in Ellis, 1992: 70) suggests that it would be useful to distinguish T-errors and U-errors. A T-error is any discourse act which the teacher treats explicitly or implicitly as erroneous, while a U-error is any learner utterance which deviates from target language norms. Ellis points out that researchers usually elect to examine T-errors.

Other researchers may divide errors into different categories when they conduct their own study. Nystrom (1983), for example, divided errors into 6 types: phonological errors, lexical errors, morphological and syntactic errors, discourse errors, dialect errors and content errors. In Lyster's (2001) study entitled "Negotiation of Form, Recasts, and Explicit Correction in Relation to Error Types and Learner Repair in Immersion Classrooms", he coded learner errors as grammatical errors, lexical or phonological errors, or as unsolicited uses of L1.

To sum up the basic information about errors, an error is a production of a linguistic form which deviates from the accepted form that the native speakers typically produce. Errors differ from *mistakes* in that errors are often habitual and systematic, while mistakes happen when a learner breaks the rules of the language as a result of non-linguistic factors. Teachers should worry about errors because learners are unaware of them and do not recognize them as wrong. They need help or corrections from the teacher.

Errors can be categorized differently based on varying criteria. Most researchers generally put errors into two categories: transfer error and intralingual error. In practice, researchers divide errors into different categories when conducting their own study. The present study is involved with 'grammatical errors', as it tries to examine the effects of self-correction and overt correction on the usage of English tenses.

2. Error Treatments

2.1 Definition of Error Treatment

Error treatment concerns the way in which teachers (and other learners) respond to learners' errors (Ellis, 1994: 701). The treatment may cover a number of techniques ranging from very explicit to very implicit. Long (1977; cited in Ellis, 1992: 70) has proposed a distinction between 'feedback' and 'correction' that the term 'feedback' should be used in the case of teachers' attempts to supply learners with information about the correctness of their productions, while 'correction' should be used to refer to the result of feedback. The term 'error treatment' in this study encompasses both feedback and correction.

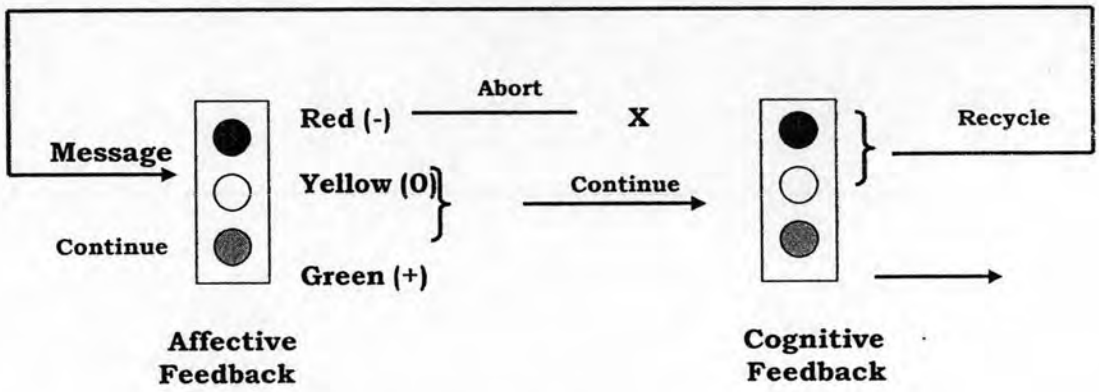
There are various terms used in identifying errors and providing feedback. The most common ones are *corrective feedback*, *negative evidence*, and *negative feedback*. According to Schachter (1991), these three terms are used respectively in the fields of language teaching, language acquisition, and cognitive psychology. Different researchers often use these terms interchangeably.

2.2 Types of Error Feedback

Feedback is one of the most important elements in the 'error treatment' process. One of the keys to successful second language learning lies in the feedback that a learner receives from others (Brown, 2001: 288). Vigil and Oller (1976; cited in Allwright & Bailey, 1991: 93) state that second language learners receive at least two kinds of feedback from their interlocutors. The first is cognitive feedback—information about the

language that they use. The second is affective feedback—emotional reactions in response to their utterances and signals as to the interlocutor's desire or willingness to continue communicating. Figure 2.1 depicts Vigil and Oller's model.

Figure 2.1: Affective and Cognitive feedback (Brown, 2001: 289)



Brown (2001: 289) explains that within the model, the "green light" of the affective feedback mode allows the sender to continue attempting to put a message across; a "red light" causes the sender to abort the attempt. He proposes that error corrections occur at the traffic signal of cognitive feedback. A green light at cognitive feedback symbolizes non-corrective feedback. A red light symbolizes corrective feedback that may come in several different forms. Both affective feedback and cognitive feedback can take place simultaneously (Brown, 2001: 289).

Vigil and Oller (1976; cited in Allwright & Bailey, 1991: 93) suggest that language teachers should provide *clear cognitive information* about the problems in the learners' output and *positive affective feedback*. Brown (2001: 289) concludes that too much negative cognitive feedback — a barrage of interruptions, corrections, and overt attention to malformations — often leads learners to shut off their attempts at communication. On the other hand, too much positive cognitive feedback serves to reinforce the errors of the learner, resulting in the persistence, and perhaps the eventual fossilization, of such errors.

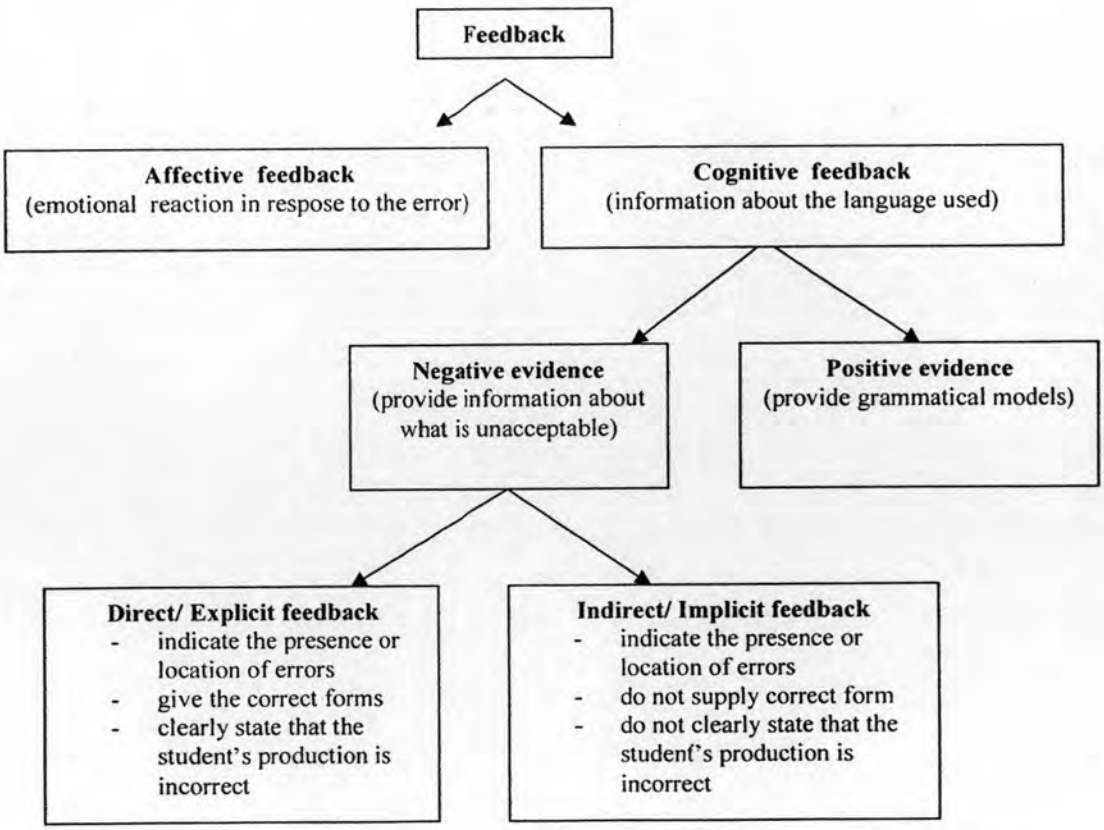
Long (1996) divides the environmental input that is provided to the learners about the target language into two categories—*positive evidence* and *negative evidence*. Long defines positive evidence as providing the learners with models of what is grammatical and acceptable in the target language; and negative evidence as providing the learners with *direct* or *indirect* information about what is unacceptable.

In relation to the 'direct/ indirect' feedback, Hendrickson (1984) provides the distinction that *indirect* feedback would indicate either the presence or the specific location of errors, while *direct* feedback would not only indicate the presence of location of errors, but would also suggest correct forms.

Another way to categorize negative feedback is the use of degrees of explicitness. The terms explicit and implicit are often used in the 'focus on form' studies. The concept is very similar to the 'direct/indirect' feedback. Explicit feedback (sometimes called overt correction) is a corrective technique where the teacher supplies the correct form and clearly indicates that what was produced by the student is incorrect (Lyster, 2001). One of the most frequently used techniques for explicit feedback in research is 'metalinguistic explanation' (Ellis, Loewen, & Erlam, 2006; Kim & Mathes, 2001). As opposed to explicit feedback, implicit feedback (or covert correction) refers to the corrective technique where the teacher neither states clearly that the students' production is wrong nor supplies the correct form. Examples of implicit correction include confirmation checks, repetitions, recasts, clarification requests, and silence.

