2021

Psycholinguistic features of successful transformation of engineering thinking in speech

Olena Tyron
State University of Infrastructure and Technologies

Svitlana Korieshkova
State University of Infrastructure and Technologies

Recommended Citation

Tyron, O. & Korieshkova, S. (2021). Psycholinguistic features of successful transformation of engineering thinking in speech. In Pazaver, A., Manuel, M. E., Bolmsten, J., Kitada, M., Bartuseviciene, I. (Eds.), Proceedings of the International Maritime Lecturers' Association. Seas of transition: setting a course for the future (pp. 128-137). World Maritime University. http://dx.doi.org/10.21677/imla2021.13

http://dx.doi.org/10.21677/imla2021.13

Psycholinguistic features of successful transformation of engineering thinking in speech

Olena Tyron
Associate Professor, State University of Infrastructure and Technologies, Kyiv, Ukraine
tyronolena@gmail.com

Svitlana Korieshkova
Associate Professor, State University of Infrastructure and Technologies, Kyiv, Ukraine
flamingo-light10@ukr.net

Abstract: In this article, we try to answer the question of what makes it difficult for future engineers to express their ideas on technical topics in oral speech. The theoretical basis of the organizational procedure of the study was the concept, according to which a comprehensive description of the professional linguistic personality can be conducted on the verbal (professional speech) and cognitive (professional picture of the world) levels. We studied future engineers' thinking patterns and found out which parts of speech were their first associations in technical, business, and everyday communication. The purpose of the study was to identify the fundamental tendencies of engineers' thinking that influence the speaking process. The results create psychological conditions for the actualization of the mechanisms of thought for speech. This mechanism involves the use of an algorithm that has common features when speaking in both a native and a foreign language. We worked out practical recommendations on how to make this process less time consuming and offer a hypothesis on how to successfully convey ideas into a statement. Identifying the peculiarities of thinking for speaking both in native and foreign languages allows the development and application of techniques to improve engineers' speaking culture. The combination of understanding the features of engineering thinking in general and features of thinking for foreign language speaking contributes to the effective formation of the linguistic personality of a technical specialist.

Keywords: tendencies of engineers' thinking; thinking for speaking in native and foreign languages; verbal and cognitive features of linguistic personality, an algorithm of transforming thought into speech, ship engineers' speaking abilities

Introduction

The traditional system of future engineers' training is aimed at both the formation of technical thinking in all its components (conceptual, imaginative and effective) and the development of verbal-logical thinking. Any employer in the field of engineering wants new employees to have a set of skills, such as teamwork, communication, and time management, that have been ignored in the past. In response, many universities have begun to implement program changes to have well-trained engineering graduates (Bucura & Ban, 2019).

Modern engineering is determined by high levels of automation and computerization. Requirements for engineers' cognitive competencies have been updated. Scientists have identified 16 cognitive competencies of systems engineers (Frank, 2012), which we believe are universal for representatives of all specializations in the engineering field, namely: to see the system and understand the system as a whole, not to get caught up in the details; understand the interconnections, interdependencies and interactions of elements of different nature; go beyond engineering thought; think creatively; understand the application of changes in the system; understand new concepts immediately after their presentation; understand analogies and parallels; be inquisitive and ask the right questions; be able to take into account non-engineering factors and see perspective; and be able to optimize (understand the ratio of efficiency, cost and timing).

Engineering thinking is a special kind of thinking that is formed and manifested in the solution of engineering problems, aimed at providing activity with technical objects, carried out at the cognitive and instrumental levels. Engineering thinking includes (Teriokhina, 2017, p.25) technical thinking - the ability to analyze the composition, structure and principle of operation of technical objects in the changed conditions; constructive thinking - the construction of a specific model for solving a problem, which means the ability to combine theory with practice; research thinking - determining the novelty of the task, and the ability to compare among known classes of tasks, the ability to reason actions and results obtained and draw conclusions; economic thinking is a reflection of the quality of the process and the result of activity from the standpoint of market demands.

