COMPARISON OF ANALYTIC AND SYNTHETIC TEACHING MODELS FOR LEARNING THE CONCEPT OF –ING FORM

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Abstract:

This study was conducted in an effort to make learners of English understand the concept of -ing form and its functions and able to use them in sentences because the functions of -ing form in sentences, whether as nouns, verbs, adjectives, or adverbs, are often difficult for the learners to understand in English grammar classes. For that purpose, there were applied in two experimental classes two models of learning to teach these concept and functions. The models of learning are analytic and synthetic which were derived from computer system learning and the concept of information processing learning. The second aim of the study was to compare which model was more effective in increasing the learners' understanding toward the different functions of –ing form in the context of sentences. By content, the analytic model consists of explanation-based learning, which is a way of learning where the learners explain their examples to prove the concept; and constructive deduction that aims to transform the information (knowledge) to a picture that is more compact (abstraction) and general (deductive generalization) while the synthetic model consists of empirical inductive learning, that is a way to generalize the examples observed; and constructive induction, where the learners form hypotheses that can explain a fact /observation to follow and find traits to build reasoning based on knowledge/information already known.

Keywords: analytic model of learning, synthetic model of learning, -ing form

INTRODUCTION

Learning English whose purpose is to master communicative competence at the secondary even tertiary level of education is not always easy for learners. One component of communicative competence, linguistic competence (knowing how to use grammar, composing words into meaningful sentences), is in fact still quite difficult to achieve considering English is not used in daily life as a second language after Indonesian language. English is often used in academic contexts, when learners should read books or information written in English for references. Sometimes English is used in the work place as the language of correspondence and official documents. Noting that, then linguistic competence becomes very basic in learning English because it is the basic foundation of all language skills.

One element of mastery of linguistic competence is an understanding of the functions of words, especially when the words are in forms of derivations and inflections. One of those forms is -ing form. -Ing form is formed from verbs with additional inflection -ing that can enter into various functions depending on its position in sentence structures and with which words it is used. The -ing form can serve as either a verb for progressive aspect, a noun, an adjective, or an adverb. The problem is that it is not easy for the learners to distinguish the word-form function from one another and apply it in the context of broader sentences and discourses. In a classroom the students often fail to identify the functions of -ing form according to their characteristics when constructing sentences. The ignorance of its functions will make it difficult for students to develop the required writing skills, especially when writing papers.

Based on the results of the tests consisting of 25 sentences covering four functions of the -ing form conducted to the students of Universitas Darma Persada (Unsada) majoring in English semester 4, most of them, i.e. 70%, were unable to recognize -ing forms as adjectives. The second largest number was in the function as adverbs as much as 68%; third place as nouns, 53%; and the last, as verbs, as much as 22%. A poll taken from 44 students after the testing showed that 100% said the -ing forms as adjectives and adverbs were quite elusive. The average test score is 54 with standard deviation 9.7. Knowledge of the forms and concepts of nouns, verbs, adjectives, and adverbs for most students is not new. They have gotten that knowledge since in the first semester. However, when the -ing form was used in sentences with all four functions and simultaneously assigned, the students had difficulty identifying it whether as nouns, adjectives, adverbs, and even verbs between each other.

Based on this background, the experiment was conducted in two grammar classes applying two models of learning/teaching adopted from learning strategies of computer learning system (machine learning) called as analytic and synthetic strategies with the aim of improving students' knowledge about the concept of -ing form in its functions as mentioned above. After the class experiments, the two models were compared to find out which learning model more effectively improves students' knowledge and understanding of the -ing form's functions in the context of sentences.

Analytic and Syntactic Strategies

In modern philosophy and science, analytic is understood as a regressive method and synthetic as a composite (composite of various elements) or progressive method. The difference is in direction. The analytical moves from the specific to a more universal direction, from the whole to its parts, and from the consequences to the causes. In contrast, synthetic moves in the opposite direction. Synthetic moves from cause to consequence, from simple (parts) to more complex (whole) and from general to more specialized. Citing the opinion of Immanuel Kant, de Jong (http://axiom.vu.nl/cmsone/DeJong.pdf) mentions that analytic and synthetic are two events to know science (two types of cognition). The first is truth based on reasoning so it is called a priori, and the second, knowledge or truth which must be based on empirical data or facts, is called a posteriori.

In the process of learning they are known as analytic and synthetic strategies. This analytic and synthetic learning strategies are categorized as a high-level learning strategies because their goal is to increase the knowledge already possessed by reforming that knowledge to a better form by deductive (analytic) process; and create new knowledge based on factual inputs through induction and analogy (synthetic) processes. Specifically, Michalski (1993) says that analytical learning is related to an informed input analysis based on the relevant knowledge that a learner has previously had and then the creation of desired knowledge based on this analysis. The inference process that goes is deductive.

In practice, analytic learning involves the method of explanation-based learning (EBL) (Mitchell et al., 1986; DeJong and Mooney, 1986). The application of EBL begins with giving an example of a concept. The learner is first asked to explain as a proof that the example is indeed an example of that concept. The abstract concept definition is assumed to have been known by the learner a priori and this is called the background knowledge of the learner. The explanatory structure generated by the learner is then used to create a concept definition reformulation so that it becomes more operational to classify the following examples.

Another method of learning from analytic learning is constructive deduction. This form uses a background of knowledge to transform the information input deductively to a more abstract picture or a more general picture or both. Creating a more abstract description is called abstraction; while creating a more general description by means of deduction called deductive generalization. Abstraction is actually simplifying a more detailed language (explanation) into an undetailed one, such as "My tablet computer uses the Android 5.1 Eight Core processor" to "My tablet computer is more responsive". While the phrase "Alex lives in Bandung, West Java" becomes "Alex lives in Indonesia", is a deductive generalization form because Alex's residence location is expanded.

Michalski (1993) then describes synthetic learning as a way of creating desired knowledge by formulating a hypothesis of the desired knowledge through inductive inference. Although the main inference is inductive, the synthetic learning process always involves some deductive inferences (i.e. to test whether a hypothesis can be postulated an observation). Induction is a process contrary to deduction. Deduction is a new derivative of the premise consequences (basic assumptions), while induction is a process of hypothesizing a premise involving consequences. Michalski underlines that strict deduction is truth-preserving, and strict induction is falsity-preserving.

