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Can EGP learning strategies be successfully used in the ESP learning process?

Savka Blagojevic

Introduction

- 1 It is a well-known fact that modern cognitive psychology has caused a dramatic turn in our understanding of human knowledge. As opposed to the view favoured for decades, the behaviouristic theory, which considers human behaviour the only objectively reliable area for psychological analysis, cognitive psychology deals with the mental processes that underlie intellectual performance. It tries to explain some important intellectual achievements, which the former theory was not capable of, such as problem solving and the acquisition of some basic learning skills: reading and writing. Thus, the findings of cognitive psychology were inevitably built into the majority of the modern studies of knowledge acquisition, especially on learning and teaching theories.
- 2 Cognitive psychology has greatly influenced the modern language teaching methodology; its previous search for the best teaching method has now been replaced by the analysis of the language learning process and explication of the mental activities the learners employ in order to become successful language learners. This resulted in several scientific researches, aimed at integrating the cognitive theory and language learning (Rabinovitz & Chi 1987; Garner 1986; Mayer 1988; O'Malley & Chamot 1990), and probably a lot of experiments of teacher-practitioners. One of them was our experiment conducted with the first-year students of chemistry and physics at the University of Nis. Since it is based on some of the cognitive theory findings, they will be explained as briefly as possible, with the stress on their relevance for language learning.

The theoretical basis of the experiment

- 3 1. The cognitive approach has created an information-processing framework for learning, which can be best described by citing one of the pioneers in applying the cognitive approach to school learning, Ellen Gagné (1985: 8):

In this (information processing) framework the mental events are described in terms of transformations of information from input (stimulus) to output (response). Further, the author explains that the portion of information is transferred to working memory, where it is stored. [...] Stored information may be retrieved. It is then organized by the response generator into a performance pattern that guides the effectors into a sequence of actions.

- 4 In relation to language acquisition, the information processing framework offers us a good basis in analyzing the complex; cognitive process by which language knowledge is stored in memory and results in language comprehension and production.

- 5 2. The cognitive theory describes the whole memory representation in terms of declarative and procedural knowledge (the distinction first made by J. Anderson 1976). Declarative knowledge is represented by propositions, and it is “knowledge **that** something is the case” whereas procedural knowledge is represented by production and is “knowledge **how** to do something”: (Gagné 1985: 483). In other words, declarative knowledge provides the data needed to perform some procedures, while procedural knowledge involves the transformation of information. In relation to language acquisition, this distinction both has theoretical and practical importance, as stated by O'Malley and Chamot (1990: 73):

Knowing about language as a grammatical system, which involves knowing the rules underlying syntax, semantics, and phonology, is not a sufficient condition for knowing how to use the language functionally... In order to use a language for communication purposes, procedural knowledge is required.

- 6 3. The cognitive approach views language as an active process, which can be facilitated by means of using adequate cognitive operations, or “the special thoughts or behaviours that individuals use to help them comprehend, learn and retain new information” (O'Malley & Chamot 1990: 1). These ‘special thoughts’ are commonly called learning strategies. In the language learning process they are expected to lead language learners to successful language performance, e.g., language comprehension and language production.

- 7 Based on the cognitive theory, the way learners approach the language learning process and the investigation of language learning strategies have become the main concern of modern language teaching methodology. The investigation of learning strategies has been established mostly in relation to second language acquisition, CALLA¹, with some suggestions and implications for foreign language learning (mostly in learning English for general purposes or EGP). So the question raised by the teachers of ESP at this point is: Can EGP learning strategies be successfully used in the ESP learning process?

- 8 The answer to this question was possible only by constructing an experiment, and immediate support was found in the extensive information on learning strategies obtained by the above-mentioned studies. They have provided the teacher with information about a great variety of learning strategies, and this empowered him to

choose the ones that are most adequate for the tasks and objectives he wants to fulfil in his language courses.