There are different theories of thinking styles that come from psychology. Sensory thinking is characteristic of all people, especially representatives of the creative professions (writers, artists, artists, directors, choreographers, etc.). Technical (practical) thinking is carried out without the participation of language. It, like visual thinking, is characteristic of higher animals and humans. Practical and effective thinking is inherent in all people, but most of all specialists in technical professions. Sometimes it is easier for an engineer to create a new machine than to present and prove a project (difficult to find the right words and expressions). Moreover, specialists who work with computers show evidence that they think in machine (computer) language. Conceptual thinking is realized through language. The Royal Academy of Engineering (2014) researched engineers' habits of mind and found six such habits: system thinking, problem finding, visualizing, improving, creative problem solving and adaptability.

Besides the scientific works on engineers' thinking, we find works on the formation of engineers' communicative competence. Burganova and Valeev (2015) formulated criteria for the assessment of technical students' communicative competence, Shamshina (2014) explained the content of communicative readiness, and Singh and Kaur (2019) give practical advice on how to develop future engineers' communicative skills.

However, there is a lack of scientific works that explain how engineers convert their thoughts into utterances – the skill that makes their communication efficient. The activity of thinking takes a particular quality when it is involved in the activity of speaking. In the evanescent time frame of constructing utterances in the discourse, one fits one's thoughts into available linguistic forms. A particular utterance is never a direct reflection of "objective", a perceived reality or an inevitable and universal mental representation of a situation. Within any given language, the same situation can be described in different ways; each language provides a limited set of options for the grammatical encoding of characteristics of objects and events. "Thinking for speaking" involves picking those characteristics that (a) fit some

conceptualization of the event, and (b) are readily encodable in the language (Slobin, 1987, p. 435).

An evolutionary approach to language comprehension, thinking and cognition gives impetus to finding new approaches to language development and innovative approaches to foreign language learning. Cognitive evolution is characterized by an increase in the complexity of thought, while social evolution is characterized by an increase in cultural diversity. A common factor in cognitive-social evolution is language. According to Chernikova (2015), through the lens of global evolutionism, language-thinking-cognition is considered in unity. The evolutionary approach to language analysis examines it at three levels. The last level involves interacting with the world. New cognitive mechanisms are formed here, including logical-verbal thinking and symbolic thinking that is realized through language, traditions and morality.

It is important to study and properly use linguistic means in expressing thought, depending on the purpose and content of the expression, which is achieved through a culture of speech. Therefore, the culture of speech is also the culture of thinking and the culture of social and spiritual relations of an individual.

Thus, we consider the process of forming the language personality of an engineer in the unity of thinking, cognitive processes and speech.

Materials and Methods

The study was conducted at the Kyiv Institute of Water Transport of the State University of Infrastructure and Technologies. The survey was conducted among 1st, 2nd and 3rd- year students of ship engineering and electrician departments (60 questionnaires of 30 students were analyzed). These professions are related to the engineering domain, so our task was to study the tendencies of engineering thinking and its impact on the speaking process of future engineers.

The theoretical basis of the study was the concept that a comprehensive description of the professional linguistic personality can be determined on verbal (professional speaking) and cognitive (professional picture of the world) levels. The professional language of the future ship engineer is presented verbally with terminological and grammar materials. As a rule, technical material is presented at the same time in a visual-shaped and abstract-conceptual form (e.g.: schemes, graphs, diagrams); an essential feature of technical thinking is conceptually-shaped connections.

At the cognitive level, there is an actualization and identification of relevant knowledge and representations inherent in the linguistic personality that creates an individual or collective cognitive space. Based on the ideas recorded in the language, the mentality of the future engineer can be judged. The professional picture of the future engineer's world is characterized by a particular type of knowledge organization and has specific language implementations. Some scientists are still discussing the relations between language and thought. Some claim that the function of language is communication; it is an instrument of thought, and a tool for the expression of thought. Asoulin (2016) argues that language does more than merely express pre-formed thoughts. There are two ways to construe the claim that language is an instrument of thought: a weak and a strong claim. The weaker claim is that language is used primarily for the expression of thought, whereas the stronger claim is that language to some extent structures thought (or at least a subset or particular types of thought). The specific character of the

cognitive processes of a professional linguistic personality determines the practical nature of its activity.
The purpose of the study was to identify the fundamental tendencies of engineers' thinking which influence the speaking process. The study was conducted in distinct stages and our tasks were to:

1) analyse linguistic tendencies of future engineers' professional thinking;
2) identify the algorithm of transforming future engineers' thinking into speaking in their native language;
3) identify the algorithm of transforming future engineers' thinking into the English language.

