DIDACTIC UNITS FOR TEACHING A FOREIGN LANGUAGE THROUGH MATHEMATICS WITH FOURTH GRADERS AT I.E.D. MANUEL DEL SOCORRO RODRÍGUEZ

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DEDICATION

To my family for their unconditional support, and for being the best example of commitment, loyalty, dedication, perseverance and the best family ever. To all the people that take time to read this project.

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ABSTRACT

This study investigates how the development and implementation of didactic units based on Eclectic Approach contribute within interdisciplinary vocabulary learning process with 4th-grade students in an EFL classroom of a public school in Bogotá, Colombia. The didactic units are aimed to integrate math prior knowledge concerning vocabulary within the English class, in order to foster the students´ participation within the spoken abilities. Data from observation, journals, field notes, and interviews was used to identify the type of strategies used by the Math and English teachers in the classroom. In addition, this project is divided into three parts: the theoretical framework which analyzes the different notions and principles about auxiliary Interdisciplinarity, Language Learning, and Eclectic Approach. The methodological framework in which is explained the instruments and the procedures that were taken into account for the data analysis that is the last step followed by the conclusion and recommendations.

Keywords: auxiliary interdisciplinarity, language learning, English language, mathematics, vocabulary, didactic unit.

INTRODUCTION

English is not simply conceived as a foreign language learning, but as a bridge that connects information from various disciplines or study fields, in which grammar, linguistic, semantic or pragmatics acquire a different value when it eases the interaction between them. For this reason, it is not possible to think about the knowledge as independent subjects, being these ones essential areas. Besides, language supports an integral perspective which is against the educational segregationist trend.

Otherwise, learning a foreign language is indispensable in a globalized world like the current one, and communication is the main reason for it, because with "the development of modern technology, especially the information and communication technology, more and more business transactions, social communication and international issues can be conducted more easily and quickly mainly through languages." (Sun, 2013, p. 36).

Therefore, language researchers have been working on the expansion of new strategies to steer teaching- learning processes aimed at strengthening vocabulary. One of these strategies is to omit the idea of counteracting the importance of academic subjects during the learning of that foreign language. It is for that reason, this project is connected to the idea of working with an interdisciplinary field that involves that necessity for communication.

In the light of the above, there is an existing correlation between the learning of a foreign language and, in this case, mathematics. For that reason, this project was born from the necessity of increasing the participation of foreign language learners in the class

of English. This is presented through the learning of new vocabulary in English by using the prior knowledge of mathematics.

This project is addressed to a population of students between nine and eleven years old from fourth grade of elementary school. It was applied in a public school at Rafael Uribe Uribe district, located in Bogotá, Colombia. This group comprehends fourth graders who speak Spanish and that receive mathematics in their native language, as well as, the majority of content in their classes of English. Moreover, these pupils have never been immersed in interdisciplinary subjects.

These processes are divided into two cycles; the first one is referred to observation and the creation of the didactic units, and the second cycle which incorporated the application of the results, with the objective of implementing didactic units that group both areas and that can be developed in different contexts. It was identified that to establish networks between prior concepts of mathematics, acquisition of new vocabulary and a flexible approach, it is possible to see an impact pedagogically, in which the students can improve their English level and the teachers can be in touch with different areas with collaborative processes.

STATEMENT OF THE PROBLEM

The institution Manuel del Socorro Rodríguez is a public school in Bogotá with an emphasis on mechatronics and statistics. For this reason, it is focused on the enhancing of mathematics in order to reach the vision and the mission that fundament the philosophy of the institution. Therefore, the classes of English are affected by the low frequency with regard to week hours and teachers' methodologies because Mathematics has higher amount of hours per week.

The director of the institution commented the impossibility of extending the classes of English, because the schedules could not be changed. For that reason, it is found the idea of using prior knowledge of successful topics in mathematics in order to strength the foreign language's vocabulary, and with this, the English level of the fourth grade pupils. Based on the passive observations, it was necessary to change the approach due to the lineal teaching presented in both areas (mathematics and English), and by following the results and analysis of the information collected in this first stage, it was discovered that the Eclectic approach accomplished the necessities of the institution.

Based on the performance of diverse methodologies in the educational field and the interest in conducting an integral student learning, it is developed a proposal that involves a cross-curricular learning consisting of collaboration between two areas of knowledge, in this case, by comprehending the use of a foreign language (English) and mathematics, as an improvement action in analytic and communicative capabilities and abilities.