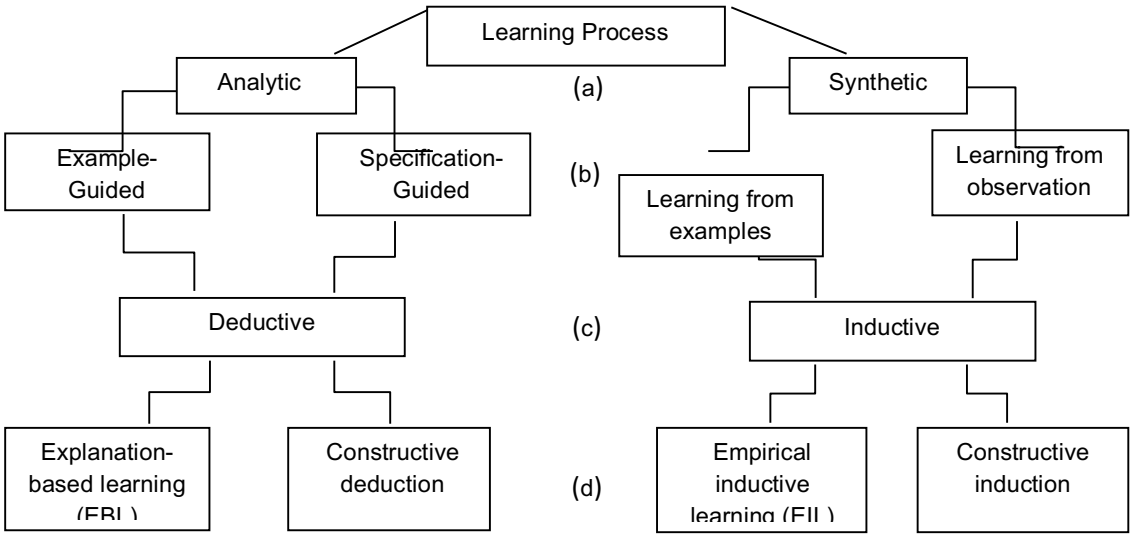
There are two methods of synthetic learning, namely empirical inductive learning and constructive induction. Empirical inductive learning does not necessarily require background knowledge and is not sufficient to build the explanatory structure for the observations made. Learners merely generalize the observed examples to create a full and consistent description of the examples based on the concepts used in describing the interconnected observations. The depiction implies observed facts, and as such, can be viewed as an explanatory hypothesis (generalization or empirical explanation). The statements generated from empirical induction are usually not explanations of causation, because the relationship is not causation but correlation. Such statements are commonly used in day-to-day reasoning, for example there are people who ask "Why is a tennis table green?" Then the answer might be "All of the tennis tables are green." This answer is not a real explanation, but people give the answer as "explanation ".

In constructive induction, learners use a dependent and independent field of knowledge to hypothesize concepts and/or relationships that characterize the input facts. Hypothesized concepts can be generalizations and can also be a cause-and-effect explanation of these facts, or can be a specialization of acquired knowledge. If the background knowledge used involves a backward-looking causal dependence, the resulting hypothesis provides a cause-and-effect explanation of what is observed. If the input is general knowledge, not the specific facts, then constructive induction involves the use of the knowledge background to hypothesize a lower or more specific level of knowledge (which implies to a more general knowledge). As an illustration for the latter, for example, there is information input that azalea flowers can grow in Bandung. From that general knowledge, one can hypothesize that the azaleas can also grow in Lembang. This type of reasoning is called inductive specialization (Michalski et al., 1989).

In general, constructive induction is a backward and/or forward reasoning through certain independent domain rules (generalization rules), and /or dependent domain rules (expressing the realm of knowledge), so the result is a hypothesis that together with the background knowledge involves initial input. Thus constructive induction can be seen as the most common form of inference induction involving empirical generalization and abduction, a backward search for finding or forming hypotheses or theories that might explain a fact or an observation by following and finding signs or traits-type to build a rationale for something already known (Patokorpi, 2007). An example of constructive induction is, for example people who believe that a well-organized person implies the ability to attend meetings in a timely manner. If one observes Mr. Amir coming to several meetings in a timely manner, then that person can constructively hypothesize that Mr. Amir is a well-organized man.

Analytic and synthetic strategies are categorized as high-level learning strategies because the objective of this strategy is to increase the knowledge already possessed by reforming the knowledge to a better form with the deductive (analytic) process; and create new knowledge based on factual inputs through induction (synthetic).

With such an understanding the framework of the analytic and synthetic learning process can be described as the following:



Note:
(a)Learning Models
(b)Learning inputs
(c) Main inferences
(d) Learning Methods

Figure 1. Analytic and synthetic models of learning

Learning Model

The learning model (not teaching, because the learning process is assumed to be centred on the learner or learner centred and takes place both ways between the lecturer and the learner) is a strategy based on theories and researches of education experts and psychologists. Learning models are linked to ways in which learning environments and teaching experiences are built, organized /ordered, or delivered. The learning model is understood as an instructional design that describes the process of detailing and

creating a particular environment or situation that causes learners to interact in such a way that there is a specific change in their behaviour (Pateliya, 2013). In reference to the Basics of the Learning Model of the Ministry of National Education (2005), it is mentioned that the learning model is a conceptual framework that describes systematic procedures in organizing learning experiences to achieve certain learning objectives, and serves as a guide for instructors/teachers in planning learning/teaching activities.

The learning model has four characteristics as follows: (1) the logical and theoretical rationale composed by the creators or developers, (2) the rationale of what and how students learn (the learning objectives to be achieved), (3) the necessary teaching behaviour for the model to be successfully implemented, and (4) the learning environment necessary for the learning objectives to be achieved (Ministry of National Education, 2005). While the functions of the learning model are: (1) helping teachers choose teaching techniques and strategies to streamline learning and learning materials to realize learning objectives, (2) to help realize the expected behavioural changes of learners, (3) help find ways and tools to create environments, (4) help achieve expected teacher-learner interaction, (5) helping to build, organize and select the content of learning, (6) help design appropriate and adequate learning activities, (7) stimulate the development of educational innovation (8) assisting in the formation of the theory of teaching, (9) helping to build the relationship between learning and teaching empirically (pateliya, 2013).

