

METACOGNITIVE STRATEGIES FOR IMPROVING STUDENTS' READING SKILLS

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ABSTRACT

This paper describes the critical situation that upper-level students present in relation to reading comprehension skills of academic texts in the English language. The aim was to identify the effects of the application of metacognitive strategies in reading comprehension as a teaching model proposal. After the completion of the treatment, a post-test was applied to the control and the experimental groups, and the results showed a significant positive difference from the results obtained in the pre-test by the experimental group. The statistical tests showed that the metacognitive strategies improved significantly the reading skills in the students who applied them compared to those who did not; therefore, the research hypothesis was accepted.

Keywords: metacognition, reading comprehension, strategy.

ESTRATEGIAS METACOGNITIVAS PARA MEJORAR LAS HABILIDADES DE LECTURA DE LOS ESTUDIANTES

RESUMEN

Este documento describe la situación crítica que los estudiantes de nivel superior presentan en relación con las habilidades de comprensión de lectura de textos académicos en el idioma inglés. El objetivo fue identificar los efectos de la aplicación de estrategias metacognitivas en la comprensión de lectura como una propuesta de modelo de enseñanza. Después de completar este tratamiento, se aplicó una prueba posterior al grupo de control y al grupo experimental, y los resultados mostraron una diferencia positiva significativa con respecto a los resultados

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obtenidos en la prueba previa del grupo experimental. Los análisis estadísticos mostraron que la aplicación de las estrategias metacognitivas mejoró significativamente las habilidades de lectura de los estudiantes en comparación con los que no las aplicaron, por lo tanto, se aceptó la hipótesis de la investigación.

Palabras clave: metacognición, comprensión de lectura, estrategia.

INTRODUCTION

Nowadays, for education in all levels it is essential that the new generations learn to develop cognitive and metacognitive skills and strategies to achieve levels of autonomous learning.

The legal principles stipulated in the 3rd Article of the Mexican Constitution, the educational transformation encouraged by the 2013-2018 Plan Nacional de Desarrollo and the objectives outlined in the 2007-2012 Prosedu: Programa Sectorial de Educación have established the leading basis to provide direction and sense to the actions in public education policies. Within this framework and based on the attributions granted by the Ley General de Educación, the Secretaría de Educación Pública proposed one of Prosedu's fundamental objectives to be achieved by 2012 in order to raise the quality of education, so that students contribute to the national development. Among the most important evaluation tools to measure the results of those national projects are studies on reading comprehension, which refer to the understanding of texts read by a person, allowing to reflect, inquire, analyze, relate, and interpret what was read with previous knowledge (Monroy 2009, 37).

Regarding reading comprehension as a learning skill, México has participated in evaluation projects with other countries, such as the Program for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development (OECD). This evaluation has shown unsatisfactory results so far, mainly in mathematical and reading skills. According to PISA, Mexico positioned itself in level two with 422 points, out of 625 of level five (PISA 2017). This position means that students have the minimum to perform in contemporary society. While level five refers to students who can handle information that is difficult to find in texts with which they are unfamiliar, display a detailed understanding of these texts, and are able to infer what information is relevant to respond to the item, in addition to critically assess and establish hypotheses.

The results obtained in this and subsequent evaluations have made it essential to develop in young Mexicans the ability to understand and interpret information, both in the mother tongue and in other languages, especially in the English language. Baier (2005, 23) establishes that reading is an essential skill in students of English as a foreign language, because being good readers can better develop their academic areas. In addition, and according to van Weijen (2012, 14), much of the world's scientific and technological information is found in articles written in English.

Chávez, M., Saltos, M., and Saltos, C. (2017, 3) emphasize that the importance of English language as a way of general communication across nations is completely evident nowadays. Therefore, with the developments in scientific, technical, and economic activities worldwide, its importance is growing more and more palpable as an international language to spread these advances in var-

