Scientific Method in English Language Teaching

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Abstract

Scientific Method menjadi terkenal di Indonesia saat Kurikulum 2013 diluncurkan olen Kementrian Pendidikan dan Kebudayaan di tahun 2013. Metode ini dipercaya bisa lebih meningkatkan hasil belajar siswa. Proses belajar mengajar seharusnya tentang memberikan kesempatan kepada siswa untuk mengontruksikan pengetahuan di dalam proses kognitifnya.
Prinsip yang nyata dari *scientific method* adalah bahwasanya metode ini berpusat pada siswa (student-centered). Situasi dan kondisi yang membuat guru dan siswa untuk selalu berkolaborasi dengan apik di dalam melaksanakan kegiatan di kelas.
Bagaimana para siswa belajar dan bagaimana para guru mengajar bahasa Inggris memungkinkan para guru ini untuk menerapkan scientific method di dalam kegiatan di kelas tanpa mengganti pendekatan dan metode yang sudah ada. Ini karena scientific method tidak hanya merupakan sekumpulan langkah-langkah yang bisa digunakan di dalam mengajar.

1. INTRODUCTION

The term "Scientific Method" gained its popularity in the field of education in Indonesia when Curriculum 2013 was launched by Ministry of Education and Culture in 2013. This new curriculum was designed to be implemented for elementary and high schools to replace the previous curriculum. In this curriculum students are viewed as subjects with the ability to search for, process, construct, and use knowledge. The teaching and learning process should be about giving students the opportunities to construct knowledge in their cognitive process. To facilitate this to occur, scientific method is implemented.

It is explicitly stated in the curriculum that, with its excellences, the scientific method is very important for a better quality of teaching and learning to develop students' affection, knowledge, and skills. The goals of learning in this method are (1) to improve intellectual competence, especially the ability to do high order thinking, (2) to develop learners' competence in systematically solving problems, (3) to get high achievement, (3) to train learners to communicate ideas, and (4) to develop learners' character. That is why, this method is strongly believed to increase students' learning outcomes more effectively. This method is also considered relevant with the idea that learning is a scientific process in the

classroom. Therefore, in Curriculum 2013 this method must be applicable in all subjects including English.

To really understand how the scientific method is implemented in the English teaching, the discussion below will move from understanding the concept of scientific method and some important facts about it to the conceptual and practical things about the implementation of the scientific method in the English classroom practices .

2. WHAT IS SCIENTIFIC METHOD?

Though scientific method is not new in the sense that it has been long employed in the science world, it is new in the world of English Language Teaching (ELT). Therefore, it is important to have a brief overview on it before further discussing its implementation in ELT.

Throughout the past millennium, there has been a realization by leading thinkers that the acquisition of knowledge can be performed in such a way as to minimize inconsistent conclusions. Rene Descartes established the framework of the scientific method in 1619, and his first step is seen as a guiding principle for many in the field of science today:

> …never to accept anything for true which I did not clearly know to be such; that is to say, carefully to avoid precipitancy and prejudice, and to compromise nothing more in my judgment than what was presented to my mind so clearly and distinctly as to exclude all ground of methodic doubt. (Discours de la Méthode, 1637, section I, 120)

By sticking to certain accepted "rules of reasoning," scientific method helps to minimize influence on results by personal, social, or unreasonable influences. Thus, science is seen as a pathway to study phenomena in the world, based upon reproducibly testable and verifiable evidence. This pathway may take different forms; in fact, creative flexibility is essential to scientific thinking, so there is no single method that all scientists use, but each must ultimately have a conclusion that is testable and falsifiable; otherwise, it is not science.

The scientific method in actuality is not a set sequence of procedures that must happen although it is sometimes presented as such. Some descriptions actually list and number three to fourteen procedural steps. No matter how many steps it has or what they cover, the scientific method does contain elements that are applicable to most experimental sciences, such as physics and chemistry, and is taught to students to aid their understanding of science.