Results

In the first phase of the study, we asked participants to read 10 technical questions and write down in one word, a diagram or drawing the first association that came to their mind. Students were told that they did not have to answer the question but that the first association was important. We have not included the entire questionnaire in this article but give examples and reasons for our choices. An example of a question used in the first questionnaire was, "Do you agree that the quality of the high-pressure fuel pumps is checked by the ease of running the rail in the extreme lower and upper position of the plunger?" The first association may be "a pump" or "measure", or "don't know", etc (an object or an action). We chose a question to which the answer could be "yes" or "no" so it cannot influence the choice of the first association. Among the 30 questions analyzed, 80% of respondents mentioned a procedure (actions), 10 % - an object and 10% graphs or drawings as the first association. To sum up, we concluded that students in purely technical matters are more inclined to think spatially and procedurally. Even in the questions unknown to the students, the first associations were "ask", "read", "don't know".

The result has shown that the main tendency of the technical thinking of future engineers is spatial-procedural. Won't this be a problem in terms of communication skills of engineering students as a whole? Language and thinking operate in different units (phoneme, morpheme, word, sentence versus concept, judgment, reasoning).

In order to identify an algorithm for transforming future engineers' thinking into speaking in the native language, we used one more questionnaire with 24 statements with the variants of associations provided. Association words represented a choice from the following grammatical categories - nouns, verbs, adjectives. We prepared 6 statements of different types: 1) about a professional fact or state; 2) about the personality of a respondent, 3) about another person 4) about a group of individuals.

Table 1. *The results of the study of the linguistic tendencies of future engineers' thinking (percentage)*

№	**Statements about:**	**associations**		
		verb	**noun**	**adjective**
1.	a professional fact or state	55	33	12
2.	personality of a respondent	51	34	15
3.	the other person	40	26	34
4.	a group of individuals.	60,1	19,5	20,4

We examined whether the interviewed students exercised a tendency to use a certain part of speech (syntactic component), and whether the type of assertion influenced the choice of programmed association (lexical component).

As can be seen from Table 1, general tendencies are the following: the most used part of speech is a verb; the least used is an adjective. The statements about professional facts and states relate to the business discourse of future ship engineers' activity (conventions and regulations), not technical issues. With technical issues, students showed 80% of verb preference, and in professional business communication – 55%. This can be evidence that technical speaking differs from other components of engineers' communicative competence.

In the statements about the personality of a respondent (a statement about yourself), the interviewees demonstrated the preference to use a verb as the first association; the choice, first of all, depended on the content of the word (its connotation). But it is precisely in the statements about themselves that we observed a high percentage of unanimity in the choice of association. This fact gave us the opportunity to assert a collective consciousness in the student group. Collective consciousness influenced the thinking of the respondents.

The difference between the choice of the part of speech as the first association is the smallest in the statements about the other person. There was no unanimity in the answers either. It is in relation to others that the respondents have shown their individuality through their attitude to the successes and failures of others. Some respondents tend to rate others, thus favouring the adjective and others are trying to be objective and state facts.

In statements about a group of people, students again prefered to use a verb and unanimity was found in the choice. The priorities were arranged as follows: the highest percentage was given to the verb, an equal number of choices to adjectives and nouns. We explain this by the fact that the respondents have included themselves into this group and, above all, projected joint activities within this group. Respondents are aware of the objects, their connections and properties, as well as their importance to themselves.

We studied the thinking patterns of future engineers and determined which parts of speech were their first associations in technical, business, and everyday communication. The results will create psychological conditions for the actualization of the mechanisms of thought for speech. Our hypothesis was that in order to convey an idea into a statement it is necessary to have a subject, so to transform a thought into a statement would be much easier if the first association of thought were a noun. The next phase of the study was to identify the impact of thinking in one's native language on foreign language speaking.

Thinking for foreign language speaking of engineering students

Proficiency in a foreign language has become an integral part of international cooperation. In this regard, special requirements for graduates include not only the presence of high level professional qualities but also the ability to communicate with partners who are representatives of other linguistic communities. English language communication is very important for marine engineers because they are required to work in crews which could be recruited from several countries by a manning agency and engaged in trading worldwide (Tyron, 2017, p.198).