Joyce and Weil (http://shodhganga.inflibnet.ac.in/bitstream/10603/418/8/08_chapter3.pdf) identified 23 models that are categorized into four groups: Information Processing Model, The Personal Model, Social models, and Behavioural System Model. Because of many differences, each model group has its strengths and weaknesses. Selection on one particular model device does not indicate the superiority and high usability of the model but because the model is suitable for a particular learning situation. There is no one size model that fits all types of learning. It depends on the material taught and the learning objectives. Therefore there is no guarantee that all models are suitable for all teaching and learning scenarios. The use and practice of learning models that are varied and tailored to the nature of teaching materials and learning objectives by teachers, will make teachers more trained to learn about the model and eventually unwittingly create their own learning models.

The main characteristics of the learning model include: (1) syntax, that is a learning outcome specification, which is what the learners should be able to do after the learning process is complete; (2) social system, a specific environmental condition in which the learners' responses can be observed; (3) principles of reaction, the specification of what learning performance criteria to expect from the learners; (4) support system, specific mechanisms that provide opportunities for the learners' reactions and their interactions with the environment; and (5) instructional and nurturant effect, systematic scientific procedures that alter learner behaviour. These characteristics are referred to as forming elements of the learning model (http://shodhganga.inflib net.ac.in/bitstream/10603/418/8/08_chapter3.pdf).

Information Processing Combined with Analytic and Syntactic Models

Referring to the theoretical basis of the analytic and synthetic strategies of this study, the model built was in the category of Information Processing Model because the Information Processing Model is an academic discipline-oriented model of inquiry structures and methods by focusing on intellectual capacity with respect to the learner's ability to observe, organize data, understand information, form concepts, use verbal-nonverbal symbols, and solve problems. This is in accordance with the analytic and synthetic theories whose concern is also processing information. Information processing refers to the way people handle stimuli from the environment, organizing data, knowing problems, lowering concepts and solutions to problems both verbally and symbolically. Thus, learners are encouraged to think productively and build intellectual abilities. Eggen, Kauchak and Harder (1979) state that the main purpose of information processing in the classroom is the development of intellectual ability and the acquisition of the content of the lesson. According to them, information processing contains three characteristics, namely: (1) information obtained by learners, (2) data processed by the learners into useful concepts and generalizations, and (3) information converted into a more useful form.

It can be concluded here that information processing is gaining knowledge through the analysis of data obtained from the environment. It also helps learners develop thinking skills, which in turn allows them to study independently. This is in line with the main purpose of analytic and synthetic learning. Learning analytically means to transform the knowledge that the learner has in the most desirable and/or effective form to achieve the learning objectives; while the ultimate goal of learning synthetically is to reach new knowledge that goes beyond previously possessed knowledge. Analytic and synthetic learnings

also focus on intellectual capacity, regarding the ability of the learners to observe, organize data, understand information, form concepts, and solve problems.

-Ing Forms

In English history, -ing forms for participle and gerund have different forms and functions. In the Old English era, the participle is really verbal and ending -ende which then becomes -inde. -Ing which is etymologically unrelated to -ende and -inde, is a suffix that is only used for nouns of action. Until the middle of the 14th century gerund has not appeared. In this century, the participle is spoken and written-ing, and combined with the form of gerund. (http://homepage.ntu.edu.tw/~karchung/pubs/contradiction.pdf). Both forms are in the course of time, fused into -ing, and this blending has caused confusion in many contemporary grammatical exposures.
-Ing forms is the morphological formation of verb and suffix (inflection) -ing. In its various uses, these forms are so complicated for students to understand. The various functions in the sentences are quite dizzying and difficult to distinguish from one another. Although the categorical boundaries often appear vague, the functions of -ing-forms' differences are divided as follows:

a. as verbs (present participles) in progressive aspect: 'They are *fishing*'.
b. as verbal nouns (gerunds): '*Reading* is my most beneficial activity'.
c. as adjektives or verbal adjektives (present participles):'The *running* water provided a picturesque view'.
d. as adverbs or verbal adverbs (present participles): 'The bull came *running* towards the rodeo clown'.
e. as the original nouns: 'The *building* was on fire'.
. f. as prepositions: 'The board has discussed an issue *regarding* the complaints from the customers'.

Sections (e) and (f) above are not included because they are not many in number. -Ing forms that are not used as native verbs are referred to as verbals, to show that although the -ing forms serve as nouns (gerunds), adjektives and adverbs (present participles), they still have the properties or meanings of verbs because if the forming comes from transitive verb, it can be followed by the object as in the phrase "*Finding* a needle in a haystack would be more difficult than what we're trying to do" for the example of gerund. While functioning as an adjektive it can be seen in its use attributively: "Instead, she began to create paintings filled with *disturbing* images (meaning: images which is disturbing)". (http://www.csun.edu/~bashforth/305_PDF__Grammar/Verbals_Gerunds&Participles.Perdu.pdf), and predicatively: "His life has been *interesting*" or post-nominal predicative: "Marshall has made life *interesting*." (Celce- Murcia, 1999)

METHOD

The first step in conducting this study was to modify the concepts of analytic and synthetic strategies of a machine learning (intelligent systems of computer technology) mainly from Michalski (1989 & 1993) and separate the strategies into two proportions to construct the learning models which were so called analytic and synthetic models of learning suited to the classroom environment. To make the models feasibly operational, they were discussed in a focus group discussion and were finally combined with the concept of information processing learning as put forward by Joyce and Weil in their "Teaching Models" (http://shodhganga. inflibnet.ac.in/bitstream/10603/418/8/ 08_chapter3.pdf).

The second was to apply the models in two Grammar classes in three sessions for each class with group-discussion-class formation. Each class consisted of 22 students. Before that, the pre-test was conducted to two experimental classes A and B in the grammar classes to find out the initial level of the students' knowledge on the functions of -ing forms before the analytic model and the synthetic model were applied. The results of the pre-tests were calculated to find out the average score and standard deviation of each class. The experiments took the form of teaching -ing forms by using analytic model for experiment class A and synthetic model for experiment class B. At the end of the experiment, a post-test was given to each class. The teaching in two classes was conducted by the researcher herself.