> McLelland (---) reviews a number of definitions of scientific method. Its definitions can be found in textbooks in both the social and natural sciences and, while some variation exists, all have certain common features. From a textbook in geology text: "Scientific method – a logical, orderly approach that

> involves gathering data, formulating and testing hypotheses, and proposing theories" (Wicander & Monroe, 2006). From a chemistry textbook: "Scientific method – Scientific questions must be asked, and experiments must be carried out to find their answers" (McMurry & Fay, 2008). From a biology text: "The classic vision of the scientific method is that observations lead to hypotheses that in turn make experimentally testable predictions" (Raven, Losos, Mason, Singer, & Johnson, 2008). From a psychology textbook: "The scientific method refers to a set of assumptions, attitudes, and procedures that guide researchers in creating questions to investigate, in generating evidence, and drawing conclusions" (Hockenbury & Hockenbury, 2000). From a sociology textbook: "The scientific method is a method to data collection that relies on two assumptions: (1) Knowledge about the world is acquired through observation,and (2) the truth of the knowledge is confirmed by verification--that is, by others making the same observations" (Ferrante, 2008).

It is clear that scientifc method is perceived similarly in both the natural and social sciences although one notices slight differences in emphasis as suggested by the vocabulary used in these definitions. The similarity is certainly expected since the social sciences attempt to copy the systematic approach developed in the physical and natural sciences.

> The most salient terms include "systematic", "procedure","empirical", "method", and "objective". More specific but equally salient terms are "discovery", "fact", "hypothesis", and "experiment". Both the natural sciences and the social sciences employ the same lexicon with very little variation, an understandable situation if we consider that both the natural and socials ciences share the 'culture of science'. A common culture of science would include not only a lexicon (language) but also norms (rules of behavior) and sets of beliefs. The norms of the culture of science revolve around how scientific work is to be conducted, the procedures used, and the steps taken in doing research. This view is explicit when Bernard states that "The norms of science are clear" (1995, p. 3) and proceeds to state that these norms include objectivity, a systematic method, and reliability. Quoting Lastrucci (1963), Bernard further points out: "Each scientific discipline has developed a set of techniques for gathering and handling data, but there is, in general, a single scientific method. The method is based on three assumptions: (a) that reality is 'out there' to be discovered; (b) that direct observation is the way to discover it; and (c) that material explanations for observable phenomena are always sufficient, and that metaphysical explanations are never needed" (Bernard 1995, pg 3-4).

3. WHAT ARE THE PRINCIPLES IN SCIENTIFIC METHOD?

Learning by implementing scientific method is based on the following principles.

a. Be student-centered i.e. the students physically and mentally take an active participation in developing meaning and understanding particular concept, law or principles,

b. Develop students' self concept i.e developing particular concept based on their own understanding,
c. Avoid verbalism,
d. Give opportunity to students to assimilate and accomodate concepts, law, and principles,
e. Force the development of students' thinking capability,
f. Develop students' learning mativation,
g. Force opportunity for students to train their ability in communication,
h. Likely build validation process towards concepts, laws, and principles which are deconstructed by students in terms of its cognitive structure,
i. Involve scientific process skill in constructing concepts, laws, and principles, and
j. Involve potentially cognitive process in stimulating intellectual development especially high order thinking (Directorate General of Junior High School Management, 2014).

The results of learning by implementing scientific method are in the forms of concepts, laws, or principles which are deconstructed by students with the teacher's help. In a specific condition, the data needed to answer the questions are not likely collected directly by students since the data are sometimes got in a long time. In this case, the teacher can provide the data needed and successsively analysed by the students.

4. WHAT ARE THE CRITERIA OF SCIENTIFIC METHOD?

There are seven criteria to determine whether a method of teaching is scientific or not. They are (1) the teaching materials are based on facts or phenomena which can be logically or reasonably explained. They are not based on prediction, approximation, imagination, legend, or myth, (2) the teachers' explanation, students' responses, and teacher-student interaction are not based on subjectivity and wrong logic, (3) the teaching materials support and inspire students to be critical in thinking and analyzing, and accurate in identifying, understanding, and resolving problems, and applying the materials learned, (4) the learning materials foster and inspire students to hypothetically think when seeing diversities, similarities and links in the learning materials, (5) the learning materials foster and inspire students to understand, apply, and develop objectivity and rational thinking in responding to the learning materials, (6) the materials are built on the basis on empirically valid concepts, theories, and facts, and (7) the formulation of learning objectives

is simple, clear, but attractive (Directorate General of Junior High School Management, 2014).