Ships' crews are now multinational and culturally diverse. However, about half of the officers are drawn from the Organization of Economic Cooperation and Development (OECD) states

and the ratings predominantly from Asia and the former socialist countries. There is now a major world shortage of officers since the traditional maritime countries have not been recruiting and training sufficient numbers for these posts over the past decades. There are tensions onboard many multinational vessels leading to poor levels of maintenance, accidents and low morale (Couper, 2000).

Teachers of a foreign language for Professional Purposes actively teach technical terms andreading of technical texts. In speech, the result is similar to the situation described below. We provide a typical situation - an interview that clearly reflects the problem.

Expert: How does the fuel get into the cylinder?
Student: There's a nozzle.
Expert: Why is it necessary to cool the engine?
Student: Friction.

These mini-dialogues prompted us to study how the student's thinking process takes place. It should be noted that students felt complete psychological satisfaction with their response. We relate such pleasure to the joy of finding a word that reflects a concept that has arisen in the mind of a student in a particular communication situation.
The process of thinking for speech in the communication process is as follows:
1 - the emergence of the concept in consciousness;
2 - search for the word that most accurately reflects this concept;
3 - formulation of thought in internal speech;
4 - search for grammatical-syntactic forms;
5 - reflection on the correctness, logic, clarity of expression.

Thinking for speaking in a foreign language involves searching for a word in a foreign language to reflect the concept. It is the third stage - the formulation of thought in internal speech must come from words in a foreign language. A situation where students formulate their thoughts in their own language and then translate the thought becomes a psycholinguistic barrier to foreign language communication. Search for grammatical-syntactic forms occurs within the formed interlanguage. The student learns a foreign language, and the interlanguage is the result, the competencies that are in the long-term memory of the student (Tyron, 2018). Speaking on technical topics is related to knowledge of the subject matter and skills to build a foreign language utterance. It is well known that English is characterized by a fixed order of words. The basic unit of speech is the subject and the predicate. If the first association in thinking is a noun, it is easier for the speaker to construct an utterance, but if it is a verb, then it is necessary to re-think so that the first association is a noun. This adjustment is time-consuming and not always easy. More time is needed to find appropriate lexical units in long-term memory. The structure of the sentence and its lexical content are the main components of foreign language speech. This is the kind of algorithm in thinking for speaking that makes it difficult to speak a foreign language. The third component is the intricacies of language (phonetics, stylistic techniques, features of grammar).

Creating psychological and pedagogical conditions for the formation of a culture of the professional technical language of future ship engineers implies motivation to control thinking for speech. Thinking for speech is a special form of thought that is mobilized for communication. It is a thinking activity that involves such thinking operations as analysis, synthesis and comparison. Thinking for speech is a deep, non-verbal process.

The key characteristics of an engineering profile are scientific mind; spatial imagination; analytical skills; the ability to reasonably state a point of view and ability to prove it; understanding the work of mechanisms and technological processes; ability to evaluate logic and consistency of information. We expect the thinking and speaking of an engineering student to have the following features:
• ability to follow logical continuity in the presentation of information;
• ability to prove their own judgments;
• application of certain principles of argumentation, namely: no contradiction, evidence and objectivity.

These are characteristics which can be formed. We share our experience of introducing exercises that train the skill of translating spatial verb concepts into linear linguistically designed concepts.

1. "Process description". Prepare 10 cards with pictures showing a process, for example, pumping out ballast water with a pump, a piston that pushes exhaust gases, the process of filling a tank with fuel. Present the drawings to students, and allow time to evaluate what they see. Then ask students to describe situations in one sentence, which will begin with the subject, which the teacher attaches to the drawing. At the first presentation of the drawing, students fix attention on the action, at the second presentation, relying on the subject, students transform spatial-procedural thinking into linear.

2. "Simplifying a language". Present students with a long sentence overloaded with complex grammatical constructions from an authentic text on a technical topic. Ask students to rephrase the sentence by minimizing it, but retaining the information.

Nevertheless, we would like to caution teachers not to overload students with such exercises. We use them from time to time, combining them with other types of educational activities. In addition, the substitution of teaching a foreign language for teaching a speciality in a foreign language is dangerous. We believe that in terms of humanistic, interdisciplinary content, teachers can make a valuable contribution from a broader perspective than that offered in specialized engineering courses. We can help students reflect on the social, ethical, and historical aspects of engineering, and discuss the impact of scientific and technological development on society. Promoting reflections on science, technology and society among engineering students through an online learning environment (Arno-Macia & Rueda-Ramos, 2011). Such topics will help develop communication skills.