ious areas. Johns and Dudley-Evans (1991, 278) made public that the demand for English for Specific Purposes (ESP) [e.g., English for science and technology, English for business, vocational English as a Second Language (ESL)] continues to expand over the world with the entry of TESOL (Teaching English to Speakers of Other Languages) into its second quarter century. The only and most important skill required to access professional information in various subject fields is reading comprehension (Richards 1976, 209). Especially for students in academic settings, to make use of materials in different areas of science and technology, reading ability has been found to be the most required skill. Parallel to this, Beasley (1990, 134) maintained that acquiring the ability to read academic texts is of great importance for university students of ESL and as a foreign language as well. This awareness has been pointed-out by such scholars as Johns and Dudley-Evans (1991, 175), Jordan (1997, 213), and Hudson (1991, 167). Johns and Dudley-Evans (1991, 305) stated “In ESP the practice of a single skill is usually reading because of its primary importance in many EFL (English as a Foreign Language) environments.” More often, ESP students’ success in their specific subject of study is bound to their ability to read sufficiently in English. Moreover, in the past decade there has been a continuous interest in promoting reading as a significant and viable means of language development for second and foreign language learners (Taguchi, Takayasu-Maass, & Gorsuch 2004, 156).

Regarding the great importance of acquiring the reading ability by students, steps have been taken to identify the problematic factors underlying the reading process. Although it is important to identify the reading problems of learners before designing suitable methods for teaching, in order to help them address their reading comprehension problems, this article intends to prove that providing the students at the Universidad Tecnológica Metropolitana (UTM) with instruction that teaches them the comprehension strategies they need, helps them develop the necessary metacognitive awareness of how and when to use these strategies.

The UTM is a higher education institution with social recognition. Its educational model, recognized for its quality, focused on the student and their learning, is the axis of its certified academic programs, with a high level of relevance to its environment, meeting the demands of the productive, private and public sectors. Students at the end of their academic career are required to apply critical thinking skills in their language classes, their academic classes, and in their future employments.

The national English curriculum for the Subsistema de Universidades Tecnológicas designed by the Comité Técnico de Idiomas in Mexico is based upon the Common European Framework of Reference for Languages (CEFR), and has been approved by the Coordinación General de Universidades Tecnológicas y Politécnicas (CGUTyp). This program is the basis of the main objective for this research.

In English reading comprehension classes at the UTM, most of the students seem to be lost when reading in large classroom groups (there are 28 students average in current classes). Due to this, one of the aims is to provide students with an opportunity for controlled reading in order to achieve understanding competence.

At this point, it is important to define key concepts. Reading comprehension is an intentional, active, interactive process that occurs before, during, and after a person reads a particular piece of writing (Adams 1994, 98).

Reading skills are the abilities acquired through reading, such as comprehension, fluency, and independence. Overall, these skills give students the ability to turn words on a page into a clear meaning (Fowler 2002, 42).

According to Flavell (1979, 21-29), metacognition consists of both knowledge and experiences or regulation. Metacognitive knowledge refers to acquired cognitive processes, which can be used to control these processes. Metacognitive Strategies refers to methods used to help students understand the way they learn; in other words, it means processes designed for students to 'think' about their 'thinking' (Henao-Álvarez 2001, 45-67).

Cognitive Strategy Instruction (csi), is an instructional approach which emphasizes the development of thinking skills and processes as a means to enhance learning. The objective of csi is to enable all students to become more strategic, self-reliant, flexible, and productive in the learning endeavors (Scheid 1993, 114). csi is based on the assumption that there are identifiable cognitive strategies to be utilized by only the best and the brightest students, and which can be taught to most students (Halpern 1996, 297). The use of these strategies has been associated with successful learning (Borkowski, Carr, and Pressley 1987, 25; Garner 1990, 40).

Previous studies developed by Phakiti (2006)², Zhang (2013)³, García (2009)⁴, and Baier (2005)⁵, among others, look for the means to make it possible for students to acquire the strategies and linguistic structure that are necessary to help themselves increase their reading comprehension skills in English language. The statistical data presented in those studies revealed the need to carry out an intervention that promoted a better student performance during the learning process of reading comprehension.

By performing an intervention here, this research offers a variety of benefits at different levels:

² In his research, Phakiti developed an empirical study in a government university in Thailand that examined the nature of cognitive and metacognitive strategies.

³ Metacognitive strategies were investigated within their use by superior level students of English in academic readings at Guizhou University in China.

⁴ This research includes a proposal for increasing reading comprehension skills in students at UNAM-FES Acatlán, Mexico.

⁵ The study presents the hypothesis that students who have good reading skills perform better in reading comprehension tests in the University of Wisconsin-Stout in USA.