The practical bases for the experiment

- 9 The majority of ESP courses at university level are faced with the shortage of time and the ESP teacher is usually under pressure to find out the best way to achieve the course objectives for the time available. We believe that he can make his task more successful by concentrating his attention on the way his learners approach the learning process and by instructing them in the use of learning strategies.
- 10 The initial assumptions in using learning strategies in ESP are that: a) they can be instructed; b) in the same way as in EGP, the teacher demonstrates them by “thinking aloud” to his students, and c) the essential difference between teaching EGP and ESP conditions the selection and choice of the learning strategies, which are to be used in the ESP learning process. As opposed to teaching EGP, where the development of general language capacity is required, ESP teaching is aimed at fulfilling specific tasks, leading to the development of so-called “restricted competence” (Widdowson 1983: 6).
- 11 Bearing this in mind, and respecting the opinions of the students interviewed as to the purpose of their studying English as a part of their specialist studies, I have set up the work objectives of the one-academic-year ESP course for students of the Departments of Chemistry and Physics. These objectives were created to meet the students’ needs for using scientific texts in English, which are of relevance either for their present subject-matter studies, or for the further professional prosperity, e.g. the aim was to teach the students to read scientific texts properly in order to enhance comprehension, learning, and retention of the information provided by the text. The Objective, shortly indicated as “teaching the reading of scientific texts properly”, actually meant a completely new approach in teaching, the validity of which could only be proved in comparison to the conventional approach. For this reason, first year students were divided into two groups (25 participants in each group) of more or less equal performance, based on their EGP test results. The members of both groups showed a good command of EGP and their basic knowledge of chemistry and physics was also presupposed. These two facts made a necessary basis upon which both of the approaches were conditioned.
- 12 The “conventional” approach meant that the students were being given scientific texts throughout the year, they were asked to look up unfamiliar words in a dictionary and prepare the texts by translating them into the mother tongue, by answering comprehension questions enclosed with the texts, and by writing a short summary of the text. The teacher’s main role was to explain the difficulties and clear up the uncertainties.
- 13 The approach with the experimental group was of a completely different kind: the students were not given the entire texts, but representative passages from the scientific texts which were used as samples for demonstrating the learning strategies necessary for their understanding. Thus, the students were being trained to learn how to organize the passage information in order to comprehend it better. This group of students will be referred to as “the strategy training group”.
- 14 In considering the experiment with the strategy training group, I was inspired by the research of Cook (1983), presented in her doctoral dissertation, who designed some

instructional methods for chemistry students in order to help them learn new information by reading scientific texts. The important thing is that her students were native speakers of English, and I was greatly tempted to see how it would work with non-native speakers of English.

- 15 The main idea in Cook's research was to identify the structures which are commonly used in scientific texts and to instruct the learning strategies in relation to the specific type of structure, by means of "step by step procedure". She examined three groups of structures (out of five indicated) in her research. We have broadened these into six: generalization, classification, description, enumeration, comparison/contrast, and sequence structures.
- 16 As each of these structures has its specific rhetorical function, they could be therefore called rhetorical structures or rhetorical patterns. Each of them has its clearly distinguishable features, and to call the students' attention to those features is the first step in learning how to identify them. Since this action is underlaid by a group of mental processes and belong to our cognitive behaviour, it will be explained later in Discussion and suggestions, in terms of cognitive psychology.

The procedure of the experiment

- 17 After six rhetorical structures typical of chemistry and physics texts have been selected, the time devoted to practising each of them was carefully planned. Each sample with a selected structure passage was given in three turns; each of the turns presents a phase in the experiment.
- 18 The initial phase can be called "the loud phase" with a lot of talking done almost exclusively by the teacher. The intermediate one is "the questioning phase", when the students are mostly engaged in asking questions and requiring explanations, while in the final phase, "the silent phase", the students should decode the given passage using the strategies that they have learned.
- 19 In the initial phase, the students were given a sheet of paper with the selected passage on it and with the indicated type of the rhetorical structure presented by it: "enumeration", "generalisation", "description", etc. The passage was accompanied by a "steps-instruction" list, the written part of which had the role of a guide through the passage. Before reading the passage, the students were asked to look briefly at the "steps-instruction" list, some suggestions and at the "overall strategy instruction", which was written in block letters, below the "steps-instruction". The overall strategy instruction gave general information about the selected passage and it had to be born in mind the whole time they were working on the passage. It presented the main directive and a guideline to which the students were able to return as many times as needed. This previewing activity was planned to initiate the students' selective attention to the passage.
- 20 The students were first asked to read the passage silently at their own pace. When the slowest reader had completed the task, the teacher went through the text, asking herself loudly about the steps she should take in order to grasp the meaning of the text and to extract the information out of it. (These questions coincided with the meaning of the imperatives from the "steps instruction".) For example, teacher's questions: "Shall I first try to find out the general topic? What does it seem to be?" coincided with the instructions from the steps instructions - "Identify the general topic of the passage," etc.