5. HOW DOES THE SCIENTIFIC METHOD VIEW LEARNING?

Learning in the scientific method can be defined as learning which is designed in such a way that learners can actively get knowledge, skill, and attitude through several steps i.e. observing (to identify the selected problems), questioning (and to construct hypothesis), collecting data/information with various techniques, associating (analyzing data/ information) and concluding and communicating the results involving the conclusion and other findings instead of the problem formulation. These steps then can be continued with the step of creating. The implementation of scientific method in learning involves process skill such as observing, classifying, measuring, predicting, expalining, and concluding. In doing this process, the teacher's help is needed, but it reduces as the learners achieve higher levels.

Scientific method closely relates to the following learning theories from Bruner, Piaget, and Vygotzky. The learning theory from Bruner is also called inquiry learning theory. There are four major strands in this theory (in Carin & Sund, 1975). First, the learner only learn and develop his thought if he uses his mind. Second, by doing cognitive process in the inquiry process, learner will get sensasion and intellectual satisfaction which is an interinsic reward. Third, the only way leraner can learn techniques in inquiring is that he has the opportunity to do the inquiry. Fourth, by doing inquiry, learner's memory retension strengthens. Those four strands go well with the cognitive process needed in scientific approach.

Based on Piaget's theory, learning relates to the formulation and development of scheme (plural scemata). Scheme is a mental or cognitive structure with which a learner can intellectually adapt and coordinate the surroundings (Baldwin, 1967). This scheme keeps changing. The child's scheme will develop towards adult's scheme. The process causes this change is called adaptation.

The formation process of adaptation can be done in two ways, i.e. assimilation and accomodation. Assimilation is a cognitive process with which learner can integrate stimulus, which can be in the form of perception, concept, law, principles, or new experience, to the existing scheme in his mind. Assimilation occurs if the stimulus agree with characteristics of the existing scheme. If the characteristics of the stimulus don't agree with that of the existing scheme, one will undergoes accomodation. The accomodation can be in the form of developing new schemes which agree with the characteristics of the existing stimulus or

modifying the existing scheme in such a way that it will agree with the characteristics of the existing stimulus. In learning, it needs equilibration between assimilation and accomodation. If the accomodation dominates the assimilation, a learner will own abundant but low quality schemes. On the other hand, If the assimilation dominates the accomodation, learner will have limited but qualified schematta. The equilibration between assimilation and accomodation is needed to develop learner's intellecuality to the higher level.

Piaget (in Carin & Sund, 1975) states that meaningful learning will never occur unless the learners can mentally act in the form of assimilation and accomodation toward information and stimulus from the surroundings. If this does not happen, teacher and learner will only involve in a pseudo-learning and the learned information tend to be easily forgotten.

The cognitive process needed in constructing concept, law, or principles in learner's scheme through observing, formulating problems, formulating hypotheses, data collecting with various techniques, analyzing data, concluding in scientific approach learning always involves assimilation and accomodation processes. Therefore the learning theory from Piaget indeed relevant to this approach.

Vygotzky states that learning accurs when learners learn and handle tasks which haven't learned, but those tasks are in range of the learners capability, or the tasks are in zone of proximal development, i.e. the area in between the current level of the learner's development which is defined as the ability to solve problems under adult's or peer with higher capability supervision. The implementation of learning which refers to Vygotzky's theory is called scaffolding. It refers to the help or aid given by more competent peer or adults. It means that a large amount of support is given to the learners during early level of their learning, then it reduces to give more oppotunity to the learners to take bigger responsibility soon after they are able to execute it by themselves.

6. WHAT ARE THE STEPS IN SCIENTIFIC METHOD?

The scientific method is a form of critical thinking that will be subjected to review and independent duplication in order to reduce the degree of uncertainty. In an article McLelland (---)states that the scientific method may include some or all of the following "steps" in one form or another: observation, defining a question or problem, research (planning, evaluating current evidence), forming a hypothesis, prediction from the hypothesis (deductive reasoning), experimentation (testing the hypothesis), evaluation and analysis, peer review and evaluation, and publication.

1. Observation

The first process in scientific method involves the observation of a phenomenon, event, or "problem." The discovery of such a phenomenon may occur due to an interest on the observer's part, a suggestion or assignment, or it may be an annoyance that one wishes to resolve. The discovery may even be by chance, although it is likely the observer would be in the right frame of mind to make the observation.

2. Question

Observation leads to a question that needs to be answered to satisfy human curiosity about the observation, such as why or how this event happened or what it is like. In order to develop this question, observation may involve taking measures to quantify it in order to better describe it. Scientific questions need to be answerable and lead to the formation of a hypothesis about the problem.