To summarize, the above mentioned feedback types are collected and presented in Figure 2.2.

Figure 2.2: Feedback types



Both of the error treatment types employed in this study (overt correction and self-correction) provide negative evidence to the students. Overt correction is more direct in that it provides correct answers when the student produces a wrong answer. Self-correction, on the other hand, is an indirect one because it does not reveal the correct answer. Students are encouraged to find the right answer by themselves. However, the techniques used to provide feedback and explanations may be slightly different from what were suggested by Hendrickson. The presence of error is indicated but the location is not pinpointed. Rather, the researcher has applied the 'scaffolding' technique, wherein the feedback is provided step-by-step, starting from less to more and more help if the student still cannot identify the correct answer.

2.3 Criteria for Error Treatment

Holley and King (1971; cited in Walz, 1982: 8) used two criteria for oral correction to train graduate teaching assistants: the error had to be common to the class and it had to reflect the lesson being taught.

Hendrickson (1979; cited in Walz, Ibid.) suggest a hierarchy for oral errors based on the proficiency of the students:

- Elementary level: correct only errors that impede communication
- Intermediate level: correct errors that occur frequently
- Advanced level: correct errors that have a stigmatizing effect upon the students.

2.4 Timing for Error Treatment

Teachers have the option of whether to deal with errors immediately or to delay the treatment. The problem with immediate error treatment is that it often involves interrupting the learner in mid-sentence—a practice which can be disruptive and could eventually inhibit the learner's willingness to speak in class at all (Allwright & Bailey, 1991: 103).

The teacher may alternately delay the treatment for longer periods of time. However, the psychology research literature shows that feedback becomes less effective as the time between the performance of the skill and the feedback increases (Long, 1977; cited in Allwright & Bailey, 1991: 103).

2.5 Techniques Used in Error Treatment

Error treatment may be presented in a number of correction techniques. Walz (1982) has reviewed several techniques used to correct errors, and they are summarized as shown in Table 2.1.

Table 2.1: Techniques used in error correction (Walz, 1982)

Type	Techniques for oral errors	Techniques for written errors
1. Teacher correction	1.1 *Providing correct answer.* The teacher simply tells the class the proper form. It saves time and reduces confusion. However, this technique has been widely criticized as not demonstrating that real learning is taking place.	1.1 *Direct correction.* The teacher tells the student where the error is and what the correct form is. For example, a misplaced word can be bracketed and placed in its proper order with an arrow. Superfluous words are simply crossed out, etc.
	1.2 *OLD.* It stands for "Own Language Distortion" (Burt & Kiparsky, 1972). The teacher translates into the native language an improper syntactic element a student has made to demonstrate how bad it sounds.	1.2 *Recording.* Recording corrections on cassette tapes avoids the problem of students' ignoring written corrections and allows the teacher to provide explanations of grammar that may be too long to write out.
	1.3 *Discrimination exercises.* Fanselow (1977) recommends contrasting the correct and incorrect forms, even to the extent of writing lists on the board and asking students for explanations of each item.	1.3 *Charting errors.* The teacher draws up a list of types of errors and assigns a point value to each. A tally sheet can then be constructed with types of errors listed vertically and students' names horizontally. The teacher can use a symbol to mark an error on a composition, and the student must consult the list to find out what it is.
	1.4 *Paraphrasing.* Hanzeli (1975) suggests paraphrasing a syntactic error while Joiner (1975) suggests modeling the incorrect sentence with the proper substitution but without calling attention to the correction. This technique is criticized in that many students may not hear the difference between the two. It should be used only when a more direct correction would have a negative effect.	
2. Self-correction	2.1 *Pinpointing.* The teacher localizes an error without revealing it (Cathcart & Olsen, 1976). The teacher will repeat the student's sentence up to the error. It is effective for correcting student-generated sentences.	2.1 *Symbols and abbreviations.* The teacher writes symbols representing grammatical terms, then the students have to rewrite the work and hand it in with the original draft.
	2.2 *Rephrasing question.* The teacher rephrases the question to reduce the number of words or changes an information question to a yes-no question (Holley & King, 1971; Joiner 1975). This technique is appropriate when the student does not understand the question but does not make a grammatical error.	2.2 *Reference to grammar rules.* Teacher indicates page number and rules that the students should consult to. It can be used only with classes that have finished a grammar book.
	2.3 *Cueing.* The teacher gives grammatical variations of a key content word (Holley & King, 1971). It is used when a student indicates difficulty forming a specific word.	2.3 *Checklists.* Teacher prepares a checklist that students can use as a reminder when they write compositions.
	2.4 *Generating simple sentences* (Holley & King, 1971). The teacher provides several possible answers to the question just asked, thereby relaxing the constraints. It is a technique to use	

	when the student shows a lack of understanding of an entire question.	
	2.5 *Explain key word* (Joiner, 1975). The teacher may write a difficult word on the board or act it out.	
	2.6 *Questioning* (Burt & Kiparsky, 1972). If the teacher does not understand the student's word, the teacher should ask a question about it. The student should reveal the meaning of the word without recourse to the native language and without making an obvious correction.	
	2.7 *Repetition* (Cohen, 1975). The teacher asks the student to repeat the sentence containing the error. Researchers sometimes view this technique as ambiguous or vague since the student may not realize that an error has been made or where it is.	
	2.8 *No*. The teacher may shake his/ her head to indicate the error. It is criticized by Fanselow as being too vague. However, it can be useful in certain areas; for example, an 'either or' choice.	
	2.9 *Grammatical terms*. The teacher localizes an error by mentioning what function it plays in the sentence. It should be noted that this technique does not focus on communication but rather on form or linguistic correctness.	
	2.10 *Gestures*. The teacher uses gestures to respond to the students. The great advantage of using gestures is that there is no additional verbal input to confuse the student. In addition, gestures often take less time than verbal corrections.	

In the present study, the researcher has applied some of these techniques to the CALL programs. For the self-correction program, the techniques used are "no", "pinpointing", and "reference to grammar rules". First, students are told that the answer is wrong. Then, the clue(s) will be pinpointed to guide the students to the correct answer. In addition, grammar rules and explanations will be provided if the students still cannot get the correct answer. In the overt correction program, the "direct correction" and "providing correct answer" techniques are used. That is, the program will indicate that the answer is wrong and then it will give the correct answer.

2.6 Learner's Attitudes towards Error Correction

From the learner's perspective, error correction is expected. Cathcart and Olsen (1976; cited in Bailey, 1985: 112) surveyed 149 adult learners of English as a second language and found that all the students wanted to be corrected when they made oral errors. Seventy-four percent of the respondents preferred to be corrected all the time, while another 17 percent preferred to be corrected most of the time. Apart from that, students at all levels thought pronunciation and grammar errors were the most important to correct.

In 1987, Cohen did an extensive survey of 217 students from New York State University and found that many students consider the teacher's feedback valuable for improving their writing.

The findings are confirmed by the results of Willing's study (1988; cited in Nunan, 1989: 31). Willing did a study of learning preferences with 517 adult learners and also found that 'error correction by the teacher' was the second most highly regarded classroom activity after 'practicing the sounds and pronunciation of English'.

2.7 Self-correction versus Overt Correction

In general, overt correction is a term that is used to refer to a corrective technique where it is obvious to the learner that he/ she is being corrected. However, in the present study, the term 'overt correction' is used to refer to the traditional 'teacher correction' that is assumed to have these functions: to detect whether the answer is correct or not, to explain why it is (or is not) correct, and to reveal the correct answer.

Previous research shows that the most common source of feedback in language classrooms is provided by the teacher (Cathcart & Olsen, 1976; Fanselow, 1977; Lucas, 1976; all cited in Walz, 1982: 18). In Thailand, Chumsawat (1993) studied error correction behaviors of student teachers in teaching English. The results confirm that the most frequently used technique in correcting grammatical errors was teacher correction; that is, the teacher immediately provided the right answers to the students. However, teacher correction does not establish a pattern of long-term memory (Fanselow, 1997; cited in Walz, Ibid.). Corder (1973; cited in Hendrickson, 1979: 16) affirms that teacher correction will probably help students, but that teacher correction alone is insufficient to change error patterns very noticeably.