- 21 While thinking aloud to her students, the teacher was demonstrating the use of the strategy needed for decoding the given passage and thus encouraged them to follow her steps. After the teacher's demonstration, the students were asked to complete the "steps instruction" list, and then were given an additional sheet of paper with the comprehension questions (often in a multiple-choice form) on the examined passage. Finally, the students were asked to sum up orally the information from the passage, using their native tongue. This procedure was carried out with three different samples of the same rhetorical structure.
- 22 In the next phase, the students were given the same type of the rhetorical structure passage, but this time the teacher's instructions were omitted and the students were left to work on their own. All the time the students were encouraged to ask questions for clarification, and the answers were provided either by the teacher or by other students. The students then filled the "steps instruction" list, which was followed by answering the comprehension questions. This activity also ended with an oral summary.
- 23 In the third phase of the experiment, the students were again given a passage of the same rhetorical type, as in the first two phases, but this time the "steps instruction" list was not included, only the comprehension questions below the passage, and the students were instructed to work independently.
- 24 Since the whole procedure was repeated for each of the six selected rhetorical structures several times throughout the year, it was noticed that the time needed for practising a certain type of structure was reduced, and the same was true for the students' questions for clarification. Thus, the teacher's explanations, first abundant in details, gradually became more general, freed from the details repeated in dealing with the first three passages. This was an indication of the students' progress in strategy competence acquisition, so that in the final phase of the experiment, very few students asked for the "steps instruction" list to remind them of the procedure. It was obvious that one of the main concepts in the cognitive approach to learning —transfer of knowledge— was at work. The students' self-confidence seemed to strengthen and this evoked the belief that the students were on the right track in making their strategies automatic.
- 25 The order in the presentation of the selected passages did not follow the frequency of the appearance of a certain rhetorical structure in scientific discourse; it followed the teacher's appreciation of the degree of the explicability of the structure. Thus, the rhetorical structures, which were easier to explain, were the first ones to be taught.
- 26 As the participants in the experiment were non-native speakers of English, the main problem in dealing with the selected passages was that of unfamiliar words. The meaning of these words, since they belong to the field of science, and were not of the colloquial type, could not be left for negotiation, or for "guessing the meaning through the context" The meaning of unfamiliar key-words had to be precisely determined. On the other hand, unfamiliar words always divert students' attention from the main stream of the ideas, and may cause students' failure in comprehending the text.
- 27 An acceptable solution for both problems was found in ranging the selected passages according to language difficulties. In the initial phase, the students were given the selected passages written in simple or simplified English, while in the following phases of the experiment, the provided passages were written in a more complex language, and the vocabulary list with a few unfamiliar key-words translated into the native language was included.

- 28 The same approach was applied during the test. This solution helped in testing exactly the requested strategies, not the one which meant handling the dictionary successfully.
- 29 In the final phase of this learning approach, when the students have already acquired a good deal of the requested strategies, the teacher may introduce some minor strategies concerning the vocabulary of scientific discourse. They may help in the decoding of the meaning of unfamiliar words, without the use of a dictionary, as is the case with the strategies suggested and exploited by F. Zimmerman (1989: 41, 58,164,179). The author suggests calling the students' attention to the prefixes and roots which are of Greek and Latin origins and common for English words used in scientific discourse, such as *hyper-*, *hypo-*, *post-*, *aqua-*, *terra-*, *pyro-*, etc.
- 30 The students are also encouraged to comprehend and learn the unfamiliar words by means of association and cognates. They are advised to make a personal mini-dictionary with the most frequent words they commonly come across while reading the scientific texts needed for their specialist studies. However, the use of a specialist dictionary is an inevitable part of studying ESP and the most reliable source in learning unfamiliar words.