3. Hypothesis

To answer a question, a hypothesis will be formed. This is an educated guess regarding the question's answer. Educated is highlighted because no good hypothesis can be developed without research into the problem. Hypothesis development depends upon a careful characterization of the subject of the investigation. Literature on the subject must be researched, which is made all the easier these days by the Internet (although sources must be verified; preferably, a library data base should be used). Sometimes numerous working hypotheses may be used for a single subject, as long as research indicates they are all applicable. Hypotheses are generally consistent with existing knowledge and are conducive to further inquiry.

A scientific hypothesis has to be testable and also has to be falsifiable. In other words, there must be a way to try to make the hypothesis fail. Science is often more about proving a scientific statement wrong rather than right. If it does fail, another hypothesis may be tested, usually one that has taken into consideration the fact that the last tested hypothesis failed. One fascinating aspect is that hypotheses may fail at one time but be proven correct at a later date (usually with more advanced technology).

The hypothesis should also contain a prediction about its verifiability. For example, if the hypothesis is true, then ... (1) should happen when ... (2) is manipulated. The first

blank (1) is the dependent variable (it depends on what you are doing in the second blank) and the second blank (2) is the independent variable (you manipulate it to get a reaction). There should be no other variables in the experiment that may affect the dependent variable.

One thing is clear about the requirement of the testability of hypotheses: it must exclude supernatural explanations. If the supernatural is defined as events or phenomena that cannot be perceived by natural or empirical senses, then they do not follow any natural rules or regularities and so cannot be scientifically tested.

4. Experiment

Once the hypothesis has been established, it is time to test it. The process of experimentation is what sets science apart from other disciplines, and it leads to discoveries every day. An experiment is designed to prove or disprove the hypothesis. If your prediction is correct, you will not be able to reject the hypothesis.

Testing and experimentation can occur in the laboratory, in the field, on the blackboard, or the computer. Results of testing must be reproducible and verifiable. The data should be available to determine if the interpretations are unbiased and free from prejudice.

It is interesting that other scientists may start their own research and enter the process of one scientist's work at any stage. They might formulate their own hypothesis, or they might adopt the original hypothesis and deduce their own predictions. Often, experiments are not done by the person who made the prediction, and the characterization is based on investigations done by someone else. Published results can also serve as a hypothesis predicting the reproducibility of those results.

5. Evaluation

All evidence and conclusions must be analyzed to make sure bias or inadequate effort do not lead to incorrect conclusions. Qualitative and quantitative mathematical analysis may also be applied. Scientific explanations should always be made public, either in print or presented at scientific meetings. It should also be maintained that scientific explanations are tentative and subject to modification.

Evaluation is integral to the process of scientific method. One cannot overemphasize the importance of peer review to science, and the vigor with which it is carried out.

Full-blown academic battles have been wagged in scientific journals, and in truth, many scientific papers submitted to peer-reviewed journals are rejected. The evaluation process in science truly makes it necessary for scientists to be accurate, innovative, and comprehensive.

In the context of Curriculum 2013, it is stated in the Regulation of Minister of Culture and Education Number 103 of 2014, when implemented in the teaching and learning process scientific method is conducted through a number of steps.

1. Observing

   The aspects of a phenomenon are observed by using the senses (listening, watching, smelling, feeling, or tasting) with or without a tool to identify problems.

2. Questioning

   Questions related to the problems are formulated. In this step hypotheses or temporary answers are formulated based on the exisiting knowledge. The activities can be asking questions, asking and answering questions, and discussing what is not understood or additional information to find out as clarification.

3. Experimenting (collecting data or information) using various techniques

   In this step some activities can be carried out, for example exploring, trying, conducting experiments, discussing, demonstrating, immitating certain movements, and reading various other resources (in addition to textbooks), and collecting data from resource persons through interviews or questionnaires.

4. Associating (Analyzing)

   The data that have been collected are analyzed to draw conclusions by categorizing them, associating or relating phenomena or information to find certain patterns, and finding arguments and concluding the interrelationship between two facts/concepts, and making interpretations.

5. Communicating

   In this fifth step, the answers of the questions (conclusions) as the product of analyzing (associating information/data) are presented either in the written or oral form, for example written or oral reports, charts, diagrams, graphs, etc. Up

to this step, factual, conceptual, procedural, and/or metacognitive knowledge are already constructed.