For the institution: graduate students, who are able to apply critical reading in all different areas of study, are examples of the academic success at the UTM and of the students' intellectual growth. Therefore, the university could achieve the institutional goals of quality accreditation it has been awarded in 2014 and 2015.

For teachers: Due to the pedagogical implications of this study, teachers at the university could take advantage of how and when to apply metacognitive strategies in order to deploy an effective reading comprehension and, therefore, improve this skill among students.

For students: When they apply the metacognitive skills to reading comprehension, the students could connect their background knowledge in order to help themselves learn more effectively in the classrooms and to reach the vocational and personal goals that are appropriate to their particular spectrum of intelligence, and therefore, become more inclined to serve the society in a constructive way.

Based on these previous considerations, the problem to be addressed in this study was established: How does the implementation of metacognitive strategies help university students develop reading comprehension skills? And lead to the establishment of the research hypothesis: The implementation of metacognitive strategies helps university students develop reading comprehension skills in seventh quarter Administration Engineering students at the Universidad Tecnológica Metropolitana during the months of September-October 2018, compared to those who do not apply metacognitive strategies.

MATERIALS AND METHODS

The study design was quasi-experimental with one experimental group (EG) and one control group (CG), with pre-test and post-test. The independent variable (metacognitive strategies) was deliberately manipulated to observe its effects on the dependent variable (reading skills) within a controlled class situation (Hernández, Fernández, & Baptista 2010, 257, 286).

Method: The method in this study refers to quantitative paradigm research because it uses data collection and analysis to answer research questions and test hypotheses; it is common to measure numerical, count, and use statistics to accurately establish patterns of behavior of a population (Hernández *et al.* 2010, 46).

Type of Study: In this quantitative research, the type of study is correlational, since it measures the level of association that could exist between the variables and gives a response to the problem statement (Hernández *et al.* 2010, 156).

Population: For this research, a total population of 60 students in group 7A and 7B, ages between twenty-one and twenty-five, was selected in the seventh-quarter of Administration Engineering at the UTM in Merida, Yucatan, Mexico.

Table 1. Population

Groups	Men	Women	Total of students
7º A	13	18	31
7º B	11	18	29
Total	24	36	60

Source: School Control from UTM (2018)

In this research, there is not a sampling, because it is a correlational study with two intact groups formed previously.

Variables: The variables in this study were as follows:

Independent Variable: metacognitive strategies.

Dependent Variable: students' reading skills.

Indicators of Variable: The independent variable, metacognitive strategies, was measured by applying a treatment in class using the current student's textbook. The unit for measuring this variable was nominal, with negative and positive values using the following indicators: a) Remember; b) Understand; c) Apply; d) Analysis; e) Evaluation; f) Create.

The dependent variable students' reading comprehension skills were measured using expository texts through the indicators: a) Recognition of Information, which dimension is the ability to recognize explicit elements in the text and characters, relationships, ideas, vocabulary, etc.; b) Lexicon Domain, which is when the students show certain knowledge of basic functions of words that make up the text; c) Structural Management, related to the ability to properly use the parts or elements that make up the text, organization and plot their interrelationships; d) Inferential Capacity, when the students show the ability to transcend by discovering explicit text information, hypothesizing, and elaborating conjectures; and e) Critical Capacity which is the ability of judging, evaluating, comparing and reacting to the content of the text in the light of their experiences. The unit for measuring this variable is numerical, with values of zero and one.

Research Instruments: The readings for the pre-test and post-test instruments to measure the students' reading comprehension skills were taken from ReadTheory.org (Copyright LLC Read Theory, 2012) and consisted of two documents with thirty questions included in three expository texts for each one of the instruments, aimed at investigating the levels of reading comprehension expressed by the students of higher education (table 2).

Table 2. Total of items and indicators measured

Variable	Indicator of Variable	Sub-Indicator of Variable	Pre-Test 30 Items	Post-Test 30 Items
Reading Comprehension Skills	Recognition of Information	Identify the meaning of the words	5	5
	Lexicon Domain	Relate the meaning to the context	5	5
	Structural Management	Establish the meaning of the paragraph	7	7
	Inferential Capacity	Choose the general meaning	8	8
	Critical Capacity	Establish an opinion about the text	5	5

In the pre-test instrument, the first expository text entitled “Robots” contained 293 words. The second reading was a 364-word text entitled “Materials.” The third reading was a 492-word text entitled “The Incredible Machine.” At the end of each reading, there was a test with ten items in multiple-choice questions. The character of response was correct or incorrect, so a rating was set where a point was assigned to each success. The score ranged from 0 points minimum to 10 points maximum for each reading.