Discussion

In everyday life, we come across such statements: "He is a technician, his presentation will not be successful", "It is difficult for him to learn English, he is a technician". The idea that it is unlikely to expect a successful level of development of communication (humanities) skills from engineering students is a theory of psychologists about the natural abilities of the individual. According to Gardner (2003), there are 9 natural faculties of personality, including linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, naturalistic and spiritual. And these abilities are given to personality by nature in different quantities. If the most developed are logical and mathematical abilities, then it is true that linguistic natural abilities are less developed. Thus, the difficulty in speaking for specialists in technical specialities is natural. Individuals like Einstein, Marshall, Curie, and Jennings are

“geniuses” in different ways, and a single conception of “intelligence” is not adequate to account for the varieties of intelligence they display. Sternberg’s (2012) triarchic (three-part) theory of intelligence extends the concept of intelligence to include not just the mental operations you perform (analytic intelligence) but also the ability to vary your approach to problems (creative intelligence) and manage your cognitive resources (practical intelligence) to get the job done. Sternberg and his colleagues have developed new intelligence tests designed to assess analytic, practical, and creative intelligence. They offer evidence that scores on these tests can predict success at some jobs at least as well as standard intelligence tests.

The results of our research prove that engineers’ thought transformation into speech can be successful even if we accept the fact that they have more developed logical-mathematical and less developed linguistic natural abilities. In support of our ideas of natural abilities and presentation skills, we refer to the names of the writers-inventors who successfully combined technical thinking and fiction writing: Leonardo da Vinci, Mark Twain, Robert Heinlein, Lewis Carroll, etc. Following the evolution of tech writing, we would like to mention Jules Verne, Herbert Wells, Arthur Clarke, Isaac Asimov, Ray Bradbury.

We offer a discussion as far as possible to teach engineering students to express their thoughts easily in technical matters. Studying the differences between more efficient and less effective university students learning a foreign language, it was determined that students belonging to the art, law, or medical faculties achieved the highest results, whereas most of the less effective students came from the university's engineering and science faculty (Wong & Nunan, 2011). Nevertheless, we think that the issue of engineers’ thinking and speaking features are not sufficiently studied, their characteristics are not fully taken into account in the language courses for future engineers.

Conclusion

Engineers’ technical thinking is a part of engineers’ communicative competence and is mostly presented in the spatial and procedural form. If the person wants to transform such thinking into speech, the way of thinking must be converted into linear thinking according to the laws of linguistics. Our hypothesis is that in order to convey opinion in a statement it is necessary to have a subject, so to transform a thought into an utterance would be much easier if the first association of thought were a noun. Collective consciousness influences the thinking of the students of the same group and they show their individuality through their attitude to the successes and failures of others.
The process of thinking for speech in the communication process is as follows:
- the emergence of the concept in consciousness;
- search for the word that most accurately reflects this concept;
- formulation of thought in internal speech;
- search for grammatical-syntactic forms;
- reflection on the correctness, logic, clarity of expression.

Thinking for speaking has similar features in a foreign and native language, but speaking in a foreign language involves searching for a word to reflect the concept. A situation where students formulate their thoughts in their own language and then translate the thought becomes a psycholinguistic barrier to foreign language communication. The results of our research prove that engineers’ thought transformation can be successful if formed.

References

Asoulin, E. (2016). Language as an instrument of thought. Glossa: a journal of general linguistics, 1(1): 46. 1–23, http://dx.doi. org/10.5334/gjgl.34

Arno-Macia, E., Rueda-Ramos, C.(2011). Promoting reflection on science, technology, and society among engineering students through an EAP online learning environment. Journal of English for Academic Purposes, Volume 10, issue 1, March 2011, pp.19-31. https://doi.org/10.1016/j.jeap.2010.12.004

Bucura, M., Ban, A.(2019)The importance of the concept of communication among future engineers- a pre-test of European study. Procedia Manufacturing, 32,348–355

Burganova, N., Valeev, A. (2015). Development of Technical College Students' Communicative Competence. Review of European Studies; Vol. 7, No. 5; 2015