Data before and after treatment with the models were calculated through the -t test. The pre-test and post-test data of each class were calculated by statistical t-test as a 2-sample comparative analysis correlation with degrees of freedom (df) = n - 1; H0 was accepted when t statistic <t table and H0 was rejected if t statistic > t table. Comparative analysis for 2 uncorrelated samples, i.e. data analysis of class A's post-test and class B's post-test were also calculated by using independent sample t-test.

Furthermore, the data about supporting factors and obstacles in the implementation of both strategies were needed to obtain from the interview with the experimental respondents after the learning process ended. The interviews were open so that the above factors could be more revealed. The data obtained were analyzed descriptively.

The instruments for collecting the data were a pre-test and a post-test of the -ing form functions generated from the identification test of 25 sentences. The test instrument before and after the treatment had passed the validity test of biserial point correlation with discrimination value 0.34 (valid) and the difficulty level index of the test with the value of 0.58 (moderate). The tests were arranged in simple sentences that included 4 functions of -ing forms as verbs of progressive aspect, nouns, adjectives, and adverbs.

FINDINGS AND DISCUSSION

As previously explained, the experiment of teaching –ing forms in two classes was conducted by utilizing analytic and synthetic models. The learning processes with those two models were briefly described in the following table with the learning processes in the two classes.

Table 1. The Syntax of Analytic and Synthetic Models in Teaching –ing Form

Learning input	Thinking Process	Learning Methods
Analytic Model		
1. The teacher gives examples of a concept with specifications (example-guided and specification-guided). 2. A number of types of hypotheses the learners make are presented to be discussed. 3. The definition of an operational concept is used to classify subsequent examples.	1. The learners identify the examples by observing the attributes (characteristics). 2. The learners prove the hypotheses based on a variety of different examples. 3. The learners conclude (deduce) based on examples	1. The learners discuss the characteristics of the examples and compare them with the specification of the concept. 2. The learners make explanatory structures (proof) that the example is actually a proof of a concept (EBL). 3. The learners use the explanatory structures to build knowledge and create an operational definition of the concept (constructive deduction).
Synthetic Model		
1. The teacher presents a complete definition of a concept to be learned 2. The teacher provides examples that fit into the definition of the concept and those which are not included in the definition of the concept 3. The teacher guides the learners toward understanding the concept through the process of discovery and construction.	1. The learners analyze the definition of the concept used to identify and list examples. 2. The learners analyze the examples and identify the suitability and unsuitability of the examples with the definition of the concept. 3. The learners hypothesizes the examples and those which are not examples of the definition	1. The learners generalize the examples and identify the data (EIL) 2. The learners explain the relationship of the suitable examples with the definition of the concept and the examples which do not fit the definition (constructive induction). 3. The learners build new concepts of the examples that are not related to the definition (constructive induction).

Analytic Model of Learning

The teacher gave various sentences as the examples from the concept of -ing form with the specification as verbs, nouns, adjectives, and adverbs (word class category). By way of analogy, the teacher also presented a variety of other sentences that contain the four concepts of word classes other than the –ing form. Actually, the learner was assumed to have background knowledge about the concept of the four word classes above, but the teacher could give them guidance so that they could recall the

four classes. For example, to make the learners understand the concept of verb, noun, adjective, and adverb, the teacher presented a sentence: "*The previous order is coming soon*" and stated that the verb in the sentence was *coming*, *order* was a noun, *previous* was an adjective, and *soon* was an adverb. Of course the teacher should explain why the word *order* was the noun in that sentence, and so on. This process was referred to as example-guided and specification-guided.

The learners identified and compared the characteristics of these different examples and in what words the form was used both in terms of the word class and sentence structures, for example:

- They will have been *touring* for six months before they get to Japan.
- *Leaving* the children alone at night is very dangerous.
- The *sleeping* baby looks so peaceful and relaxed.
- They spend their leisure time *playing* cards.

The examples presented may be more numerous and varied than those above because they provide many ranges of options. For example -ing form that serves as an adjective should not be positioned before the noun (attributive), but also can be predicative and post-modifier positions.

The learners' identification based on the concept towards those examples was made in the form of a structured explanation for each category to prove that the examples were really the examples of each concept.

The learners discussed the features of the example and compared it with the concept specifications. They used their background knowledge about the concept of four word classes (nouns, verbs, adjectives, adverbs). If necessary, they were asked to make the limitation of the word class in a simple way in order to be used as a comparison tool. After that the learners were asked to create an explanatory structure (hypothesis) to explain that the examples corresponded to each specification of the concept of form -ing form. This hypothesis had to be ultimately proved again through the use of the -ing form in other sentences that they made with the teacher's guidance. This is called Explanation-Based Learning (EBL)

Their explanations became hypotheses which were then used as the next data to be studied and discussed. The learners identified and analyzed additional examples as True or False based on the hypotheses they already made. For example they hypothesized that the -ing form in the phrase "*will have been **touring** for six months before they get to Japan*" was a verb by noting that *touring* was shared with the auxiliary '*been*' in perfective aspect '*have*' and future tense, and the overall sentence referred to the progressive aspect; while syntactically, the -ing form was in predicative position after the subject. With such an explanatory structure the learners identified the other sentences in the examples as verb (True) and not verb (False). For example, the -ing form in "***Leaving** the children alone at night is very dangerous*" is not a verb. If it is mentioned as a verb, then the sentence is wrong and so on.

The learners tested their hypothesis and made operational definitions of concepts in accordance with the attributes or features contained in the sentences. After that they made examples of their own sentences to be classified again that the examples fitted the concepts they had built.

The teacher asked about their reasons for the True and False answers and affirmed the hypothesis and reiterated definitions based on important features. The learners then deducted by defining the operational concept for the phrase "*Leaving the children alone at night is very dangerous*" as follows: ' The -ing form in the sentence is a noun instead of a verb, because in the sentence structure the noun phrase is positioned as the subject of the sentence and the predicate is "*is very dangerous*". The learners were assumed to have a background knowledge of the minimum English sentence structure that the sentence structure consists of subject and predicate (noun phrase + verb phrase). The learners sharpened their analysis by focusing on the noun phrase in which the -ing form *leaving* is followed by the noun phrase *the children alone*. Thus the noun *leaving* also has a verb character so that *the children* can be described as the object of the verb which also becomes the noun phrase in the sentence as a whole. They could draw the conclusion (deduction) that the -ing form in that context was called the verbal noun, i.e. the noun that had the verb character.