In the post-test instrument, the first expository text entitled “Muffins” contained 319 words. The second reading was a 360-word text entitled “Puppies.” The third reading was a 351-word text entitled “Ice cream.” At the end of each reading, there was a test with ten items in multiple-choice questions. The response was correct or incorrect, so a rating was set where a point was assigned to each success. The score ranged from 0 points minimum to 10 points maximum for each reading.

It is important to mention that the questions at the end of the readings were also taken from ReadTheory.org. The number of questions varied, so in order to complete the number of questions required for each reading and their corresponding indicators, the missing questions were added without altering the first ones.

Time: All the study was carried out in the months of September-October 2018.

Validity and Reliability of the Research Instruments: Hernández, *et al.* (2010, 459) stated that the validity of the instrument refers to the degree in which an instrument really measures the variable that it is intended to measure.

For the process of validation, the instrument was given to an expert from Escuela Normal Superior de Mérida, and it was presented along with the pro-

tocol for the validation of content, the codebooks, and the letter of validation of the instrument. The criteria for validation included the variable to be measured, the indicators and sub-indicators for the variable, the number of items for indicator, and the category for each item. The expert established a comparison between the results of the instrument with other external and similar variables, approved the validation of content, and signed the letter. This validation points out how the instrument measures the specific content domain, considering that the instrument needs to represent all, or most, of the indicators of the variables that were measured.

The reliability of the instrument, in the degree in which it produces coherent and consistent results (Hernández, *et al.* 2010, 405) was obtained by a pilot pre-test and post-test applied to a group with similar characteristics to the control and experimental groups. The tests were given to the students within two weeks between the pre-test and the post-test. The results were collected and analysed through the Kuder-Richardson coefficient (KR-20 and the KR-21) for objective tests. Both tests were graded and the marks analysed, giving a result of 0.80 for the pre-test and 0.85 for the post-test. These results showed a level of strong reliability (0.76-0.89) (Hernández, *et al.* 2010, 434), which meant that the instrument was appropriate for measuring the variable.

Procedure for the Data Collection: Once the Languages Coordinator at the UTM gave the authorization, group 7A with 31 students and group 7B with 29 were selected to be part of the study. The first activity with both groups was the induction, an introductory session with both groups to explain their participation in the research activities. After that, the day and time were set to apply the pre-test to both groups. The collected data was analyzed using the KR-20 coefficient. Simple tables, matrixes, and graphs were elaborated for further analysis and interpretation. Based on the results of the pre-test, the group 7A obtained the highest average of correct answers and became the Control Group (cg). The lowest average was achieved by group 7B and they were to be the Experimental Group (eg).

Treatment Procedure: During this stage, the explanation of the strategies was carried out at three moments: before, during and after the applied exercises.

The application of the strategy consisted in the activities⁶ that were carried out during this stage of the methodological process. The readings the students worked on were in their textbook as a part of the course planning, and both the experimental and control groups had the same class readings. The treatment was applied only to the experimental group. The action plan continued with the application, twice a week, of the treatment from September 17th to October 10th, 2018, where students continued working with different readings in order to accomplish the treatment developed for a total of sixteen sessions. The objective

⁶ The activities held in the classroom were: identify vocabulary, recognize sentence patterns, relate meaning of words to context, establish the meaning of paragraphs, identify the general meaning, and establish an opinion about the text.

of the action plan in this treatment stage was to know the effectiveness of the application for students of the strategies related to reading comprehension given during the previous stage. The aim was to teach the students to acquire knowledge in a meaningful way, trying to articulate knowledge with the performance of actions and to facilitate the flexibility of thinking in solving problems or questions when reading.

Specifically, the strategies of previous knowledge browse and examination, reading objectives, approximation, and interpretation are expected to allow students to use their knowledge as a base to promote new learning. It was also expected from them to develop adequate predictions in the texts, to find meaning and value function for the learning involved, and even to know the purpose and scope of the readings.