The Theories Concerning Self-Correction and Overt Correction

The present study compares the effect of overt correction and self-correction on the usage of English tenses of undergraduates. A number of learning theories indicate the preference of self-correction to teacher correction. The first learning theory that supports self-correction is constructivism. Constructivists believe that all human beings construct their own version of reality (Brown, 2000: 11). In other words, language learners are believed to be able to construct their own knowledge through social interaction. Unlike behaviorists, constructivists believe that language learners are active in the learning process. They respect individual past experiences that would cause people to learn better through different ways. The role of the teacher has changed from being a traditional

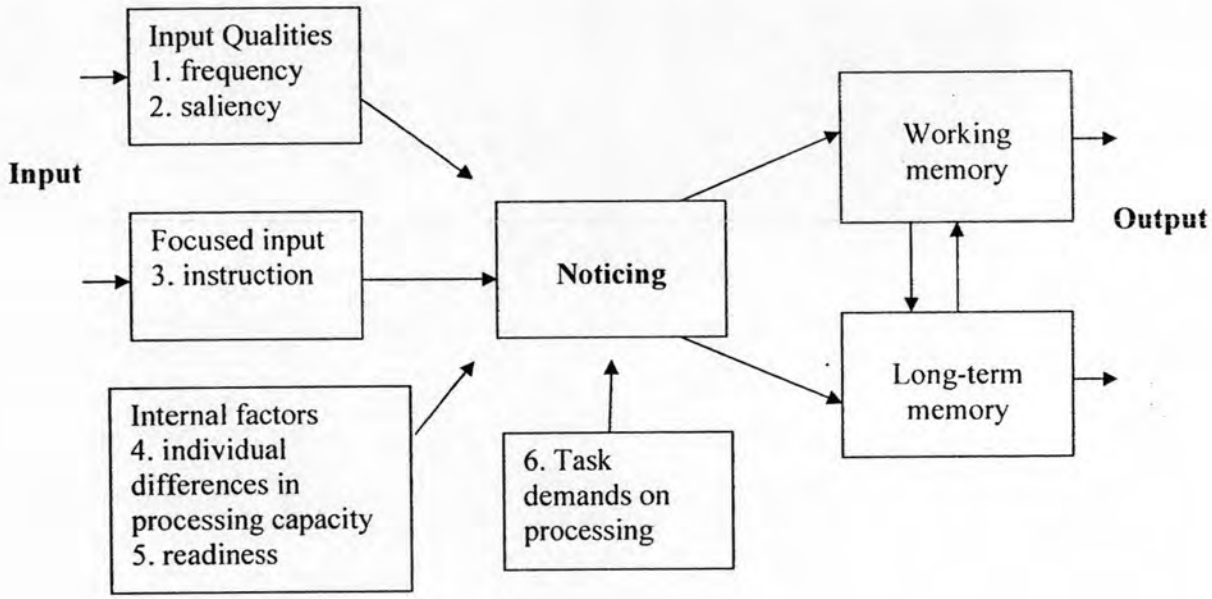
lecturer or knowledge transmitter to being a facilitator, a supporter, a feedback provider, etc. According to constructivism, language learners should be engaged more actively in their learning. They do not have to wait for the teacher to tell them that their production is erroneous, or wait passively for correction from the teacher. They should be able to actively monitor themselves, checking whether their production is correct or not; and if not, they can correct their own errors.

Another theory that supports self-correction is the "Noticing Hypothesis" proposed by Schmidt (1990; cited in Fotos, 2001). According to Schmidt, *noticing* is the process of attending consciously to linguistic features in the input. Once a student becomes aware of a particular grammar point or language feature in input, he/ she often continues to notice the structure in subsequent input, particularly if the structure is used frequently (Schmidt, 1990 cited in Fotos, 2001: 272). Fotos (Ibid.) explains that repeated noticing and continued awareness of the language feature is important because it will raise the student's consciousness of the structure and will facilitate restructuring of the learner's unconscious system of linguistic knowledge. Therefore, when a student pays attention when receiving a grammar lesson or doing practice exercises, he or she becomes aware of the grammar feature. When he/she sees it again, the student often tends to notice it or recall that he/she learned about it previously. Fotos concludes that when it happens frequently, his/her unconscious language system begins to develop new hypotheses about language structure and alter his/her existing language system.

Schmidt discusses six influences to "noticing" (Skehan, 1998: 48) which is illustrated in the Figure 2.3 below. First, the more frequently a form occurs, the more likely it is to be noticed and then become integrated in the Interlanguage system. The second influence is perceptual salience, which concerns how prominent a form is in input. Third, instruction may play an important role. The concern is the way the instruction channels attention and brings the form into awareness. With the same quality of input, instruction can generate a plethora of teaching methods and techniques. The fourth influence is individual differences in processing ability. This concerns the learner's capacity to deal with the range of forms in the input. Schmidt's fifth influence on noticing is the current state of the Interlanguage system or readiness to notice. According to cognitive processing principles, word order acquisition, for example, can be predicted. Schmidt's claim implies that a prediction can be made about what the learner can profitably notice because it is the "next" thing to be acquired. The last influence on noticing is task demands. It concerns what is expected of the language user

at any given moment as a result of the activity he/she is engaged in. Particular tasks may, through their characteristics, make certain language forms more salient than others.

Figure 2.3: Influences upon noticing (adapted from Skehan, 1998: 52)



After the students have noticed the form, the form would go into memory. There are two types of memory — short-term (or working memory) and long-term memory. Cognitive scientists suggest that short-term memory is limited in storage capacity while long-term memory is not (Fotos, 2001: 272). Once information enters the working memory, people have about 15 seconds while the brain decides to process the information or to discard it (Tileston, 2004: 20). About 98% of the information is discarded at this point. Generally, only seven items can be stored for about a minute in short-term memory. Transfer from working memory to long-term memory is therefore very important. The key to getting information to long-term memory is rehearsal. *Rehearsal* refers to what one does with the information once it has been introduced into working memory through the senses or retrieved from long-term storage. Rehearsal performs two functions: it maintains information in working memory, and it is the mechanism by which people transfer information to long-term memory (Tileston, Ibid.).

Schmidt also pays attention to the role of consciousness in language learning (Skehan, 1998: 56). For Schmidt, consciousness has considerable importance in language

learning; it enables learners to appreciate better the instruction they are receiving, especially the correction that is being given.

It is quite clear that self-correction in the present study is more 'consciousness raising' than overt correction. According to the demands of the task, students have to pay more attention when they do self-correction. They have to compare the choice that they would like to select with the rules that they have learned and try to identify whether gaps or differences exist. If the answer is wrong, the keywords will be highlighted. Again, the students have to consciously decipher what the keywords are saying, and try to figure out the answer.

Self-correction does not only promote active and consciousness-raising learning but it is also good to help train the students to become *autonomous l*earners. Holec's interpretation (1981; cited in Hall & Beggs, 1998: 26) of "autonomous learners" in the context of language learning is often cited as definitive:

> To say of a learner that he is autonomous…is to say that he is capable of taking charge of his own learning… To take charge of one's learning is to have and to hold the responsibility for all the decisions concerning all aspects of this learning, i.e. determining the objectives, defining the contents and progressions, selecting the methods and techniques to be used, monitoring the procedure of acquisition, evaluating what has been acquired.

The concept of learner autonomy has gained much interest and has been viewed as an ultimate goal in language learning because, ideally, learners are expected to be able to manage their learning and to apply the rules they have learned to correct their own mistakes in real life communications. Allwright and Bailey (1991: 107) suggest that the most fruitful treatment to promote such a goal is self-correction, since it trains the learners to make self-initiated self-repairs. This perfectly agrees with the policy guidelines of the Thai Ministry of Education. In the context of English language teaching in Thailand, the Ministry has framed University English Foundation Courses around two goals and seven standards. One of the descriptors for Goal 2 – "to use English to help achieve personal and academic goals and to promote life-long learning" – is "applying self-monitoring and self-corrective strategies to build and expand a knowledge base".

2.8 Impact of the Feedback: A Review of Previous Research Studies

The impact of negative and positive evidence on SLA has become one of the most controversial issues. El Tatawy (2002) reviews related theories and makes an easy-to-understand summary as follows:

> According to nativist theory advocated by Chomsky (1975), negative evidence hardly plays any role at all. This is due to the fact that, for the nativists, what makes language acquisition possible is Universal Grammar and the innate linguistic mechanism that is available to all humans. They have argued that instruction, including negative evidence, has little impact on forms within UG since it will temporarily change only language behavior and not IL grammars. In this view, changes in the IL grammar are the result of positive linguistic evidence.

Similarly, Krashen, in his *input hypothesis*, suggests that explicit negative evidence hardly have any positive effect on SLA. He proposes the distinction between acquisition and learning that *acquisition* is a subconscious and intuitive process of constructing the system of a language while *learning* is the process in which learners attend to form, figure out rules, and are generally aware of their own process (Krashen 1981; cited in Brown 1987). He argues that SLA is the result of implicit processes operating together with the reception of comprehensible input and that learning cannot be converted into acquisition (Krashen 1982, 1985; cited in El Tatawy, 2002). Conscious learning can only act as a monitor that edits the output. Therefore, for Krashen, negative evidence has a barely discernable effect on SLA (El Tatawy, Ibid.).

Recently, Truscott (1996; cited in Ferris, 2004) avidly presented his own position–error correction is harmful and should be abolished–in a review essay 'The case against grammar correction in L2 writing classes' published in the journal *Language Learning*. The paper received a lot of attention and was the source of commentary and controversy at conferences and in journal articles (Ferris, Ibid.).

Ferris is one of the scholars who do not agree with Truscott's claim. In response to Truscott's paper, she wrote an article 'The case for grammar correction in L2 writing classes: a response to Truscott (1996)' published in 1999 (Ferris, 1999). Moreover, she made a critical review of the studies on the issues surrounding error correction in L2 writing, including the ones reviewed by Truscott (Ferris, 2004). She points out that of all the six studies that actually examine the 'correction/ no correction' comparison, three of them clearly report evidence in favor of the helpfulness of error correction (Ashwell,

2000; Fathman & Whalley, 1990; Ferris & Roberts, 2001; all cited in Ferris, Ibid.); one finds positive evidence for error correction but curiously interprets it as negative (Kepner, 1991; cited in Ferris, Ibid.); one is inconclusive because of missing information (Semke, 1984; cited in Ferris, Ibid.); and one provides support for Truscott's view (Polio, et al., 1998; cited in Ferris, Ibid.).