Materials and instructions

- 31 As indicated, the six types of the commonest rhetorical structures used in chemistry and physics texts were presented to the students through the short selected passages. To give an idea of the whole experiment, the three passages accompanied by the "steps instruction" list, suggestions and an overall strategy instruction will be presented in this section, while the rest of the passages used in the first phase of the experiment are given in the Appendix.

Testing, results, and discussion

- 32 At the end of the academic year, both groups of students were subjected to testing which suited the course's main objective: the reading comprehension of scientific texts. The same text was given to both the strategy training group and the control group, and the same testing time was allotted. The students were given two hours to complete the task, but were permitted to hand the tests in as soon as they had finished.
- 33 The text was accompanied by a vocabulary list of unfamiliar key-words (the use of a dictionary was not allowed), and two types of tests were established: the first one was to circle the correct answer from the offered multiple-choice set, and the second, to write a short summary of the text in their native language. The latter test was based on the assumption that writing a summary in one's native language could be a reliable measure of reading comprehension.
- 34 The evaluation concerning the results of the first test was simple: the points of the correct answers were scored (fifteen items, a point for each correct answer), but the evaluation of the students' summaries seemed to cause a problem. The decision had to be made about the exact elements that a good summary in the native language should include. Thus, a list of obligatory propositions was designed as a result of the text analysis made in co-operation with a native speaker of English, a colleague from the Faculty. The eight most important pieces of information, referred to as 'the obligatory propositions', were listed as the criterion for the summary evaluation. That was the sole

criterion while the style of the summary (coherence, cohesion), was not taken into consideration. The presence of each of the indicated propositions was rewarded with two points. The maximum score for the entire summary was sixteen points. The individual test completion time was measured as well.

- 35 The results obtained by the two groups tested were compared, both concerning the first and the second type of the test, and the testing time as well. The data obtained by comparing the two groups' scores on the multiple-choice test proved to be not as convincing as was expected: 16% in favour of the strategy training group. However, the data obtained by comparing the scores of the summary evaluation for the two groups was not only more convincing but surprising as well. Exactly the same number of all the participants had the maximum score: six participants from each group had the eight required propositions incorporated in their summaries.
- 36 Measuring below this score indicated a greater index of deviation, which led to the general conclusion that the strategy training group had written their summaries better, in comparison to the ones written by the control group. The final score acquired from the summary evaluation was 29% in favour of the strategy training group. Some more specific comparisons were not analyzed.
- 37 The comparison of the test completion time indicated that the strategy training group was faster by 17 minutes than the control group.

Discussion and suggestions

- 38 Besides proving that the strategy training group has demonstrated a higher comprehension level in scientific discourse, the obtained testing results indicated two possible fields for further research.
- 39 The first concerns the validity of a multiple-choice test as a precise measure for reading comprehension, while the second field concerns the fact that the same number of the best-scored participants appeared both in the strategy training group and in the control group.
- 40 The low score difference between the two tested groups regarding the multiple choice test results, might be due to the nature of this type of testing. It seems that the multiple-choice test is not sufficiently distinguishing in character, though defects in test construction are also possible. That is why one can be certain of qualifying this type of test as reliable for measuring reading comprehension only after several applications. Nevertheless, the conclusion drawn from this experiment warns us that the multiple choice test should not be applied as the sole measuring instrument for reading comprehension but only in association with some other kinds of tests.
- 41 The same percentage of the best-scored results of the participants on both sides directed our thinking towards the nature of the learning process of the best learners and led us to the conclusion (which might be either proved or rejected only after some detailed investigations) that the best learners probably possess some kind of built-in learning strategies, possibly acquired through the process of their previous education. We consider this field of investigation very interesting and worthy of research.