6. Creating

   Due to the different natures of various subjects, the five steps above can be followed by creating. This step is not explicitly mentioned in the regulation. In this step, products or ideas are created and/or innovated by using the knowledge that has been constructed. What is created constitutes the application of the constructed knowledge and can be either tangible or non tangible.

The five or six steps do not have to be covered in one single meeting. For instance, in the first meeting only observing, questioning, and experimenting are carried out. The second meeting will continue with the steps of associating (analyzing data or information). Finally, creating is done in the third meeting.

In scientific method, teachers play important roles, such as functioning as resource persons or facilitators, managing/guiding the learning activities, providing feedback, and giving explanation. Teachers are expected to not merely let the students find or construct their own knowledge, but also to provide the students with guidance.

In details Priyana (2015) proposes the teachers' roles in each step of the scientific method. In the step of observing, teachers help the students find/list/making inventories of whatever they want/need to know to be able to do or create something. In the step of questioning, teachers help the students to formulate questions based on the list of what they want/need to know to enable them to do or create something. In the next step – experimenting (collecting data/information), teachers help the students plan and obtain data/information to answer the questions that have been formulated. In the step of analyzing/associating, they help students to analyze data/information and draw conclusions. In the step of communicating, teachers manage, provide feedback, provide enrichment and more explanation or information. Finally, in the last step – creating – they provide example/ideas and choices, encouragement, or reward for the students.

7. HOW IS SCIENTIFIC METHOD IMPLEMENTED IN TEACHING ENGLISH?

After discussing some important points of scientific method in general, lets's have a look at how it can be implemented in teaching English by firstly seeing how language and language learning are viewed.

1. View of language and language learning

The English teaching in Indonesia is still under the influence of Communicative Language Teaching which have been manisfestated into different trends, namely Content-Based Instruction, Task-Based Language Teaching, Genre-Based Approach, and Competency-Based Approach. This approach views language as a means of expressing meaning, both in oral and written forms. Meaning is determined by both the grammatical and situational contexts. Learning a language is learning to mean (in the target language).

Classroom goals are focused on all the components of communicative competence and not restricted to grammatical or linguistic competence. The four broad domains of skills constituting one's communicative competence are: (1) linguistic competence, (2) the ability to distinguish between forms – part of the linguistic competence, and the communicative function, (3) skills and strategies of using the language as a means of effectively communicating meanings in concrete situations, (4) awareness of the social meaning of the language forms (Madya, 2013).

Language learning is characterized as a process of developing the ability to do things with the language. In the communicative classroom, students ultimately have to use the language, productively and receptively, in unrehearsed contexts. The teaching is student-centred in nature; therefore, students' characteristics should be taken into consideration.

With those points above, the goals of English Language Teaching in Indonesia today are formulated as follows: (1) developing the student's ability to communicate in the target language orally and in writing accurately and appropriately in the four language skills in a variety of contexts for varied purposes using a range of text types and language functions; (2) equipping the students with adequate knowledge about texts, particularly social function, text structure, grammar, and vocabulary; and (3) developing acceptable behaviour in personal, social, academic, and professional contexts.

To achieve the goals, the teaching and learning process should be based on the following principles recommended by Curriculum 2013: (1) students are facilitated to learn; (2) learning process applies the scientific approach; (3) learning is competecy-based; (4) learning is integrated; and (5) students learn from varied learning sources. It is scientific method that is considered able to create such a teaching and learning process implementing those principles.

The following sections show how the goals above can be achieved by implementing the scientific method in the teaching of English.

2. Steps of scientific method in the English Language Teaching

The same as other subjects at school, the teaching of English should also implement the steps in scientific method consisting of observing, questioning, experimenting (collecting data/information), analyzing, and communicating. The discussion below shows how the steps are implemented.

a. Observing

In the language learning process, observing means reading and/or listening to texts. Students are exposed to models of text in order to list items they need to know in order to understand and/or produce texts or communicate ideas. The texts can be authentic and/or simplified. The items to list basically include the social function of the text, text structure, grammar, and vocabulary.

Some activities conducted in this stage are for example, students listen to an audio recording, watch a video, watch the teacher (with or without other students) demonstrate a monologue or dialogue, watch other students act out a monologue or dialogue, and read texts.