The conclusions of Semke's and Polio et al.'s studies are also criticized by Chandler (2003) in her literature review section, where she stated the studies need to be examined closely. Part of her critique is as follows:

> Somke's (1984) finding of lack of effect of error correction on accuracy and negative effect on fluency may not have been due entirely to the different treatment methods but also to the differences in the quantity of writing practice. The group that self corrected wrote much less new material because of the time it took to make revisions. Similarly, in Polio et al.'s (1998) study, the experimental group receiving error correction was assigned to write half as many journal entries as the control group because of their editing activities. Both groups improved in accuracy, but there was no significant difference between them.

Chandler (Ibid.) argues that the lack of differences may come from other factors, not solely from the treatment. Therefore, the results should be interpreted with caution and conclusions must be made with care.

Although some scholars hold negative views about the impact of error correction, other scholars argue that feedback on errors has a positive impact on SLA. According to the noticing hypothesis (Schmidt, 1990), input will become intake for L2 learning only when some degree of noticing occurs; this is the role of corrective feedback to help the students notice the gaps between the target norms and their target language, which will lead to subsequent grammatical restructuring. Similarly, Ellis (2002: 171) proposes that the acquisition of implicit knowledge involves the processes of noticing, comparing, and integrating. Moreover, empirical findings from several experiments reveal that learners receiving corrective feedback do better in posttests than their control groups (Ayoun, 2001; Carroll & Swain, 1993; Carroll, Swain, & Roberge, 1992; Mackey & Philp, 1998). Concerning the question of the efficiency of error correction in improving students accuracy over time, Ferris (2004), in the same review, lists the studies that report the improvement in accuracy of students who received error correction over time as follows: Chandler (2003), Ferris (1995, 1997), Ferris and Helt (2000), Frantzen (1995), Lalande

(1982), Robb et al. (1986), and Sheppard (1992). However, Ferris suggests that a conclusion cannot be made because the studies were various and inconsistent in design.

In relation to the effectiveness of *direct/ explicit* and *indirect/ implicit* feedback, several studies have been conducted to compare one feedback type with another. Fathman and Walley (1990) report that students who received grammar feedback that indicated the place, but not type, of errors significantly improved their grammar scores on subsequent rewrites of the papers. Lalende (1982) asserts that indirect feedback may be more beneficial to students than direct feedback in editing because indirect feedback can guide learning and help the students solve problems by themselves. The superiority of indirect feedback over direct feedback is supported by Frodesen (2001) who states that indirect feedback is generally more useful (and often more desired by students) than direct correction of errors.

Lyster (2001) did a study to investigate specific patterns of corrective feedback and their relationship to error types and immediate learner repair. There were three types of feedback in the study: 1.explicit correction, 2. recast, and 3. negotiation of form which covers the following techniques: elicitation, metalinguistic clues, clarification requests, and repetition. In relation to grammatical errors, the teachers showed a preference for recast of this type of error. However, only about one-third of the grammatical repairs followed recasts; almost two-thirds were peer and (mainly) self-repairs following the negotiation of form. Based on the findings, Lyster suggests that perhaps teachers could draw more frequently on the negotiation of form in response to grammatical errors because almost two thirds of all grammatical repairs resulted from this type of feedback. This study provides evidence that supports 'implicit' feedback. Although Lyster stated that negotiation of form is more explicit than recast and more implicit than explicit correction, it is grouped as 'implicit' according to the criterion that it did not give the correct form to the students.

On the other hand, there are some studies that yield results in favor of explicit feedback. Chen (2005) did a study aimed at discovering what types of feedback better facilitated Taiwanese college students studying English oral language. From classroom observations, she found that English teachers tended to employ indirect and implicit feedback. However, the results concluded that direct and explicit feedback actually prompted a higher percentage of both uptake moves and repair moves by the learners.

Another study conducted by Carroll and Swain (1993) in an experimental laboratory study with adult Spanish-speaking learners of ESL, examined the effects of four different types of feedback which differed in their degree of explicitness. Similar to

Chen, they found that the group receiving explicit metalinguistic feedback outperformed all groups, including the recast (implicit) group.

Makino (1993) did a study that investigated to what degree teacher cues or hints help their students correct their own errors in EFL written compositions, and what kind of cues are more effective in self-correction. The subjects were 62 Japanese college students. Makino reports that the more detailed the cues to the errors, the higher the ratio of learner self-correction achieved. The results also indicate that learners demonstrated that they could activate their linguistic competence to some extent in order to correct their own errors in written English compositions.

Recently, Ellis, Loewen, and Erlam (2006) conducted an experimental study comparing the effects of recasts (implicit feedback) and metalinguistic explanations (explicit feedback) on the acquisition of the past tense *-ed*. They report a clear advantage for explicit feedback over implicit feedback for both the delayed imitation test (designed to measure implicit knowledge) and grammaticality judgment posttest. This leads to their conclusion that 'metalinguistic explanation' benefits implicit as well as explicit knowledge.

However, there are some studies that report no differences between the two feedback types. Paniagua (1985) conducted a study to compare the effect of overt correction (OC) and covert correction (CC) in Spanish class. In the OC group, the teacher corrected grammatical or pronunciation errors in drills by modeling the desired response after the error and required the student to repeat it back. In the CC group, the teacher did the same, except they did not require the student to repeat it back. Paniagua reports that both techniques were found to be effective in helping students learn. No significant difference was found between the two groups both on their grammar and pronunciation tests.

Kim and Mathes (2001) investigated two types of negative feedback–explicit metalinguistic information and sentence recast– on 20 Korean speakers' use of dative alternation in English. It was found that scores from the posttest of both groups were not significantly different.

Similarly, Chandler (2003), who examined the effects of four different kinds of teacher response to error on the correctness, reports that both direct correction and simple underlining of errors were effective ways of increasing the accuracy both for revisions and for subsequent writing.

Up to this point, it can be seen that the questions about effectiveness of error treatment and that of each type of feedback are still far from an absolute conclusion.

Some studies yield support for implicit feedback while others report the superiority of explicit feedback. The conflicting results may be due to the differences in the purpose, focus and context of the different research settings.

In conclusion, this part presents the aspects related to 'error treatment'. Error treatment concerns the way in which teachers (and other learners) respond to learners' errors (Ellis, 1994: 701). One of the most essential components in the error treatment procedure is 'feedback', which refers to information about correctness given to the learner by the teacher. Feedback can be divided into two main types: *affective* and *cognitive*. Cognitive feedback can further be divided into *positive* and *negative* evidence. Positive evidence is the providing of models that are grammatical and acceptable in the target language. Negative evidence, alternatively, provides the learners with *direct* or *indirect* information about what is ungrammatical or unacceptable.

Regarding the students' attitudes towards error correction, students think corrective feedback from the teacher is valuable and clearly state that they want corrections.

Previous research studies have demonstrated the ability to self-correct of students. However, the impact of the feedback and its effectiveness are still inconclusive. More studies that are 'well-controlled' and 'comparable in design' are needed in order to yield a sound conclusion.

3. Computer-Assisted Language Learning (CALL)

Beatty (2003: 7) proposes a definition of Computer-assisted Language Learning (CALL) as 'any process in which a learner uses a computer and, as a result, improves his or her language'. CALL covers a broad range of activities, including issues of materials design, technologies, pedagogical theories and modes of instruction. There are several other terms that are related to CALL. Beatty (Ibid.: 9) points out the differences as follows:

CAI *Computer-aided instruction* refers to learning at the computer, but not necessarily with a language focus. Although it may not be the intention of all those who use the acronym, the term *instruction* suggests a teacher-centered approach.

CAL *Computer-assisted learning*, similar to CAI, may refer to the learning of any subject (including language learning) using a computer, but in contrast to CAI, CAL emphasizes the learner.

CALI *Computer-assisted language instruction*, was a term once commonly used in North America.

CALT *Computer-assisted language teaching*, is like CALL, but with an emphasis on the teacher.

CALT *Computer-assisted language testing* or *Computer adaptive learning testing*. Computer adaptive testing refers specifically to situations in which the computer considers the answer to each question and raises or lowers the level of difficulty accordingly.

3.1 A Brief History of CALL

The first computers used for language learning were large 1950s' mainframes that were only available at research facilities on university campuses (Beatty, 2003: 16). In 1959, the first and most significant computer applications for teaching and learning were developed by the University of Illinois and were used on the Programmed Logic/Learning for Automated Teaching Operations (PLATO) system (Beatty, Ibid.). Much of PLATO's language learning work was based on the grammar translation approach. In 1975, microcomputers were first sold in kit form (Merrill et al., 1996; cited in Beatty, Ibid.: 23). This led to the development of a great number of applications, including ones for language teaching.

Garrett (1987: 170) proposes that the development of computer-assisted instruction can be roughly classified into 3 periods: *machine-driven, teacher-driven, and learner-driven*. Early attempts at developing CAI were constrained by limits on what the technology could do. Garrett explains that limits on the amount of machine memory, on the ability to produce foreign language accents and special characters, on flexibility in judging student responses, etc., made software developers stay within a narrow range of possible exercise types, most commonly vocabulary and drill-and-practice grammar lessons. Garrett also points out that many of the lessons in the machine-driven period were developed not by teachers but by programmers who had only a superficial knowledge of the foreign language and little, if any idea, of language pedagogy.