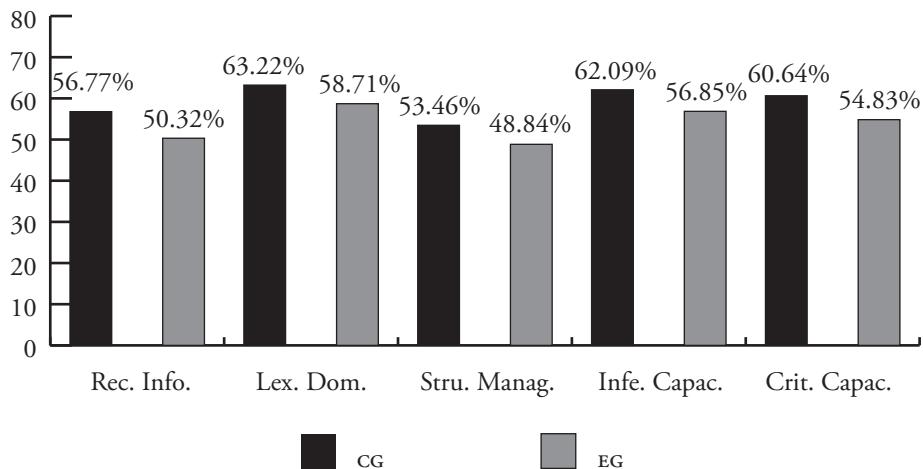
Once the application of the treatment was completed, the evaluation stage was considered for application in order to see if the students of the experimental group showed progress, in addition to consolidating the importance of the strategies in the development of reading comprehension.

On October 15th, 2018 the post-test was applied to both the experimental group and the control group. On October 17th, the analyzing of the results of the post-test began. It was necessary to grade the tests, to revise the results looking for any mistakes, and to detect the level of competency per item and indicator. It was also necessary to input data to analyze and examine the results per student, item, and indicator, in order to determine the competency levels after the treatment, to key in data in the Excel Database Statdisk Program, to review each test and avoid any mistake in uploading of the results, to find out the Student's *t* value using the Statistical Package for the Social Sciences (SPSS) version 22, and to write the final report.

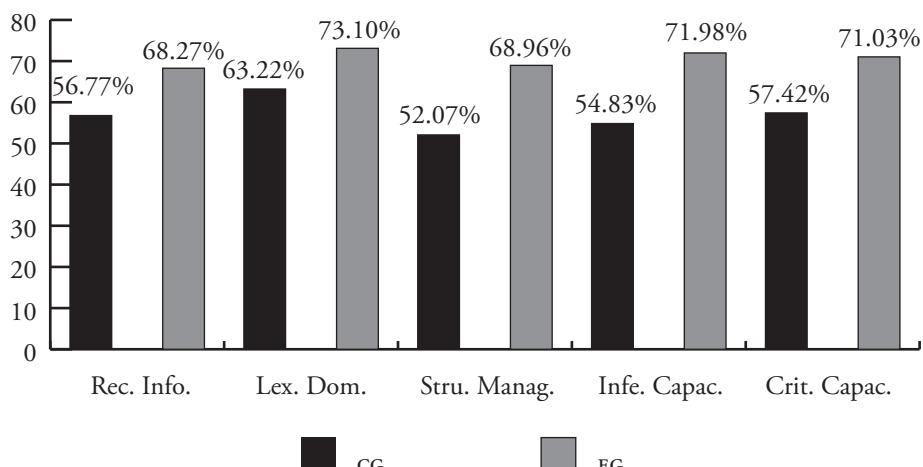
RESULTS

The results of the statistical analysis regarding the application of the pre-test and the post-test to the two groups were presented with the purpose of determining if the implementation of the metacognitive strategies improved the reading skills in the students.

As it is shown in figure 1, in the comparison of results, the control group achieved the highest average of correct answers (63.22 %) in the indicator Lexicon Domain. Also they showed their lowest average in the indicator Structural Management (53.46 %). All the results obtained by the experimental group by indicator were less in percentage compared with the control group. At this stage, the students of the control group were more able to identify the meaning of words, to relate the meaning of the words to the context, to establish the meaning of paragraphs, to choose the general meaning, and to establish an opinion about a text than the students of the experimental group.