Chernikova, I. (2015).Evolutionary Approach to Understanding Language and Thinking. The XXVI Annual International Academic Conference, Language and Culture. Procedia-Social and Behavioral Sciences, 200(2015)101-106, doi:10.1016/j.sbspro.2015.08.025

Couper, A. (2000) Implications of maritime globalization for the crews of merchant ships. Journal for Maritime Research, 2:1, 1-8, doi: 10.1080/21533369.2000.9668303

Frank, M. (2012) Engineering Systems Thinking: Cognitive Competencies of Successful Systems Engineers. New Challenges in Systems Engineering and Architecting.Conference on Systems Engineering Research (CSER) 2012

Gardner, H. (2003). Three distinct meanings of intelligence. In R. Sternberg, J. Lautrey and T. Lubert (Ends.) Models of intelligence: International perspectives. Washington D.C.: American Psychological Association

Han Z., Cadierno, T. (2010) Linguistic Relativity in SLA: Thinking for Speaking. In Clevedon (Eds.): Multilingual Matters.Columbia University Working Papers in TESOL & Applied Linguistics, Vol. 11, No. 1, pp. 72-76

Rayan, A., Shetty, R. (2008).Developing Engineering Students' Communication Skills by Reducing their Communication Apprehension. English for Specific Purposes World (www.esp-world.info), Issue 4 (20), Volume 7, 2008

Royal Academy of Engineering (2012) Achieving Excellence in engineering education: the ingredients of successful change. London: Royal Academy of Engineering.

Royal Academy of Engineering (2014) Thinking like an engineer. Implication for the education system. London: Royal Academy of Engineering.

Shamshina, I. (2014). Professional competences necessary for the bachelor-degree-holding engineer specialising in engineering industries. Pacific Science Review, 16 (2014) 85e88. Retrieved from http://dx.doi.org/10.1016/j.pscr.2014.08.018

Singh, D., G. Kaur, G.(2019) Professional Communication Skills in English for Non-native English Speaking Engineers: Challenges and a Proposed Teaching Framework. International Journal of Recent Technology and Engineering (IJRTE), Volume-8 Issue-2S10

Slobin, D. I. (1987). Thinking for speaking. Proceedings of the Thirteenth Annual Meeting of the Berkeley Linguistic Society, 435-444.

Slobin, D. I. (2006). What makes manner of motion salient? Explorations in linguistic typology, discourse, and cognition. In M. Hickmann & S. Robert (Eds.), Space in languages: Linguistic systems and cognitive categories (pp. 59-81). Amsterdam: John Benjamins.

Sternberg, Robert J. (2012). The triarchic theory of successful intelligence. In D. P. Flanagan, & P.L. Harrison (Eds). Contemporary intellectual assessment: Theories, tests, and issues (3rd ed.). New York, NY: Guilford Press.

Sternberg, Robert J. (2014). I study what I stink at: Lessons learned from a career in psychology. Annual Review of Psychology, 65, 2014, 1–16. DOI: 10.1146/annurev-psych-052913-074851

[19]Sternberg, Robert J. (2014). Teaching about the nature of intelligence. Intelligence, 42, 176–179. DOI: 10.1016/j.intell.2013.08.010

Teriokhina, O. (2017). Formuvannia tehnichnoho myslennia maybutnih bakalavriv mashynobuduvannia u protsesi fahovoi pidgotovky [Formation of technical thinking of future bachelors of machine building in the process of professional training]. Zaporizhzhia, Ukraine: "ZNTU".

Tyron, O.(2018) Gipoteza isnuvannia mizhmovy iak psyholingvistychnoii pidsystemy [The hypothesis of the existence of interlanguage as a psycholinguistic subsystem]. Psycholinguistics in the Modern World - 2018: Abstracts of the 13th International scientific-practical conference. Pereyaslav-Khmelnytskyi, October,2018), pp.33–36.

Tyron, O. (2017).Psyhologichni teorii, scho poiasniuut pryrodu vynyknennia pomylok v inshomovnomu movlenni [Psychological theories which explain the appearance of errors in a foreign language speaking]. Psycholinguistics, Pereyaslav-Khmelnytskyi, Ukraine. 22(1)2017. DOI:10.5281/zenodo.1088328

Wong, L., Nunan, D.(2011)The learning styles and strategies of effective language learners. An International Journal of Educational *Technology and Applied Linguistics,* v39 n2 p144-163 Jun 2011.