The *teacher-driven* period began with the development of computer technology. Computers have become so sophisticated and powerful that no machine limitations would have controlled the design of materials. Teachers have been more involved in the design and production of software (Garrett, 1987: 170).

More recently, teachers and educators have become more aware of language-learning process. The increasing use of the acronym CALL instead of CAI seems to suggest that this change of perspective has already taken place (Garrett, 1987: 171). In

the *learner-driven* period, the computer's full potential for interaction with the individual learner cannot be exploited until decisions about the kinds of materials to be used and their design are based on theoretically motivated and research-based insights into the language-learning process rather than on traditional precepts about the language-teaching process (Garrett, Ibid).

3.2 Types of CALL Programs

The most common types of programs used in CALL are summarized by Wyatt (1987: 87) as follows:

Program Type	**Examples of Functions and Contents**
1. Tutorial	Introducing new material—e.g., the Cyrillic alphabet in beginning Russian
2. Drill and practice	Allowing mastery of material already presented—e.g., grammatical forms, culturally appropriate behavior
3. Game	Adding elements of peer competition, scoring, and timing to a wide variety of practice activities
4. Holistic practice	Providing higher-level, contextualized practice activities—e.g., cloze passages
5. Modeling	Demonstrating how to perform a language task—e.g., how a good reader handles difficult sections of a reading passage
6. Discovery	Providing situations in which linguistic generalizations can be made—e.g., inferring rules for generating comparative forms
7. Simulation	Allowing students to experiment with language use—e.g., levels of formality in a conversational simulator
8. Adventure reading (interactive fiction)	Offering "participatory" reading materials—e.g., student as detective explores murder location, gather clues
9. Annotation	Providing a wide range of language "notes" (vocabulary, syntax, plot, etc.) available on demand during reading or listening activities
10. Idea processor	Planning and editing outlines—e.g., before writing activities, after listening to lectures
11. Word processor	Creating and editing written assignments
12. On-line thesaurus	Expanding vocabulary, improving writing style
13. Spelling checker	Guarding against errors during or after writing activities
14. Textual analysis	Revealing structural and stylistic aspects of written work—e.g., complexity and variety of sentence types, subject/verb agreement errors

The experimental materials in the present study were designed in a 'drill and practice' fashion. The students are presented with items to practice two particular tenses at a time. Buttons that link to 'help' including forms, usage, keywords, and glossary are provided.

3.3 CALL and the Learning Principles

In order to design and to develop effective CALL programs, the designer needs to be acknowledgeable not only in programming but also in learning principles. The theory he/she believes in will most likely frame the programs he designs. However, it should be noted that no universal agreement exists on how learning occurs. The views towards the principles of learning have been changed significantly throughout the 20th century. Today, many educators are strong proponents of particular approaches, whereas others take a more eclectic approach, adopting a combination of principles from different theories (Alessi & Trollip, 2001: 16). The following section discusses the three dominant principles—Behavioral psychology principles, Cognitive psychology principles, and Constructivist psychology principles.

3.3.1 Behavioral Psychology Principles

Behavioral psychology was the dominant psychological theory of the 1950s and 1960s. Primarily, it began with the work of Thorndike and Pavlov. Pavlov's research concerned 'classical conditioning'. He proposed that an animals' basic instinctual responses to natural stimuli could be linked to artificial stimuli (Alessi & Trollip, 2001: 17). Thorndike, at the beginning of the 20th century, conducted research that led to what is now termed 'operant conditioning': the use of rewards and punishments to modify behavior. The work was refined and popularized by Skinner. Skinner proposed a set of basic behavior rules as follows (Alessi & Trollip, Ibid.):

1. Behavior that is followed by positive environmental effects (known as positive reinforcement, or reward) increases in frequency.

2. Behavior that is followed by the withdrawal of negative environmental effects (known as negative reinforcement) also increases in frequency.

3. Behavior that is followed by a negative environmental effect (punishment) decreases in frequency.

4. When behavior that was previously increased in frequency through reinforcement is no longer reinforced, it decreases in frequency (known as extinction).

Skinner has gained recognition for his contributions to education through teaching machines and programmed learning (Skinner, 1968; cited in Brown, 1987: 17). Skinner's theory of verbal learning was consistent with the prevailing beliefs of many applied linguists of the 1940s and 1950s, who maintained that second languages should be learned through extensive drill and practice without recourse to rationalistic explanation (Omaggio Hadley, 2001: 56). According to this theory, language learning is like any other kind of learning in that it involves habit formation (Ellis 1997: 31). Habits

are formed when learners respond to stimuli in the environment and subsequently have their responses reinforced so that they are remembered. Ellis explains that, from this view, learning takes place when learners have the opportunity to practice making the correct response to a given stimulus. Learners imitate models of correct language and receive positive reinforcement if they are correct and negative reinforcement if they are incorrect.

Based on this theory, Tanpipat (1998; cited in Boonplong, 1998: 34) proposes that the CALL programs will be designed in a linear structure. In addition, learners will be regularly asked questions. If they answer correctly, they will receive positive reinforcement or rewards. On the other hand, if they give a wrong answer, they will receive negative reinforcement and an explanation or punishment. Students need to finish and pass the criteria set for each lesson so that they can move to the next lesson; if not, they have to go back and practice again until they can reach the goal/objectives of that lesson. Rodpothong (2003: 73) notes that the contents of each lesson based on this principle are divided and progress from a simple lesson to a more complicated one. Students have to answer all questions correctly so that they can move on to other questions. Students will receive immediate feedback and reinforcement is provided to every response. The programs are not time-limited. Students can practice at their own pace.

3.3.2 Cognitive Psychology Principles

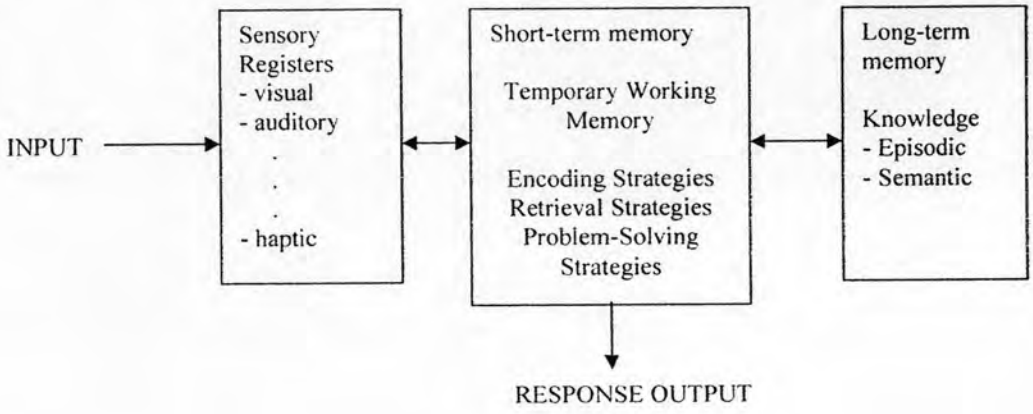
The dominance of behaviorism began to wane in the last third of the 20th century, and cognitive psychology began to overtake it during the 1970s (Alessi & Trollip, 2001: 19). Cognitive theory derives from the field of cognitive psychology and places emphasis on unobservable constructs, such as mind, memory, attitudes, motivation, thinking, reflection, and other internal processes.

Dominant schools of cognitive learning psychology are based on the information-processing (IP) approach. The information-processing theories attempt to describe how information enters the human senses, becomes stored in memory, is retained or forgotten, and is used. Information processing theorists often use flow charts to depict schematically the flow of information through the system. Figure 2.4 gives an overview of the system's components.

Hamilton and Ghatala (1994) provide explanation about the flow that information is initially represented in its original sensory form in *sensory registers* which can hold large quantities of information but only for a matter of milliseconds. Byrnes (1996) suggests that the information will get into the sensory store in the form of an *icon*. The

icon will last only for one second, unless attended to (Atkinson & Shiffrin, 1968; cited in Byrnes, Ibid.).

Figure 2.4: Structures and processes of the information processing system (adapted from Hamilton & Ghatala, 1994)



Byrnes explains that *attention* causes information in the sensory store to be passed along to the short-term store or *short-term memory*, where the capacity is smaller but the representations are more durable, lasting for seconds. Short-term memory is also referred to as working memory. Byrnes suggests that the size of the average person's short-term memory has been determined to be a fixed capacity of seven chunks of information. Thus, if more than seven items are presented, some of them will not enter the short-term store and will be forgotten. If nothing is done to the information in short-term memory within 15 to 30 seconds, it will be lost or forgotten (Siegler, 1991; cited in Byrnes, Ibid.) In order for information to pass onto long-term memory, it is typically necessary to use a memory *strategy*. Once information is stored in long-term memory, it is there indefinitely. Therefore, from an IP perspective, *learning consists of storing new information in long-term memory and subsequently retrieving it* (Hamilton & Ghatala, Ibid).

Hamilton and Ghatala (Ibid.) explain that long-term memory can be thought of as a vast repository of knowledge. The knowledge stored in the long-term memory is classified as *episodic* and *semantic*. Episodic knowledge is the memory of the personal experience events which make up human lives. Semantic knowledge, in contrast, consists of memories that are not tied to an individual's personal history but rather

transcend a particular context. It refers to knowledge of general concepts and principles and their associations. Much of what is learnt in school is semantic knowledge.