Figure 1. Comparative results of the pre-test by indicators

The comparative results of both groups in the post-test are shown in figure 2. The experimental group in the indicator Lexical Domain achieved the highest average. In all the other indicators, the experimental group also reached higher averages than the control group, which, in this case, obtained the lowest percentage of all in the Structural Management indicator.

Figure 2. Comparative results of the post-test by indicators

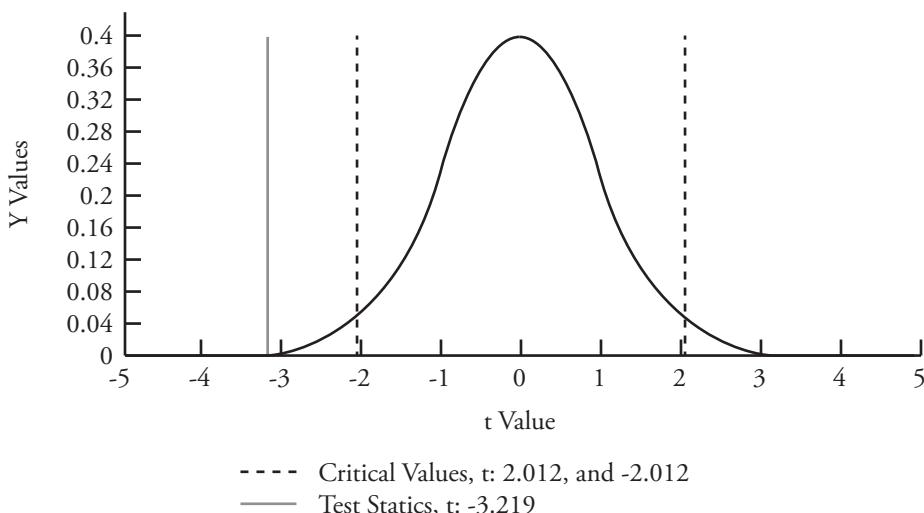
Student's t Test: This method was used to evaluate if these groups differ significantly from their mean in a variable. It is a cross-sectional study, since the dependent variable generates two groups. To determine the acceptance or rejection of the research hypothesis, the Student's t test was applied using the statistical program SPSS version 22. In this research, it showed a value of -3.2193 and the Critical t showed values of ± 2.012153 . Also, the calculated P-Value was 0.0023 which was lower than 0.05. When this occurs, the Null Hypothesis is rejected, and the Research Hypothesis is accepted (table 3).

Table 3. Students' t-Test results

Not eq. vars: No Pool (and df calculated with Formula 9-1)
Alternative Hypothesis: μ_1 not equal μ_2
Test Statistic, t: -3.2193
Critical t: ± 2.012153
P-Value: 0.0023
Degrees of freedom: 46.6365
95% Confidence interval:

The Gauss Bell showed critical values of 2.012 and -2.012, and the absolute value the t-Test equal to 3.219, which indicated that the t obtained was out of the limits of the critical range of the two inflection points located in both sides of the mean (figure 3).

Figure 3. Critical values in Gauss Bell for hypothesis testing



Therefore, it is suggested that the Research Hypothesis is accepted: Compared to those who do not apply metacognitive strategies, the implementation of metacognitive strategies helps to develop reading comprehension skills in seventh quarter Administration Engineering students at the Universidad Tecnológica Metropolitana during the months of September-October 2018.

DISCUSSION

Regarding the critical situation that upper level students presented related to reading comprehension skills of academic texts in English language, key data was found to examine after the completion of this research.

Henao-Álvarez (2001, 50) stated that metacognitive strategies for reading comprehension refers to methods used to help students understand the way they learn as well as to activities held in the classroom with students during the English class. It is essential for education at this level at the Universidad Tecnológica Metropolitana (UTM) that students learn to develop cognitive and metacognitive skills and strategies to achieve levels of autonomous learning. Students at the UTM were trained to acquire metacognitive strategies applying different techniques. Therefore, the abilities developed through reading, such as comprehension, fluency, and independence gave the students the ability to turn words on a page into a clear meaning (Fowler 2002, 12).

In order to enable students at the university to become more strategic, self-reliant, flexible, and productive in their learning process, they were exposed to the instructional approach called Cognitive Strategy Instruction, which emphasizes the development of thinking skills and processes as a means to enhance learning (Scheid 1993, 21).