Then the learners made another hypothesis, for example that "like the noun function in general, then the-ing form can also replace the other nouns in the sentence". They were then asked to make examples of other sentences to prove their hypothesis. For example they were encouraged to make sentences like "Forgive me for the late call", that could be substituted with the noun form phrase "Forgive me for calling so late." The teacher also gave guided examples, such as the phrase "I talked to him without <u>any knowledge</u> that he was the head of the department "in which the underlined section should be replaced with the noun -ing form phrase by the learners. Through discussion they were expected to replace the noun phrase underlined <u>any knowledge</u> by <u>knowing</u>.

In the same way, there was also an analysis of the concept of -ing form which has adjective specifications, for example:

- The sleeping baby looks so peaceful and relaxed.
- Running water looks pretty in a fountain.
- We had an exciting moment at that time.
- Instead, she started to create disturbing sounds.

Then the deduction became: "the -ing form in the above example serves as an adjective because it is used to describe (modify) a noun placed after it, so the *sleeping baby* means the baby that is sleeping, running water means the water which is running, exciting moment means the moment which is exciting, and so on.

For adverb specifications like in the sentence "*The sunshine came streaming through the window*", the learners were to deduce it by saying that the –ing form in *streaming* was an adverb because of its position after the intransitive verb *came*. Then the word serves to explain (modify) the verb *come* as the adverb of manner, with proving in question: "*How did the sunshine come through the window*?"

The learners were also to identify the -ing form phrases that serve as adverbs in slightly more complex sentences, such as "*Not knowing anyone in town, he feels very lonesome*".

The other form of deduction is an abstraction that distinguishes two functions of the -ing form having the same position along with the nouns. This deduction can be preceded by an example guided by the teacher asking the learners to complete a sentence e.g.:

A room for waiting is called..... (the expected answer from the learners was *a waiting room*)
A train that is waiting is called..... (the expected answer from the learners was *a waiting train*)
A bag that is used for sleeping is called.... (the expected answer from the learners was *a sleeping bag*)
A child that is sleeping is called.... (the expected answer from the learners was *a sleeping child*)

The learners then analyzed these examples and identified the different uses of the -ing form so that it could be seen that the waiting room was different from the waiting train. That way the learner deduced the -ing form in *the waiting room* was that it was used as a noun because *waiting* in the expression *a room for waiting* is a noun. It was assumed that they had a background knowledge of the prepositional phrase, that the word after a preposition is a noun. Semantically, they were also encouraged to be able to explain the meaning that the noun of -ing form when used in conjunction with another noun head has the meaning or function of the head noun.

Then the deduction for the *waiting train* also referred to the previous expression that was *a train that is waiting* in which the clause *that is waiting* functioned to explain a train. It was concluded that *waiting* in *a waiting train* was an adjective. Through observation it was seen that the -ing form that serves as an adjective when used in conjunction with head noun would mean action or description of the head noun, not usability or function of the head noun.

The learners were encouraged to disclose and report on their explanatory structure, whether they were concentrated on attributes or concepts, whether they hypothesized once in one time or several times, and how they altered their hypothesis if the hypothesis had not been approved. Their hypotheses may either be accepted or rejected on the basis of proof of the example. If accepted, the hypothesis will be the definition of the concept.

In conveying the structure of the explanation (deduction) in the hypothesis and the definition of the concept, if necessary, it was sometimes done in the Indonesian language because the important point here was the learners' own understanding to explain the -ing form as verbs, nouns, adjectives, and adverbs.

A proven hypothesis would be the definition of a concept. The definition of the concept is considered a better form of knowledge that can be used as a reference to construct new sentences. Explanatory structures, hypotheses, and operational definitions can be either deductive abstractions or generalizations. Both are called constructive deductions.

The analytic model of learning as described above also includes aspects such as:

Social system

The social system has a moderate structure in which a teacher and learners can engage in free interaction and dialogue even though the teacher initially plays a major role in concept selection and control of learning activities. With the learners being encouraged, it is expected that the learners can deduce and make operational concept definitions usable for making their own examples. Among the

learners there is also constructed a cooperative discussion interaction so that they can learn independently.

Principles of reaction

The teacher provides supports throughout the lesson by focusing on discussions that discuss the hypotheses made by the learners. The learners are helped to create a dialogue between them in hypothesis testing. The teacher focuses on the learners' attention to specific characteristics in the examples and assists them in discussing and evaluating their thinking strategies. The teacher should also support the benefit of using various strategies rather than just one strategy that is expected to be the best for everyone in all situations.

Support system

Well organized material is an essential support needed in this learning model. Materials and data are selected and arranged in units that make it easy to sample. If the learner is able to think more complex, then the level of difficulty of the examples can be increased thus the understanding of a concept deepens. On the other hand, it can encourage the ability of learners to make their own examples.

Instructional and nurturant effect

The instructional effect t of this learning model is that learners can understand the nature of concepts, explanatory structures (hypotheses), concept building strategies, and the ability to construct operational definitions of concepts. While the nurturant effect in the form of environmental experiences and learning atmosphere created from the model is the sensitivity of logic thinking in communication, tolerant attitude to the differences but still appreciate the logic of reasoning, and awareness of the perspective or other views.