The long-term memory system is very large in capacity; it can operate in a parallel fashion (Skehan, 1998). Skehan points out that the transfer of information from the short-term to the long-term memory is affected by processes of *rehearsal*. The most cited example of this is the rehearsal of a telephone number so that it can be slowly transferred to long-term memory.

In relation to language learning, cognitive theory focuses on the role of more general cognitive processes involved in language acquisition, such as transfer, simplification, generalization, and restructuring (McLaughlin, 1987; cited in Omaggio Hadley, 2001: 65). It is in direct opposition to Behaviorist theory. From a cognitive perspective, learning is believed to result from internal mental activity rather than from something imposed from outside the learner (Ellis, 1990; cited in Omaggio Hadley, Ibid.). Moreover, second language learning is seen as "the acquisition of a complex cognitive skill" (McLaughlin, Ibid.). For a language learner to become proficient, subskills of this complex task must be practiced, automatized, integrated, and organized into internal representations, or rule systems, that are constantly restructured as proficiency develops (Omaggio Hadley, Ibid.).

The design of CALL programs in the present study has been guided by several issues central to cognitive psychology. Firstly, they are drills that allow learners to practice so that they can strengthen their knowledge. Furthermore, the contents are divided into small chunks because of the awareness that learners are naturally limited in the amount of information they can process and remember. Moreover, the contents are presented in a 'top-up' fashion; there is a revision that combines all learned topics every two modules. This intends to have the learners rehearse and bit by bit reconstruct the new information to their existing information.

3.3.3 Constructivist Psychology Principles

Constructivism is a philosophical view that holds that there is an objective world that humans perceive more or less accurately through their senses, and that learning is the process of correctly interpreting the senses and responding correctly to objects and events in the real world (Alessi & Trollip, 2001: 31). It argues that knowledge is not received from outside, but that humans construct knowledge in their heads. An example of one of the schools of constructivist thought is 'social constructivism' which holds that knowledge is socially constructed rather than having its own independent existence (Nunan, 1999: 304).

Concerning language learning, the theory acknowledges the importance of both input and internal language processing. Learning takes place as a result of a complex interaction between the linguistic environment and the learner's internal mechanisms (Ellis, 1997: 44).

In the early to mid-1990s the constructivist approach to learning spread rapidly in the instructional design and multimedia fields. Education is viewed as learners actively constructing their own knowledge with teachers being coaches, facilitators, or even partners with learners in the learning process (Alessi & Trollip, 2001: 32). The program designers should create educational environments that facilitate the construction of knowledge.

The following principles are typically promoted as ways to accomplish the goal (Alessi & Trollip, Ibid.):

- Emphasize learning rather than teaching.
- Emphasize the actions and thinking of learners rather than of teachers.
- Emphasize active learning.
- Use discovery or guided discovery approach.
- Encourage learner construction of information and projects.
- Have a foundation in situated cognition and its associated notion of anchored instruction.
- Use cooperative or collaborative learning activities.
- Use purposeful or authentic learning activities.
- Emphasize learner choice and negotiation of goals, strategies, and evaluation methods.
- Encourage personal autonomy on the part of learners.
- Support learner reflection.
- Support learner ownership of learning and activities.
- Encourage learners to accept and reflect on the complexity of the real world.
- Use authentic tasks and activities that are personally relevant to learners.

3.4 Roles, Advantages, and Limitations of CALL

The computer takes several roles in language teaching and learning. It can simply act as a tutor by providing information, assessing the learner's reply, recording it, pointing out mistakes, and giving explanations (Kenning & Kenning, 1983: 2). In addition, it can be a partner for the learner to play educational games with, or it can be a highly efficient reference book. It can also be used to generate examples, to illustrate certain operations, or to simulate conversation.

Kenning and Kenning (1983: 3) point out a number of advantages of the computer over normal class work. First, it offers privacy. Students are relieved from the fear of being ridiculed for their mistakes by their classmates. Second, it allows learners to work on their own, in their own time and, most importantly, at their own pace. This is very valuable not only for slow learners, but also for better students. It yields the concepts of individualization. Each student can use the computer to review the grammar at his/ her own speed with special emphasis on areas where he/ she is weak (Nelson et al., 1976:37; cited in Beatty, 2003: 10). Third, the computer lacks impatience. It tirelessly repeats the same point again and again. Finally, the computer is consistent, unbiased, and has no 'off days'.

For teachers, the computer offers the opportunity to make better use of their time and expertise. Since the computer can help in tedious mechanical tasks, it allows teachers to spend more time on other activities. In addition, through its record-keeping facilities, it gives teachers access to detailed information on their students' strengths, weaknesses, and progress.

Not only can the computer support language teaching and learning, but it has also become an important tool in research efforts to collect data. Doughty (1987: 134) states that computers make possible collection of data detailed enough to shed light on the complex processing and casual variables involved in SLA. Doughty proposes that some advantages of using the computer as a research tool include more control over collection, examination, and manipulation of data, as well as convenience (and speed) of data recording, storage, and computation within an appropriate experimental design.

However, Kenning and Kenning (Ibid.) also state limitations should be noted. First, the computer is not suited to all activities because it operates in a predetermined fashion. It, then, cannot cope with the unexpected. Also, it is more tiring to read from a screen than from a printed text. Lastly, it is time-consuming for teachers who develop their own materials.

3.5 CALL Feedback and Its Timing

Garrett (1987: 174) points out that the one real advantage in doing grammar on the computer rather than in a workbook is that the computer can give students immediate feedback on the correctness of their input. However, current software is not very successful because much of the commercially available offerings are of the "wrong, try again" model, which only indicates *whether* student-produced language matches the TL model stored in computer memory (sometimes also showing the correct answer) without indicating *how* or *why* the student input does not match (Garrett, Ibid.). Thus, current efforts to improve grammar software tend to focus on different ways of giving students better feedback.

The first technique discussed by Garette (1987: 175) offers a feedback message that is not based on analysis of the student's error at all, but presents an analysis of the correct answer; no matter what wrong answer the student types in, the feedback message is the same, explaining what it should have been. Garrett comments that this technique tends to be insufficient and unsuccessful because students cannot always analyze how the "rule" they were using to produce their incorrect response differs from the correct one merely by being told "wrong," or even seeing the correct answer after one or more unsuccessful attempts. Furthermore, students who have made only typing or spelling errors may resent grammar explanations.

In another technique (Garrett, Ibid.), the computer indicates which specific letters of the student response do not match the correct answer and then puts symbols indicating a variety of error messages beneath the student's response. The location of the error is pinpointed on the basis of the computer's letter-by-letter comparison of the student's input with the machine-stored correct version. This technique allows students to recognize their typing mistakes without having them labeled as grammar error. However, the machine looks only at the surface characteristics of the input.

Garrett (Ibid.) suggests that a further level of feedback accuracy can be achieved if a CAI lesson author draws up a list of anticipated wrong answers for every item and programs the computer to give an appropriate message in response to whichever one the student enters. This technique allows the computer to give highly grammar-specific feedback. The disadvantages of this approach are that it is extremely time-consuming for the author to prepare and uses a great deal of machine memory. Furthermore, teachers will often find it difficult to anticipate all the wrong answers that may be produced.

The last technique discussed by Garrett (Ibid.) is to provide "intelligent" feedback. This is the most sophisticated technique. The computer is programmed to do a

linguistic analysis of the student's response, comparing it to a stored analysis of the relevant grammar rules of the TL and returning a feedback message based on that comparison. However, Garrett states that the development of such a parsing program is still in its infancy.

Kulhavy (1977; cited in Boonplong, 1998: 37) reviewed studies about error feedback and suggests that negative feedback seems to be more effective than positive feedback. It is also suggested that positive feedback should be provided after the students have started to work for a while or have finished half of the lesson. It is not necessary to give positive feedback every time they answer correctly.

Cohen (1985; cited in Boonplong, Ibid.) gives suggestions for CALL developer that:

1. The program should not give "praising" feedback
2. The program should provide immediate feedback
3. Feedback should be always provided; no matter the answer is correct or not
4. Feedback should contain explanations telling the student why his/ her answer is correct or why it is incorrect.

Alessi and Trollip (2001: 115) suggest that feedback should provide the learner with information to improve future performance. It should avoid negative statements, sarcasm, and should never demean the learner. Also, it should be noted that providing too *interesting* feedback may increase the rate of errors. When feedback following errors is much more interesting than that following correct responses, the learner may be stimulated to make errors intentionally to see the interesting effects.

With regard to the timing, it is found that immediate feedback is not always more beneficial than delayed feedback, but is almost always better than no feedback (Alessi & Trollip, 2001: 115). The proper timing depends on the nature of what is being learned and how it is being learned. In general, an advantage for delayed feedback has been demonstrated for propositional knowledge (verbal information, knowledge, principles, etc.). In contrast, immediate feedback is more likely to enhance learning procedural knowledge (Anderson, 1982; cited in Alessi & Trollip, Ibid.).

3.6 Previous CALL Studies

There have been numerous studies that compare the effect of CALL to normal class or to other modes of study. Elkins (1986) examined the effect of computer assisted practice on English grammar and mechanics achievement of third grade students. The experimental group received traditional instruction with practice provided by computer while the control group received traditional instruction with practice provided by means

of workbooks and worksheets. It was found that computer-assisted practice significantly improved the English grammar and mechanics scores of the students, but not the language expression scores.