The activities developed and applied to technical readings were: recalling information, facts, and basic concepts; interpreting information by explaining ideas or concepts; using knowledge gained to solve problems; breaking down concepts or ideas to understand the relationship of the parts to the whole; evaluating concepts against specific criteria; and producing new or original work by putting together original elements from learned information; all of them considered part of the metacognitive strategies for reading comprehension (López and Rodríguez 2003, 159).

Once the period of sixteen sessions concluded, the students from both the control group and the experimental group took the post-test examination in order to see if there was any difference in reading skills performance among them. It is relevant to say that the students were not accustomed to follow a structured way to go through written texts, and even though they were exposed to the strategies, they found them difficult to apply since they were not completely willing to read like that.

CONCLUSIONS

After the period of treatment application, and based on the data obtained from the experimental group, the results show students could benefit greatly from organized, explicit instruction on how to use specific strategies for understanding a text, which means that specific comprehension strategies can be taught and learned, and that their deliberate use by readers improves comprehension (Henao-Álvarez 2001, 102).

At the beginning, word recognition was difficult, and students used too much of their processing capacity to read individual words, which interfered with their ability to comprehend what was read. The strategies of previous knowledge allowed the students to use their knowledge as a base to promote new learning, besides allowing them to develop adequate expectations in the texts, to find meaning and value function to the learning involved, and even to know the purpose and scope of the readings. It is important to remark on the fact that the students felt more and more comfortable each time when applying the strategies to the technical readings and achieving the goals in less time than expected.

In conclusion, all the treatment and the obtained results in this context suggest the rejection of the null hypothesis and the approval of the research hypothesis: The implementation of metacognitive strategies helped university students develop reading comprehension skills in seventh quarter Administration Engineering students at the Universidad Tecnológica Metropolitana (UTM) during the months of September-October 2018, compared to those who did not apply metacognitive strategies.

Recommendations

The results of this investigation, the observations performed during the process, and the influence of the context, lead to the commitment of divulging the results and allowing the following recommendations to:

Students: They should realize that the understanding of written text is not as difficult as they think. Metacognitive strategies could be learned and applied to any kind of text in order to get the meaning and react in consequence. Students should adopt the application of the strategies in reading technical texts in order to better understand them. This ability should be of a great value when they start working.

Teachers: Metacognitive strategies for reading should be an important tool but, unfortunately, they are not applied on a regular basis. The strategies should be taught to students in order for them to feel motivated because of their achievements.

The teaching of metacognitive strategies should be a challenge when it comes to elaborate lesson plans to deploy an effective reading comprehension and

include them in the syllabus. As the link between better academic performance and the use of the metacognitive strategies has been established by this and previous researches, teacher support programs must include training on this topic to ensure better teaching and learning of the English language. Teachers should be self-sufficient and investigate about metacognitive strategies in order to apply them in their favor.

Directors and Coordinators: Technological schools should design schedules exclusively to improve reading skills, especially when it comes to reading and understanding technical manuals. In the same way that there is more time aimed to develop speaking skills, it is important to have quality time devoted to reading skills. At the end of the day, what is expected from students regarding reading comprehension is to be able to understand technical manuals related to their careers.

Regarding special certification tests, such as the International Language Testing System (IELTS), the Test Of English as a Foreign Language (TOEFL), or the Cambridge Test, among many others; the reading part has always been a challenge for presenters. Implementation of metacognitive strategies in reading courses and workshops offered to teachers by institutions of higher education, and their further application in the tests, should help presenters to achieve better results.

Researchers: In this specific context, it has been proved that the application of metacognitive strategies improves students' reading skills. Considering that reading is one of the last and least achieved skills in language acquisition, it is important to pursue more research projects in the field applying different methodologies and strategies. In the Mextesol Yucatan Chapter 2016 Conference held in Mérida, México, the very first thoughts and ideas of this research project were presented, and due to the feedback received by colleagues those comments were included in this paper.

Further research could investigate the following aspects: The factors that play a role in the extent to which specific metacognitive strategies are used by teachers and learners; the reasons why they are used to a greater or lesser extent by both the teachers and the learners; and the influence of the teacher-learner ratio, teaching experience, qualifications, and allocated time of teaching on the use of them. The relation between learner age, home language, and language of instruction, gender, and race on the use of the metacognitive strategies by learners could be further researched.

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