In this step teachers have some roles. The roles include assisting students to list items to know in order to comprehend and create the targeted texts, providing a list of items from which the students can select some, and making some items in the input (model of language) salient.

b. Questioning

In this second step students ask or formulate questions based on the identified items. The questions at least cover all of the achievement indicators stated in the lesson plan. In this step of learning, students are encouraged to

propose temporary answers based on their knowledge and/or limited information they have.

This stage serves the following functions:

a. to arouse the students' curiosities about, interests in , and attention to the lesson;
b. to encourage and inspire the students to learn actively and develop questions from and for themselves;
c. to diagnose the students' difficulties in learning and at the same time anticipate the solutions;
d. to organize the learning tasks and provide the students with the opportunity to show their attitude, skills, and understanding of the lesson;
e. to elicit the students to use their skills in speaking, asking questions, and answering them logically, systematically with accurate and appropriate language expressions;
f. to encourage the students to participate in discussing, arguing, developing the thinking skills, and drawing conclusions;
g. to encourage the students to be open in giving to and accepting opinions or ideas from one another, enriching vocabulary, and developing the social tolerance in group activities;
h. to accustom the students to think spontaneously and quickly, as well as to respond to sudden problems quickly; and
i. to train the students to speak politely and to develop their empathy to others (Directorate General of Junior High School Management, 2014).

Examples of the activities in this step include, for example with or without the teacher's guidance, students ask questions about the social function, generic structure, and linguistic features of the text being read or heard (watched) that they do not understand or want to know more, or with guiding questions, the students formulate questions about the social function, generic structure, and linguistic features of the text being read or heard (watched).

To facilitate the process of questioning the teacher should help the students ask questions with reference to the items they want to know, provide them with a number of questions the students can start with, and even provide

them with a number of guiding questions – the students can just tick some of them.

c. Collecting data/information (experimenting)

In experimenting, students collect data/information to answer the questions formulated in the second step. They use one or more techniques such as observation (e.g. watching videos or listening to audio recording), interviewing resource persons, and reading books. To enable the students to collect data or information, the teachers should provide them with worksheets and learning resources.

The activities in this stage are for example watching more videos, listening to more audio recordings, listening to more sample expressions, reading more texts, looking up words into the dictionary, interviewing resource people, reading books on grammar, pronunciation, vocabulary, etc assigned by the teacher, accessing website links, doing exercises, or practising the grammar, vocabulary, or pronunciation.

d. Associating (analyzing data/information)

In this step, students analyze data/information to answer their questions and draw conclusions. With or without teacher's support students sort out, classify, and identify patterns to answer their questions.

Some activities can be alternatives, for instance identifying patterns (grammar, vocabulary, or pronunciation), formulating patterns (grammar, vocabulary, or pronunciation), finding answers for the formulated questions, or drawing conclusions

To facilitate the students in analyzing data/information the teachers should help students see patterns to answer questions, and also help them draw conclusions.

e. Communicating (answers/conclusions)

In the communicating step students communicate their answers or conclusions to the class in writing and/or orally. Their answers (conclusions) represent a new knowledge they 'construct' or learn. At the end of this step the students are expected to have learned the necessary knowledge (especially

about the social function of the text, structure of the text, grammar, and vocabulary) in order to comprehend and create texts.

In this step, students present their answers (conclusions) to the class, to the other groups, display their answers (conclusions) or exchange their findings (answers/conclusions) to the other groups.

In this step teachers should play some roles, for example providing feedback – correction, and enriching the knowledge that the students 'construct'.

f. Creating (texts)

In the context of English language teaching the five steps in the scientific approach are not enough to enable the students to communicate in English because learning a language does not end when students already learn the features of (the targeted) texts and their knowledge about texts should be used to understand and create texts (through guided, semi guided and free language production tasks).

Another step, namely creating, is needed to help students achieve the communicative competence. In this step the students are involved in the various activities ranging from guided to free activities, for example doing guided writing or speaking activities, doing semi guided writing or speaking activities, and doing free writing or speaking activities.

It is the teachers' job to design guided, semi-guided and free language production tasks and to provide the students with strategy, idea, and language support.

8. CONCLUSION

Scientific method which has been long and commonly employed in in science can be adapted and adopted in English language teaching in some ways. It is true that how the students learn science and English, and how the teachers teach science and English are different in nature. In spite of that it is still possible for the English teachers to apply the scientific method in their classrooms without actually replacing existing approaches and methods in ELT as the scientic method is only a set of fixed steps that can be used in teaching.

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