Avent (1993) developed a CALL courseware and compared the effect of the courseware to that of the traditional lab. It was found that at every ability level the mean score of the computer group was higher than that of the language lab group.

Maneekul (1996) examined the effects of normal instruction supplemented with CAI grammar game on the achievement of Thai vocational-technical students at Lanna Polytechnical College. She reported that the students in the treatment group had significantly higher scores than those in the control group. Also, students in the former group had better attitudes than those in the latter group. She concluded that normal instruction supplemented by CAI improved achievement and attitude scores.

Nutta (1996) compared computer directed (CD) grammar instruction with teacher directed (TD) classroom grammar instruction for four groups of post-secondary students enrolled in an intensive ESL program. Achievement was measured by three means: cloze, multiple choice, and open-ended tests. Nutta concluded that her research offers an indication that computer directed grammar instruction can be an effective teaching method for students from varying regions of origin and levels of proficiency.

Katekaew (1997) developed a CALL for teaching English tenses and used it with Thai high school students for five weeks. It was found that the treatment group had significantly higher scores on the achievement test than the control group.

All of the above studies yield similar results of the CALL group performing better than the control group.

Other research studies focus on different details. Heift (2004), for example, focuses on the types of corrective feedback that foster learner uptake in CALL. The subjects were 177 students from three Canadian universities. The feedback types studied included: meta-linguistic, meta-linguistic + highlighting, and repetition + highlighting. The results showed that feedback that provide an explanation of the error and also highlights the error in the student input (meta-linguistic + highlighting) is most effective at eliciting learner uptake.

Todd's research (2001) investigated three areas– induction, the use of concordances, and self-correction– with 25 Thai postgraduate students and reported a relevant result to the present study that generally, students were able to induce valid patterns from their self-selected concordances and make valid self-corrections. The

findings serve as empirical data to affirm that language learners are able to construct their own knowledge.

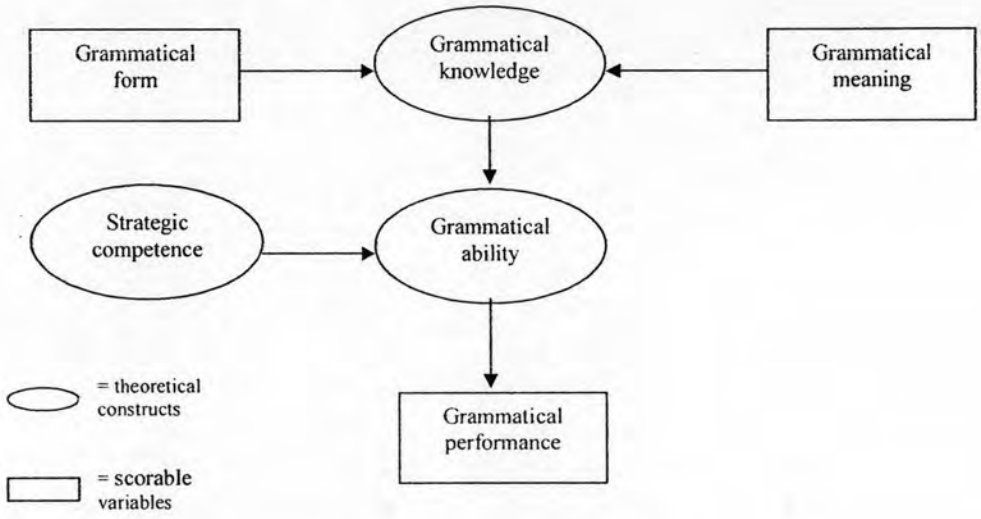
Lamazares (1991) puts the emphasis on the effects of computer aids on the writing performance and writing anxiety of students. Analytical scores revealed that the content of the computer essays produced by the CAI group was rated significantly higher than the content of paper-and-pencil essays produced by the same group. However, analysis of grammar, spelling, organization, and sentence structure did not yield significant differences between the handwritten and computer essays. It is also interesting to learn that the CAI group's writing anxiety became significantly lower than that of the comparison group.

To sum up, CALL is a very useful tool in the modern world of language teaching and learning. It offers privacy and individualization for learners and offers more time for teachers to spend on other activities. There are many types of programs providing different functions and serving different objectives. The present study uses two drill and practice programs (self- and overt correction) as its experimental materials. To develop effective CALL, the designer needs knowledge in both programming and the learning principles because what he/ she believes will definitely influence the program he/ she designs. Results of the previous research studies indicate superiority of CALL over traditional classroom practice.

4. English Grammar Teaching

Grammar refers to the rules for constructing words and sentences in a particular language (Trask, 1999: 110). To be able to use a language grammatically, one needs to have *grammatical ability* and be able to demonstrate it through *grammatical performance* (see Figure 2.5).

Figure 2.5: A depiction of grammatical knowledge, ability and performance (adapted from Purpura, 2004)



Grammatical ability can be defined as the capacity to realize *grammatical knowledge* accurately and meaningfully in testing or other language-use situations (Purpura, 2004:86). Grammatical knowledge comprises two components: grammatical form and grammatical meaning. Grammatical form is simply defined as linguistic forms while grammatical meaning refers to both literal and intended meaning (Purpura, Ibid.). Then, to say that one has grammatical knowledge, one should know about the forms as well as the meaning.

According to Bachman and Palmer (1996; cited in Purpura, Ibid.), language ability consists of language knowledge and *strategic competence*, defined as a set of metacognitive strategies (e.g. planning, evaluating). Purpura proposes that the ccmpetance should also include cognitive strategies (e.g. associating, clarifying) for the purpose of creating and interpreting discourse in both testing and non-testing situations.

The views towards teaching grammar are diverse. Krashen (1982; cited in Ellis, 2002: 167) has argued that formal instruction in grammar will not contribute to the development of 'acquired' knowledge—the knowledge needed to participate in authentic

communication. Opposing Krashen, Ellis (2002: 167) argues that grammar teaching does aid L2 acquisition and that formal grammar teaching has a delayed rather than instant effect. A survey of experienced teachers from Puerto Rico and from the New York area by Eisenstein, Ebsworth and Schweers (1997; cited in Larsen-Freeman, 2003: 11) also confirms that teachers hold divergent beliefs and attitudes.

Larsen-Freeman (Ibid.) has challenged some conceptions of grammar and has suggested that if teachers expect to help their students overcome the dual problems of their lack of engagement in learning the forms and their inability to call upon their knowledge of forms when they must put their knowledge to use, they have to change the way they think about grammar. She proposes that grammar should be viewed as a skill rather than as an area of knowledge. This underscores the importance of students' developing an ability to do something, not simply storing knowledge about the language or its use. To support her argument, she has coined the term *grammaring* (Larsen-Freeman, 1992; cited in Larsen-Freeman, 2003: 13) to highlight the skill dimension of grammar.

According to Larsen-Freeman (2003: 143), *grammaring* is the ability to use grammar structures accurately, meaningfully, and appropriately. Grammar can be productively regarded as a fifth skill. She suggests that mindful practicing with grammatical structures and using them for one's own purpose(s) will hone the grammaring skill. In addition, students should be grammatically aware—aware not only of rules, but also, importantly, of reasons.

Quite similar to Larsen-Freeman, Garrett (1987: 172) broadens the views of grammar. She states that, conventionally, grammar is presented in foreign language textbooks as a set of descriptions of the formal features of the target language codified as rules for its correct production. However, Garrett argues that nowadays students are not required to recite the rules, but they are still expected to be able to "use" them—not in order to translate and parse, but to give correct TL form to the expression of their own ideas. Therefore, grammar rules seem to constitute a body of information to be transmitted to students, and mastery is supposedly achieved through *drill and practice*, although it is, ideally, demonstrated finally in spontaneous grammatical communication, not on discrete-point tests (Garrett, 1987: 172-173).

This is also true in the context of English language teaching at Huachiew Chalermprakiet University. Students are not asked to recite the rules; they are rather expected to be able to use the language appropriately in communication. Grammar is the 'skill' that many students are weak in and need improvement. As a matter of fact,

English tenses are all taught at the secondary level. However, Thai students still have problems using them, mainly because they do not have chances to use them or to practice outside class. Therefore, they require more drills and practice to strengthen their knowledge.

For some teachers, 'drill and practice' might sound old-fashioned because it is believed the method resulted from the behaviorism. I would argue that this view is not entirely correct. Drill and practice has many angles that support other learning principles, depending on how we design and use it. The self-correction CALL program in the present study is an example of a drill and practice program that incorporates the 'scaffolding' technique which is a part of the constructivism. Moreover, the program keeps combining the new knowledge with the existing knowledge by putting all the learned topics together, mixing them all up, and having the students do the practice again every two modules. The chance to practice one topic over and over could be viewed as a rehearsal, which is an essential part of long-term learning as suggested by the cognitive principle (for details, see topic 3.3.2 Cognitive psychology principle). That is how the grammar is consolidated in the present study.

With regard to the tasks in the drill, Ellis (2002: 168) puts a number of different types of grammar practice activities into three groups—mechanical practice, contextualized practice, and communicative practice. Mechanical practice consists of various types of rigidly controlled activities, such as substitution exercises. Contextualized practice is still controlled, but involves an attempt to encourage learners to relate form to meaning by showing how structures are used in real-life situations. Communicative practice entails various kinds of 'gap' activities which require the learners to engage in authentic communication while at the same time 'keeping an eye, as it were, on the structures that are being manipulated in the process' (Ur, 1988: 9; cited in Ellis, 2002: 168). The practice of grammatical structures usually moves from under controlled conditions to under the more normal communicative ones. The CALL programs in this study comprise mechanical practice and contextualized practice. The items in each module begin with simple and concrete ones and end with longer and more complicated conversations. The contexts are usually given to the students on the complicated part. Also, pictures that are provided help the students relate the discrete items to real-life use.