Explanation and conclusion

- 42 As the basis of this experiment lies in the cognitive approach, it is fair to explain it briefly in terms of cognitive psychology. The input information presented through the selected passages was submitted to a series of transformations (information-processing), the result of which was an output information realized through reading comprehension.

Since

competent individuals are effective because of special ways of processing information (O'Malley & Chamot 1990: 2),

- 43 these "special ways" (learning strategies) were introduced to a strategy training group in order to acquire the necessary procedural knowledge. This type of knowledge is acquired by means of a pattern recognition procedure which is associated with two learning processes —generalization and discrimination. The result of the former is a procedure which enables the learner "to respond in a similar manner to stimuli that differ" (Gagne 1985:106), while the result of the latter is a procedure which directs the learner's attention to the differences among the stimuli. Both generalization and discrimination are learning processes which, to be successful, should rely greatly on a wide range of learning strategies.
- 44 In the process of identifying the type of rhetorical structure and extracting the meaning out of it, the students should have employed metacognitive, cognitive and social strategies. (The naming and the classification are made according O'Malley & Chamot [1990]).
- 45 Metacognitive strategies were supposed to be used throughout the three phases of the experiment. So, in the initial phase, the "steps instruction" list was included in order to elicit the selective attention to the key-information from the sample passage, and initiate the students' previewing of the sample passage. When the "step information" list was omitted, the students had to rehearse the knowledge of the explained procedure, employing the "advance preparation" strategy. The strategies of self-monitoring, e.g. checking the comprehension during the reading of the text, and self-evaluation; judging the degree of comprehension, were employed during all phases of the experiment .
- 46 The main cognitive strategies, elaboration (relating new information to prior knowledge) and transfer (using the acquired knowledge and applying it to new situations) were accompanied by the resourcing strategy, using reference from the unfamiliar key-words vocabulary. Each phase of the experiment ended by making a mental summary of the information gained through reading, e.g. summarizing.
- 47 Social strategies were also encouraged by inviting the students to ask either the teacher or their peers questions for clarification, and by the students' occasional reporting about the strategy they were going to apply for a certain required activity.
- 48 It can be easily noticed that the learning strategies used in fulfilling certain tasks of the ESP learning process coincide with those of the EGP learning process, but selected and modified to suit the needs of the former. So, the question presented in the heading of this paper not only has an affirmative answer, but tells us that the use of learning strategies is a desirable and strongly recommended activity in the ESP learning process as much as it is in the EGP learning process. By instructing his students in the use of learning strategies, the ESP teacher may help them a great deal "to become full participating

members of the relevant discourse community” as Swales (1980) recommends, reminding an ESP teacher of his role.

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APPENDIXES

The type of structure: GENERALIZATION

Chemical reactions are the processes that convert substances into other substances. Thus sodium chloride has the property of changing into a soft metal, sodium, and a greenish-yellow gas, chlorine, when it is decomposed by passage of an electric current through it. It also has the property, when it is dissolved in water, of producing a white precipitate when a solution of silver nitrate is added to it; and it has many other chemical properties. Iron has the property of combining readily with the oxygen in moist air, to form iron rust, whereas an alloy of iron with chromium and nickel (stainless steel) is found to resist this process of rusting. It is evident from this example that the chemical properties of materials are important in engineering. Many chemical reactions take place in the kitchen. When biscuits are made with the use of sour milk and baking soda there is a chemical reaction between the baking soda and a substance in the sour milk, lactic acid, to produce the gas carbon dioxide, which leavens the dough by forming small bubbles in it. And, of course, a great many chemical reactions take place in the human body. Foods that we eat are digested in the stomach and intestines. Oxygen in the inhaled air combines with a substance, haemoglobin, in the red cells of the blood, and then is released in the tissues, where it takes part in many different reactions. (Pauling L. & P. Pauling. 1975. *Chemistry*. San Francisco: W.H. Freeman & Company)

Instructions:

Step 1: Identify the main idea and write it down

Step 2: Find out the evidence which support the main idea

Step 3: List the evidence in relation to the main idea

Suggestions:

Make notes, use the abbreviations, formulas...