Some research projects addressed mathematics as a tool for teaching English learning students that are learning a second language by acquisition. Krista Hemphill (2010) in her research project from University of Northern Iowa called "*Using mathematics as a gateway to literacy for English language learners"* mentioned the importance of the universal language of mathematics as a way to help children that do not have the opportunity to learn this disciplinary subject because of the limits of the language that the environment, where they are immersed in, represents. Notwithstanding in Colombia the context is different and the students are in language learning conditions, likewise, the majority of public schools in Bogotá do not have auxiliary interdisciplinarity in their curriculum plans.

According to the data collection instruments, this project identified that students in the school Manuel del Socorro Rodríguez do not have enough vocabulary for participating in an active way in the English classes. Furthermore, the emphasis of the school is mechatronics and statistics, and this is not evidenced in classes apart of mathematics, that means, that all the subjects follow a lineal curriculum without options of interdisciplinarity.

Therefore, the following question arises: How does the development of didactic units based on Eclectic Approach contribute within interdisciplinary vocabulary learning process in an EFL classroom?

CHAPTER 1

1. EPISTEMOLOGICAL FRAMEWORK

1.1. Theoretical framework

1.1.1. Interdisciplinarity

Before start with the definition of interdisciplinarity and its role in this research project, it is necessary to define the discipline's concept and its implication in this field. Thus, disciplines are conceived as "thought domains – quasi-stable, partially integrated, semi-autonomous intellectual conveniences – consisting of problems, theories, and methods of investigation" (Aram, 2004, p. 380). Consequently, disciplines involve a continuous change and they are considered semi-autonomous because they fit its principles out through pieces that complete those goals they are following.

On the other hand, Boisot (1972) argues that the principles of disciplinary areas with three main elements. Firstly, the objects which are observable and that are managed by methods and procedures. Secondly, phenomena which are the outcome of the interaction between these objects, and finally, the set of axioms that conforms the laws. Nevertheless, Squires in 1992 presented three dimensions that envelop the core of discipline characteristics. These ones are the problems and topics; follow by the position towards the knowing, the doing and the being concerning the object studied, finishing with the analysis or reflection about the nature of the discipline itself.

In this way, even if it is taken one conception of discipline's principles by a mentioned author or another, both contemplate the necessity of an object that is studied

and which displays a number of questions and answers that, in this case, are not isolated from the idea of being examined, whether the object or the disciplinary area involved in the process. This allows the idea of introducing discipline as an elemental part of understanding interdisiciplinarity, due to that evolving allows new areas to integrate and complement each other.

As it was mentioned before, "the first argues for interdisciplinarity normatively, positioning it either in terms of filling the gaps that disciplinarity leaves vacant or in terms of transcendence surpassing what disciplinarity can ever hope to achieve" and "There are naturally counter arguments for interdisciplinarity. One is that interdisciplinarity is parasitical and cannot exist without disciplines" (Chettiparamb A. 2007, p. 13). That is to say that interdisciplinary was accepted as a complement of the disciplines. Nevertheless, Stember's argument (1991, cited in Payne 1999, p. 176) suggests that there is a moment in which the disciplines are leaving aside in order to create a unitary type.

Hence, this project is rooted in a neutral position among those ideas mentioned above, as is an interdisciplinarity that clusters the concept in teaching and that, at the same time, involves, mixes and creates a dialog among multiple fields, which can be presented in different ways, to different degrees, and different purposes (Sapiro V. 2004).

1.1.1.1. Interdisciplinary in teaching

By following the discipline and interdisciplinarity concepts, it is introduced interdisciplinarity teaching concept since The Subcommittee on Interdisciplinary Teaching at Emory University (quoted by Chettiparamb, 2007) who defined it as "the enrichment of one discipline by the use of the language, methods, or canons of one more

other disciplines". This project takes into account two areas, mathematics and English, considered by the Ministry of Education of Colombia as fundamental subjects of basic education (from first grade of elementary school to ninth grade of high school).

Nikitina (2006) shows three strategies for interdisciplinary teaching, which are contextualizing, conceptualizing and problem-centring. That is why, there were applied a first process of population identification, followed by the main concepts required in the areas and the connection between them, and finally, it is necessary to link the knowledge and ways of thinking, being important for getting an outcome related to daily life situations. This project adopted these three strategies consequently in which the first step was to recognize the context, the main elements of mathematics and English and the identification of the subject in which the project was going to be based on.