Synthetic Model of Learning

In the learning of -ing forms synthetically, the teacher provided information input in the form of concept definitions and examples or data. The teacher also encouraged the learners to find, mention and list the data that fit the definition. For example, the learners were given the task of observing and identifying the -ing form as a verbal noun (gerund), but previously they were given a description (concept definition) about the gerund: "*Gerund are verbals that function as nouns and have an -ing ending. Since gerunds are derived from verbs and have an ending, they do express action. However, because gerund function as nouns, they occupy slots traditionally held by nouns in sentences such as subjects, direct objects and objects of preposition. Gerunds may occur as a word, or they may be part of a gerund phrase. A gerund behaves as a verb within a phrase so that it may be modified by an adverb or have an object.* "(www.uhv.edu/ac)

The synthetic model is in the realm of cognitivism theory, the learners gain new knowledge with the reasoning based on the knowledge that has been previously owned. Thus, the learners are assumed to have known the role and position of a noun in the syntactic structure of English. The teacher then gave the data (text/discourse) for identification purposes. Grouping is done according to the above definition, by categorizing the appropriate and non-conforming form. The data of a discourse were as follows:

A person traveling in a foreign country will need to bring the required documents. Aisha was aware of that. So, she was very busy preparing all the stuff for her trip. She did not like taking any risk while away from home country. But anything unwanted could happen. She was stuck in a very long traffic hour on the way to the airport. Arriving late, she was not permitted to get a boarding pass. She insisted on getting it but there was no avail. She was already late and her plane was about to take off. The officer suggested she took another flight. She had no choice. Better be late than fail going abroad, she thought. Waiting for another flight, she was standing at the corner watching people go by at the airport. She saw them walking to and fro. Suddenly, someone tapped on her shoulder. It was her friend, Danny. He said hallo to her. They finally knew that they had the same destination. There was no denying that Aisha was really happy to have a company. The unexpected blessing in disguise was like a relieving pain.

The teacher assigned the learners to observing the text and grouping the -ing forms according to the definition in a table, i.e. the Gerund table and grouping the –ing forms which were not appropriate according to their observations in the Not Gerund table.

Through discussion among the learners, they analyzed and identified the text based on the given concept definitions, as well as grouping the -ing form according to the characteristics mentioned in the definition. They also classified the forms they consider not to be included in the definition. The learners further

explained the underlying reason for the grouping. They hypothesized examples and those that were not examples of a definition.

When the learners grouped the data by definition, the process is referred to as learning empirical inductive learning. The next process is constructive induction, i.e. when they explained the relationship between the data in a group and the definition as a reference. The learners observed a part of the definition of the gerund which says: "because gerunds function as nouns, they occupy slots traditionally held by nouns in sentences such as subjects, direct objects and objects of preposition". They observed the data based on the guide and found the expression "*She did not like taking any risk while away from home country*". So through discussion, they explained that "*taking*" is a gerund (a noun) because its position in the sentence is as a direct object of the verb "*did not like*". By expressing the same sentence, they also inferenced, based on the definition "gerund behaves as a verb within a phrase so that it may be modified by an adverb or have an object", that gerund "*taking*" has the object of "any risk", so the gerund "*taking*" applies as a verb in the phrase. In the non-gerund category, the learners were also asked to explain why what they mean as non-gerund is called as a non-gerund. Having found the data in accordance with the concept of a gerund, and understanding the definition along with supporting facts, the learners could perform the discovery and construction process, by formulating the formation of new hypotheses/concepts that move from the grouping of forms which do not include gerunds. Thus they found the concept of -ing forms as verbs, adjectives, and adverbs.

The easiest –ing form to identify as a non-gerund (noun) of the above discourse is the expression "*she was standing at the corner*". In this sentence the learners were asked to indicate whether the -ing form was a verb. Since they have a background in the knowledge of tenses then the teacher encouraged them to name their tenses so that they could be used to distinguish the -ing form in its function as nouns and verbs.

The attempts to understand the -ing form as an adjective require knowledge of adjective concepts. In this case the learners were reminded of the learning of parts of speech that they already had. With an inductive strategy - starting with questions and examples to principles or concepts - they were asked to give or write examples of some words in the adjective category. It is possible they will only mention isolated adjectives. To avoid this, they are lured to use the adjective along with the nouns it describes, with a question from the teacher, for example: "How do I know the word? Please use it with other word so that I can see that it is really an adjective ". The teacher can write down any noun that the learners have known and ask them again. "What if I call this an adjective? Is it an adjective? "With their background knowledge they will say the word as a noun. The teacher will ask again: "How do you know that it is a noun?" Maybe they will add the noun (e.g. "house") with a determiner (e.g. "a", "the" or "my") to prove that word is a true noun. If so, then the teacher can then insert an adjective they have previously mentioned between the determiner and the noun and let them draw their own conclusions. The expected conclusion of learners is their ability to explain adjective functions. Their hypothesis of the adjective was used to observe the text and find the expressions similar to the hypothesis. Here are two proofs. The first proof of a similar expression (the same structure) with the adjective + noun phrase (e.g. a big house) is *a relieving pain*. Thus their hypothesis is correct because it can be proven empirically based on the facts (in the text) they found. The second proof is that the form of "relieving" can be summed up as an adjective based on the hypothesis they constructed.

In terms of-ing form functions as adverbs, inductive learning took a long time because the concept of adverb and its function is quite broad and varied in its use in sentences. The phrase "*arriving late*" in the sentence "*Arriving late, she was not permitted to get a boarding pass*", could be seen partially by the learners by generalizing the phrase as being a gerund. They observed that "*arriving late*" was followed by the adverb "*late*" by considering the definition of the concept that the prevailing gerund like verbs could get adverbs. Internally, the -ing form in the phrase looks like a gerund because it has a "late" adverb, but the construction of that phrase should be viewed as a whole in relation to the context of the sentence (it needs to be emphasized to the learners that each word has certain functions and meanings only when used in the context of a whole sentence). To solve the problem, learning was done by observation of the example of other sentence which had been studied but first they were given a concept. The concept read: “to determine whether a word in a sentence is a gerund, look at the word(s) ending in –ing in the sentence. If the word can be replaced by the pronoun it, then the word is a gerund. If the word it replaces other words in addition to the gerund, then these make up the gerund phrase” (Lester, in www.uhv.edu/ac).