The last topic to be discussed here is the assessment of grammar. Traditionally, the types of test tasks can be categorized as *objective* and *subjective* test tasks. Objective test tasks refer to those in which no expert judgment is required to evaluate performance

with regard to the criteria for correctness (Purpura, 2004). Examples of objective test tasks are true-false and multiple-choice items. Subjective test tasks, on the other hand, are those that require expert judgment to interpret and evaluate performance with regard to the criteria for correctness (Purpura, Ibid.). The selection of test task is subject to the judgment of the tester because both have their own advantages and limitations. The present study uses a multiple-choice task because of its large sample size. Multiple-choice test tasks are more convenient in terms of administration and scoring and such tasks are objective when making judgments. The answers could be either 'right' or 'wrong'. Lastly, the format is consistent with the CALL format that the students are familiar with. The students have practiced with the CALL to detect a correct answer from the alternatives, so the test format should not differ from that.

It can be concluded that grammar is a set of rules in a language. It should be viewed as a skill rather than as an area of knowledge. Taking this view, the learning of grammar should be advocated through 'mindful' drill and practice that would strengthen the knowledge and enable appropriate use of the language. Students nowadays are not asked to recite the rules; they are rather expected to be able to use the language appropriately in communication. The CALL programs support EFL student's need by providing practice for the students.

5. Students' Language Abilities

Students' language abilities served as the moderator variable in the present study. According to Brown (2001), one of the learner variables that should be taken into consideration in language teaching is a proficiency level of students. Many research studies report that high-proficiency students differ from low-proficiency ones in many ways, for example, their attitudes towards different teaching/ learning methods, their developmental readiness, and their preference about types of feedback.

The differences between the high and low ability students may be primarily due to the unique characteristics of each group. Jan-aim (1978; cited in Leetaweekulsomboon, 1996) and Sukpanphotaram (1984; cited in Leetaweekulsomboon, Ibid.) provide general descriptions of student with different abilities as follows:

Table 2.2: Characteristics of high and low achievers*

High achievers	Low achievers
- high ability to learn and can learn fast - are capable of problem-solving and are careful in doing it - have relatively higher concentration - are eager to learn - have higher self confidence	- can learn slowly and need more time to digest what has been taught - easily influenced by others and lack of self confidence - low ability to understand abstract concepts - have less attention, low motivation, and less patience

* The translation is provided by the researcher

There has been evidence showing that students with different abilities perform differently or have different attitudes towards self-study in many studies. Soinam (1999), for example, examined attitudes towards autonomous English language learning of 336 vocational Thai students and found that students with high proficiency level had significantly different attitudes towards autonomous learning from those with low proficiency level. To be specific, high proficiency students rated their attitudes towards autonomous learning more positively than the low proficiency ones.

Likewise, Supyan (1994; cited in Sukamolson, 2000: 31) who investigated the effectiveness of computer-assisted language learning in ESL classrooms at Kebangsaan University in Malaysia reported that most students had positive attitudes towards CALL. In relation to the levels, it has been found that high ability students liked to use CALL more than low ability students did.

Both of the above mentioned studies show that high ability students had more positive attitudes towards CALL/ autonomous learning. Another aspect that they differ from their low ability peers is the way they choose to receive feedback and the effects of the language ability factor on their learning. Brandl (1991) examined learners' strategic responses to errors in Computer Assisted Language Learning in a group of twenty US college students studying German. The subjects were asked to use any of the four feedback options to check their mistakes. The options were: (1) feedback only stating "right" or "wrong"; (2) feedback only marking the error; (3) feedback providing grammatical hints related to the source of the error; (4) correct answer feedback. Results showed that the low achievers (LA) used all four feedback options significantly more

often than the high achievers (HA). It is interesting to learn that that the HA students showed a stronger tendency than the LA students to select those strategies that allowed them to figure out the correct answer themselves, asking for as little help as possible. Brandl concluded that HA students engage more in the learning process, whereas the LA students, by not engaging to the same degree, are not ultimately as successful in the learning process.

Leetaweekulsomboon (1996) did a similar study with junior high school students in Thailand. Students were asked to choose one of four CAI feedback types they preferred and had it throughout the study. The feedback types included: (1) knowledge of results, (2) knowledge of results and explanation, (3) knowledge of results and the correct answer, and (4) the combination of knowledge of results, correct answer, and explanation. The findings confirmed that there were significant differences between high and low level students on the selection of feedback type. The majority of high ability students chose the 4th option, accounting for 95% while only 50% of the low level group preferred this option. Another option that was selected by the low group was the 1st option, accounting for 32.5%. However, scores from the posttest did not reveal significant differences among the feedback types or between high and low ability groups.

During 1986 to 1988, there were five research studies conducted with Thai students with different levels of achievement; all reported the significance of the main effect of 'level' factor (Yindeetakul, 1986; Leela-ongart, 1987; Chollatarn, 1987; Sripathomsawad, 1988; Khansorn, 1988). Yindeetakul (1986) compared the discovery approach and the expository approach in CAI in mathematics upon learning achievement of 72 Mathayom Suksa five (grade 11) students. Yindeetakul reported that there was an interaction effect between the approach factor and the level factor on the achievement. High ability students who studied with the discovery approach were superior to ones who studied with the expository approach. In contrast, the low ability students who studied with the expository approach gained significantly higher scores than those who studied with the discovery approach.

Leela-ongart (1987) studied the interaction of levels of learning achievement and patterns of feedback in CAI lessons upon learning achievement. The subjects were 102 Thai undergraduates. The patterns of feedback included: (1) short positive, (2) long positive, (3) short negative, and (4) long negative. Results revealed that there was an interaction between levels and patterns of feedback on the achievement of the students. The long negative feedback was found to be superior over other patterns for the lower level students while the high ability group had similar gains regardless of the patterns.

Chollatarn (1987) examined an interaction of cueing techniques in CAI and levels of English learning achievement upon English learning achievement of 135 Prathom Suksa six (grade 6) students. The techniques included underlining, flashing, and inverse keywords. Chollatarn reported that the level was found to be a significant source of differences in achievement. The interaction was also found in this study. The technique that worked best with all levels was underline. High ability students who received the inverse keywords technique performed better than the flashing group. However, the flash technique worked better than the inverse keywords in the moderate and low groups.

Sripathomsawad (1988) compared English vocabulary learning achievement of 42 Prathom Suksa six (grade 6) students learning from CAI with color and monochrome pictures. It was found that both of the main factors (levels and CAI picture options) had a significant effect on the vocabulary achievement of the students. The monochrome group performed better than the color picture group. No interaction effect was found in this study.

Khansorn (1988) examined the interaction of levels and patterns of feedback in mathematics CAI lessons upon the learning achievement of 144 undergraduate students from South-East Asia College. There were four types of feedback: (1) explain to the right answer -explain to the wrong answer, (2) unexplain to the right answer - explain to the wrong answer, (3) explain to the right answer – relearning to the wrong answer, and (4) unexplain to the right answer-relearning to the wrong answer. Similar to Sripathomsawad (1988), no interaction was found between the feedback and the level factors. Nonetheless, both main factors revealed significant effects on the learning achievement. The feedback that worked best was the third option followed by the 4^{th}, the first and the second options respectively.

To sum up, high ability students differ from low ability students in many ways. They have more positive attitudes towards autonomous learning than the low ability students and they have demonstrated a more active role in their learning in previous research studies. Although some studies reported no interaction effect, almost all studies (except for Leetaweekulsomboon, 1996) found that the 'level' factor itself had a significant effect on the achievement of the students. Thus, the effect of student language ability should not be overlooked. The present study put 'students' language abilities' as the second independent variable so that its single effect and interaction with the feedback types can be examined.

Chapter Summary

This chapter presents the review of related literature and previous research studies. The background knowledge about errors paves the way to discussion about the error treatments followed by the topics surrounding CALL. Then, the discussion of the topics concerning English grammar teaching and the review of literature related to the moderator variable of students' language abilities are presented.

Having reviewed the above mentioned literature, it is found that there are a lot of studies regarding the topic of error treatment. Most studies focus on the comparison of the effects of 'with correction' and 'no correction' or 'explicit' and 'implicit' feedback. However, the results are inconclusive and most studies pay attention only to the short-term effects. Very few studies put emphasis on long-term effects or retention, which is the ultimate goal in the learning process. The lack of such empirical evidence necessitates further investigation into the question of what kind of feedback can promote retention.

According to the theories, self-correction seems to be an effective technique to advocate high retention. In practice, however, teacher correction is the most frequent technique used in providing feedback (Walz, 1982: 18; Chumsawat: 1993: 95). Therefore, the researcher would like to conduct a study to compare the effects (for both short-term and long-term) of self-correction and overt (teacher) correction on the performance of students. Since students' language abilities were found to be a significant factor in most studies, it has been included in the present study, too. Due to the constraint on class size, the study will be conducted through CALL. Details of the research methodology are presented in Chapter III.