THE OVERALL STRATEGY: THINK IN TERMS OF GENERAL IDEA AND THE SUPPORTING EVIDENCE.

Type of structure: CLASSIFICATION

All substances are divided into elementary ones and compounds. Elementary substances consist of one element, while compounds consist of two or more elements. Elementary substances, in turn, are divided into metals and non-metals, previously called metalloids. The latter classification is based on the difference in the physical properties of the relevant elementary substances. Metals are distinguished by their characteristic 'metallic' lustre, ductility, malleability, can be rolled into sheets or drawn into wire, and are good conductors of heat and electricity. At room temperature, all metals (except mercury) are in the solid state. Non-metals do not have the lustre characteristic of metals, are brittle, and are very poor conductors of heat and electricity. Some are gaseous in conventional conditions. Compounds are divided into organic and inorganic ones. The name organic is usually applied to the compounds of carbon; all the remaining compounds are called inorganic (sometimes mineral). Of the inorganic compounds, chemistry most often has to do with oxides, bases, acids, and salts. These basic classes of inorganic compounds are studied in detail in secondary school. We shall therefore give only the most important information about them in this book. Oxides are compounds of elements with oxygen. With respect to the chemical properties, they are divided into salt-forming and non-salt-forming, or indifferent. Salt-forming oxides, in turn, are divided into basic, acidic, and amphoteric ones. (Glinka, N.L. 1981. *General Chemistry*, vol 1, V.Rabinovich (ed.), translated by G.Leib, Moscow: Mir Publisher)

Instructions:

Step 1. Identify the general class

Step 2. Identify the specific items which the general class includes

Step 3. Look for further classes or specific items

Step 4. Look for the basis of classification

Suggestions:

Make notes, draw the branching diagram

OVERALL STRATEGY: THINK IN TERMS OF "CLASS" AND "ITEM"

Type of structure: COMPARISON/CONTRAST

All but 20 of the over 100 elements identified to date are metals, but only 7 of these are common in the earth's crust. Iron, the most widely used metal, is rarely found in the free state (not combined with other metals) and must be extracted from naturally occurring compounds (ores) such as hematite, magnetite, and pyrite. The beautiful colors of rocks are due almost entirely to these iron compounds. In fact, iron pyrite is often called fool's gold because of the similarity of its color to gold. Iron is very strongly magnetic, and the fact that the earth is a magnet itself tipped scientists off to the fact that iron is a major component of the earth's core, or center. Pure iron is a relatively soft, silvery metal that is very active chemically (that is, it combines with oxygen to corrode or form rust). It is usually mixed with other elements or compounds to form alloys such as steel, stainless steel, or cast iron, which are more durable and rust resistant than pure iron. Aluminium

is the most abundant metal, but it was not used until a century ago because it is so active chemically and difficult to extract. Like iron, it is soft, but in contrast to iron and steel, aluminium is very light and more resistant to corrosion. These qualities make it useful for airplanes, automobiles, rockets, and house siding. In the 1940s, magnesium emerged as an important metal. Although it is less abundant in the earth, more chemically active, and harder to extract than aluminium, it is present in sea water and that means there is an almost endless supply of it. (Zimmerman, F. 1989. *English for Science*. Englewood Cliffs, NJ: Prentice Hall)

Instructions:

Step 1. Identify the pairs of items which are compared/contrasted

Step 2. Make decisions about the bases of similarities/differences

Step 3.. List the similarities/differences

Suggestions:

Take notes, make a list, using signs >, or <

THE OVERALL STRATEGY: THINK IN TERMS OF MORE OR LESS SIMILAR/DIFFERENT

Type of structure: ENUMERATION

Holography, or wave-front reconstruction as it was first called, was invented by Dennis Gabor in 1948 in an attempt to improve the resolution of the images obtained with an electron microscope. The basic optics of holography differ from those of regular photography in three respects. First, the light reflected from the object is not focused onto the photographic plate to form an image of the object, but rather each point on the plate receives light from the entire object. Second, to record a hologram, the object must be illuminated with coherent light. For light to be coherent, it must consist of a single wavelength or frequency and it must be possible to focus the light onto a small area, essentially a point. The brightest source of coherent light is a laser. The third departure from normal photography is that a portion of the coherent light used to illuminate the object, must be used to illuminate the photographic plate directly, bypassing the object. This additional beam, called a reference beam, produced by means of interference, effects a visible display of the wave pattern of the light impinging on the photographic plate from the object (Lerner, R. (ed.). 1980. *Encyclopaedia of Physics*. NY: VCH Publishers, Inc.)

Type of structure: SEQUENCE

As an example, let us consider what happens when platinum electrodes are used with an electrolyte of copper sulphate solution. Two pieces of platinum foil are connected to a battery. One piece is connected to the positive terminal and the other to the negative. They are then placed in blue copper sulphate solution contained in a beaker. A test tube is filled with the solution and fixed over the anode. When the current is switched on it passes from the anode to the cathode through the solution. It will be seen that the blue solution of copper sulphate gradually becomes paler as the current passes through it. At the same time, gas is given off from the anode and is collected in the test tube. The copper sulphate solution gets paler because it is decomposed by the electric current passing through it. It is the copper which gives the solution its blue colour and some of this has been broken up, or dissociated, into electrically charged particles, or ions. When a current passes through the solution, the positively charged ions of copper are attracted to the cathode. There they are neutralized by the negative charge of the cathode and particles of copper are deposited on the platinum foil. Meanwhile, the anode gives off

oxygen, which is collected in the test tube. (Allen, J.P.B. & H.G. Widdowson, London: Oxford University Press, 1974)

Type of structure: DESCRIPTION

Crystalline forms. Diamond. The diamond is the purest natural form of carbon. It is an eight-sided, colourless, transparent crystal. However, impurities in small quantities will colour it red, blue, or even black. It is the hardest naturally-occurring substance known, has a specific gravity of 3.52, is insoluble in all liquids, is quite brittle, and does not conduct electricity. Chemically, a diamond is inert, being unaffected even by strong acids and alkalis. It cannot be melted, but at about 900°C, it burns in air to form carbon dioxide.

Graphite. Graphite, like diamond, is crystalline, but its greyish-black crystals are in very thin plates. The crystals are so soft and slippery they slide over one another with very little friction, thus making graphite an excellent lubricator. Graphite is even more resistant to chemical action than diamond, and melting it is almost impossible. This inactivity makes graphite a useful ingredient in stove polish and acid-proof paints. Even at extremely high temperatures, graphite is not oxidized to any extent. This quality renders it valuable in manufacturing crucibles employed in the melting of metals. Graphite is a good conductor of electricity. This quality, coupled with its inactivity and high melting point, makes it useful as electrodes in electric furnaces and arc lamps. The only product of the combustion of burned graphite is carbon dioxide. (Croal, Couke & Loudon)

NOTES

1. CALLA (the Cognitive Academic Language Learning Approach), is the ESL instructional model developed by Chamot & O'Malley to meet the academic needs of limited English proficient students (LEP).

ABSTRACTS

Modern English methodology advocates the widespread use of learning strategies in teaching English for general purposes (EGP). This paper presents the application of these strategies in the ESP learning process in order to make it more effective and the ESP learners more competent in transferring science and technology into a new language form.

Comme la méthodologie actuelle de l'anglais recommande l'emploi systématique de stratégies d'apprentissage dans l'enseignement de l'anglais général, cet article préconise l'application de ces mêmes stratégies dans le processus d'apprentissage de l'anglais de spécialité afin d'en renforcer l'efficacité et de rendre les apprenants d'anglais de spécialité plus compétents dans le transfert de leur savoir en science et technologie sur l'acquisition de nouvelles formes langagières.

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Mots-clés: anglais général, processus d'apprentissage, stratégie d'apprentissage

Keywords: EGP, learning process, learning strategy

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