For example, the phrase "*taking any risk*" in the sentence "*She did not like taking any risk*" can be replaced by "it" to "*She did not like it*", as a proof that the phrase is a gerund. But the phrase *arriving late* cannot be replaced by "it" in the sentence "*Arriving late*, *she was not permitted to get a boarding pass*" because the sentence would be wrong (not grammatical). The phrase is only suitable if replaced with an adverb, such as *eventually*.
The synthetic model of learning as described above also includes aspects such as:

Social system

In the social system of this learning model, the classroom atmosphere is highly cooperative based on activities that support each other positively. The teacher plays a role in providing stimuli that guide the learners' understanding so that they can perform discovery and construction processes in the use of several concepts of the -ing form's functions, so that it can be truly understood and used in the making of sentences. The teacher organizes sequences of activities and controls learning cooperatively. The learners also try to learn the learning strategies in the format of discussion between them.

Principles of reaction

Some important tasks that teacher should do are as follows:
- Prepare clear guidelines for activities and respond to learning activities.
- Makes the cognitive task optimally.
- Prepare activities that will be done in the classroom.
- Monitoring learners to get them the right information.
- Build questions that can encourage the learner to answer as expected.
- Condition the learners to be ready for new experiences and cognitive activities.

Support system

Learning materials should be prepared in a structured way. The four functions of -ing forms can be sequenced from the most easily understood functions to the learners, starting from the verb function because the learners first recognizes the -ing form from its use in tenses in the progressive aspect. The learning data can be provided several times according to the needs and time allocations available, starting from the simple discourse in which the functions of -ing form are used in an easy way for the four word classes (nouns, verbs, adjectives, adverbs), to the more complex phrases and sentences.

Instructional and nurturant effect

This model is designed to teach the learners how to do concept forming activities and teach various concepts based on many data. The nurturant effect is to build and develop attention to the language of logic, the meaning of words and the nature of knowledge.

The Result of the Experiments

The implementations of the two models in the experimental classes were carried out after the independent sample t-test had been conducted to make certain that both classes had the same variant. The value of Sig (0.957)> 0.05 shows that both groups have the same variant. Secondly, both groups have the same average pre-test results because the output of t-test reveals Sig (2-tailed) = 0.562> 0.05. Thus it can be concluded that the two groups meet the required qualifications for the given learning treatment with the analytical model and synthetic model because the two groups have the same average of ability.
The data below shows that both classes utilizing analytic and synthetic models improved their knowledge on the functions of –ing forms contextually. However, the analytic class did better than synthetic class, as it is shown in the different results of the post-tests' mean scores.

Table 2. Statistics of Paired Samples and Correlation of Analytic and Synthetic Models

Teaching model	Test	Mean	N	Std. deviation	Std. error mean	Correlation	Sig.
Analytic	Pre-test	50.82	22	9.634	2.054	.822	.000
	Post-test	75.55	22	10.971	2.339		
Synthetic	Pre-test	52.55	22	9.975	2.127	.773	.000
	Post-test	67.18	22	13.504	2.879		

There was a strong correlation between the score before the treatment and the score after the treatment in the analytical model of learning where Sig. <0.05. The difference of the average scores between pre-test and post-test was quite large i.e. 24.73. On a scale of 100, the mean score 75.55 after the treatment had increased to grade B+ from grade D (50.82). The influence of this analytical model on the success of learning –ing forms was (0.822^2 = 0.675) or equal to 67.5%. The remaining 33.5% was caused by other factors that were not examined. On the other hand, there was also a strong correlation between the score before the treatment with the score after the treatment with the synthetic model where Sig. <0.05. The mean score difference between pre-test and post-test was 14.63. On a scale of 100, the mean score 67.18 after the treatment had increased to grade C+ from grade D (52.55). The effect of synthetic model on the success of learning –ing form was (0.773^2 = 0.597) or equal to 59.7%. The remaining 40.3% was due to other factors that were not investigated.

The difference of standard deviation in the synthetic class after the treatment was larger than in the analytic class. It means that there was still a wide gap among the learners in the synthetic class in their ability to improve their knowledge on identifying the usages of the –ing forms in sentences. Some of the learners found it difficult to comprehend the different functions of –ing forms when the –ing forms were applied in the sentences. However, a few of them succeeded to improve their scores.

The difference of mean scores pre-test and post-test between the analytic class and the synthetic class was quite significant. The mean score of the analytic class was 24.73 while the synthetic class' was 14.63. It means that the analytic class did better in the post-test than the synthetic class as it is shown in their grades. The analytic class got grade B+ (75.55) compared to the result of the pre-test, which was only grade D (50.82). Meanwhile, the synthetic class merely reached grade C+ compared to their initial score, which was D (52.55).

Comparison of the Analytic Model and the Synthetic Model

A learning model is called as effective or ineffective when it has been used in teaching. Thus the effectiveness of the learning/teaching model is directly related to teaching effectiveness. The effectiveness of teaching is an activity that encourages students to learn. Many factors affect the effectiveness of teaching, including curriculum and its development. Some ways such as student opinions, self-reviews, peer evaluations, and objective criteria such as measuring student learning outcomes and improving their learning can all be used as tools to measure teaching effectiveness (http://www.adelaide.edu.au/learning/teaching/ development/effective-teaching.pdf).

So, the source of the effectiveness assessment comes from three types of participants: students, colleagues, and teachers themselves. In this study the measurement of the effectiveness of the learning model used in classroom teaching is limited only to student learning outcomes and opinions, plus a review of the teacher herself, in this case the researcher. Among these two, the most objective of course is the measurement of learning outcomes. Whereas student ratings and teacher reviews are positioned as qualitative data to illustrate the supporting and inhibiting factors of the teaching/learning model.

The following is a quantitative statistical calculation of student learning outcomes with the analytic and synthetic models. The purpose of this calculation is to compare the two models of learning in order to find out which model can further improve student's learning achievement in learning the concept of -ing forms, both in function aspect and its use in sentences. For this reason, a descriptive and statistical comparison of independent sample t-test can be seen in the table below:

Tabel 3. T-Test of Independent Samples for Analytic-Synthetic Models

Learning Outcome	Levene's Test for Equality of Variances		t-test for Equality of Means					
	F	Sig.	t	Sig. (2-tailed)	Mean Differ-ence	Std. Error Diff.	95% Confidence Interval of the Difference	
							Lower	Upper
Equal variances assumed	2.701	.108	2.255	.029	8.364	3.709	.878	15.849
			2.255	.030	8.364	3.709	.869	15.859

Equal variances not assumed								

T-test of Independent samples above is used to test whether both groups have the same variant, with the following hypothesis:
H0: both groups have the same variant.
H1: both groups do not have the same variant.
Sig value is (0.108)> 0.05, so H0 is accepted, meaning that both groups of data have the same variant.
Next, the same statistical test is used also to test whether both groups have the same achievement scores. The hypothesis is as follows:
H0: both groups have the same average learning outcomes.
H1: the two groups do not have the same average learning outcomes.
The output is known Sig. (2-tailed) = 0.02 <0.05, consequently, H0 is rejected, meaning that both groups do not have the same average learning outcomes. Thus it can be concluded that the analytic model used to study the concept of -ing form either in its class functions (as verbs, nouns, adjectives, adverbs) and its use in the context of sentences, is more effective than the synthetic model although both can improve learning achievement . But the learning achievement with the analytic model is still higher than the synthetic model.

Supporting and Inhibiting Factors

A reference for describing supporting and inhibiting factors for both analytic and synthetic models were derived from the students in addition to the teacher. Because the students are the groups involved in learning, then their perceptions are considered important. Their responses often illustrate the strengths and weaknesses of a teaching. However, they are not observers of lectures because their opinions are sometimes influenced by their motivations, attitudes and needs. This qualitative data was obtained through interviews at the end of the class experiments. Not all respondents gave their opinions. However, qualitative data do not necessarily require a large number of respondents. Five to ten of them have represented the whole because the questioning was done openly and witnessed by other respondents.

The supporting factor for both models according to the respondents (the students) is that the understanding of the concept of –ing form and its function in the context of sentences is stronger and deeper because they are given freedom of opinion and ultimately "find by themselves" the functions of -ing forms when they were given new sentences. Their understanding is better because they were given the opportunity to define the function of -ing forms associated with its structure and semantic aspects in the sentence. The respondents of the analytic class felt challenged by studying in groups and asking questions while testing their "hypotheses" about the function of -ing forms with other groups. The obstacle was that it took a longer time to arrive at the comprehension of a function when compared to being "told" by the teacher. While the inhibiting factor in the synthetic model is also the same. It took long learning time plus the difficulty of finding other concepts about the functions of -ing forms in the text of discourse if simply being guided by only one concept definition.

Both analytic and synthetic models are two sides of the same coin. Both are cognitive learning strategies of information processing learning approach. Information processing learning is oriented to academic disciplines regarding inquiry structures and methods by focusing on intellectual capacity with respect to the ability of learners to observe, organize data, understand information, form concepts, use verbal-nonverbal symbols, and solve problems (http://shodhganga.inflibnet.ac.in/bitstream/10603/418/8/08_ chapter3.pdf). Application of this model aims to increasing the knowledge of the concepts and, moreover, their applications can be stored longer in the memory of the learner. It will be different if a teacher only tells them directly the meaning or definition of the concept rather than encourage them to find out and find it themselves. Information or knowledge in the first way may easily be forgotten because the learner acts as a passive recipient. But when the same knowledge is obtained by the second way by involving the learners in the discovery process, then the information has the potential to be stored in their long-term memories because the learners act as active investigators.

In terms of self-review, well-organized teaching material is an essential support needed in both analytic and synthetic learning models. Materials and data are selected and arranged in units that make

it easy to become examples. If the learners are able to think more complex, then the level of difficulty of the examples can be increased to deepen the learners' understanding of a concept. On the other hand, in such a way, it can encourage the learners to optimize their ability of making their own examples. The tiring thing for the teacher is to prepare examples of sentences that are numerous, varied and in tiered levels of difficulty.

Learning materials should be prepared in a structured way. The four functions of -ing forms can be sequenced from the functions most easily understood by the learners, starting from the function as verbs because the learners first recognize -ing forms for its use in the progressive aspect of tenses. The learning data can be provided several times according to the needs and time allocations available, starting from the simple discourse in which the functions of the -ing forms are used in an easy way for the four word classes (noun, verb, adjective, adverb), to the more complex phrases and sentences. This means working and thinking hard from the side of the teacher if he/she wants the teaching to succeed.

The disadvantages of both models – in referring to the respondents' opinion - are the amount of time it takes to learn the concepts. The long time needed in the learning process is because the students are encouraged and stimulated to actively perform the inductive analysis and build conceptual understanding through a fixed analysis.

CONCLUSION AND SUGGESTION

The analytic and synthetic models for learning –ing forms are two models adapted from a synthetic analytic learning strategy for a computer learning system. Because the –ing form learning is a learning about the concept in its functions based on the word class (parts of speech) in the context of a sentence, the learning structure refers to information processing which is also identical with the information processing system of a computer. In the perspective of cognitive psychology, a human is an information processor and this is similar to how computers process the information. With this analogy, the information-processing model is also an implementation procedure in analytic and synthetic learning, built as a way to learn concepts for human beings. Although the implementation in the classroom takes relatively longer time, the learning results obtained can last longer in the learners' memory because they act as active investigators.

After applied in the teaching experiment in two classes, that is the class with analytic model and the class with synthetic model in order to know which model is more effective for the success of the study, hence through t-test statistic it is known that teaching with the analytic model improved more learning achievement. The mean score of the respondents in the post-test is 75.55 for the analytical model and 67.18 for the synthetic model.

The supporting element of the analytic model is that the concept and the functions of -ing forms in the sentences were better understood and could easily be identified by the respondents. While the class with the synthetic model still much needed tutoring because the respondents relied on only one definition of the concept of the -ing forms, i.e. as a noun. Through the data observation in the form of a discourse, they had to find three other functions. Secondly, the respondents were able to make their own definitions concerning the functions of -ing forms in relation to other words in the context of sentences. The obstacle was that the need for careful preparation and the data (examples of sentences and discourse) were numerous. Another obstacle was the amount of study time that is more than the conventional way of learning.

There are at least two issues arising from this investigation. The amount of time spent in applying the models in classes is still longer than expected. To some extent, that could make the learners frustrated and bored. There should be another way to make both models 'time friendly'. Secondly, since analytic and synthetic are two sides of one coin of the way human beings think and reason, there may be a possibility to combine both models into one package of teaching model. So, a further research is needed to be conducted in order to find solutions to these issues.

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