Otherwise, Brewer (1999) argues normatively for interdisciplinarity from a problem-focused viewpoint, that in this case is the teaching of vocabulary. The Integration, reflected in the areas of mathematics and English is a reflection of the idea proposed by Brewer, due to in this document exists a synthesis and contextualization of the individuals that are immersed in the project, followed by the validation of disciplinary worldviews that are presented in the school within a conception of individuality, that means, there is no evidence of interdisciplinary areas, likewise, the importance of the methodologies and theories redirected from the theoretical framework of this research project to the application of it.

1.1.1.2. Types of interdisciplinarity

There is a classification of types of interdisciplinarity that is provided by

OECD (1972, pp. 25-26). These types are multidisciplinary, pluridisciplinary, interdisciplinary and transdiciplinary. *Multidisciplinary* is described by this author as the apposition of various disciplines (that sometimes they do not have a connection between them); the adjunction of various disciplines that are more or less correlated is called *pluridisciplinary*; whereas that the interaction (related to the organization of concepts, methodologies, procedures, epistemologies, terminologies, data leading) among various disciplines is closely defined as *interdisciplinary*. Finally, *transdisciplinary* works with the axioms presented in a set of disciplines.

On the other hand, Heckhausen (1972, pp. 87-89) identifies six types of interdisciplinarity. The first type is called *indiscriminate interdisciplinarity* that deals with the introductory fields that are looking the counteracting of disciplinarity. Secondly, the *pseudo-interdisciplinarity* which evolves the same analytical tools; here it is referred to mathematical or computational models. Third, *auxiliary interdisciplinarity* integrates the theoretical level established between the use of one discipline's data and the "index-value" of another discipline. Fourth, in this type of interdisciplinarity different disciplines have as purpose to apply various techniques for solving a problem, it is called *composite interdisciplinarity.* Fifth, *supplementary interdisciplinarity* includes theoretical levels of integration in which the disciplines, being in the same field, develop a partial overlap. Sixth, *unifying interdisciplinarity* is presented when there is a consistency between two disciplines, this including the integration and methods of a subject matter.

In this way, if it is taking into account the classification of the OECD, this project addresses interdisciplinarity since the idea of working with the interaction of mathematics and English. However, if it is correlated this project to the Heckhausen's types of

interdisciplinarity, this one would be placed in auxiliary interdisciplinarity, due to even if both areas (mathematics and English) are joined, English is having the main role and it is requiring mathematics as a gateway for reaching the objective.

It is for that reason, that interdisciplinary is assumed in this research project, inasmuch as the contribution for one subject to another, that in this case, it is the co-working between mathematics and English, having an emphasis in vocabulary acquisition through the use of concepts, methods and principles of both areas.

1.1.2. Language learning

Learning a foreign language involves a wide variety of characteristics that make this process different from just isolated strategies. It encompasses different contexts and cultures in which it can be learnt that distorting the idea of generalizing the way a person learns, not only to speak, but to interpret, argument and propose in another language. That is way, it is imperative to explain the difference between language learning and language acquisition:

1.1.2.1. Distinction between language learning and language acquisition

Language acquisition is a subconscious process. “Language acquirers are not usually aware of the fact that they are acquiring language, but are only aware of the fact that they are using the language for communication”. (Krashen, 1982, p. 10). By comparison, language learning is a process that involves the opposite situation, the learners are mindful of the knowledge of the language that is going to be learnt, it means, the language learners know the rules of the language becoming thus a formal instruction. Furthermore, any learning process is developed in a specific environment merely social. In fact, education plays an essential role in people’s life, because it tries to prepare them

to deal with the society behaviors, performing a holistic package of contents reflected in the learning aspect itself.

In order to do a clarification of the term, it is possible to mention that "according to constructivism, learning is construction, action and awareness of the coordination of actions, where knowledge is built from learners' personal experience, with a previous learning structure or conditions, in addition to exposure to the necessary learning contents" (Shaywitz, 1998. p. 307). This mentioned meaning clusters the relevance of the content in the classroom without leaving aside the experiences and the environment that is evidenced in future useful and significant outcomes. As a response of these features, it is stated the distinction between learning a language in a classroom and outside of it.

1.1.2.2. Language learning in the classroom: differences between CLIL and Auxiliary interdisciplinary:

It is highly important to teach pupils how to learn and the meaning of the theoretical part of each class, as well as, the effects of the intervention of the students' realities; likewise, a clear target is how the students are going to transform that information in worthwhile results, with which they can solve different type of problems. For that reason, it is important to clarify the difference between a CLIL class (Content and learning integrated language) and Auxiliary interdisciplinarity. A CLIL class establishes the use of a foreign language in order to teach a disciplinary area (in this case mathematics), by contrast, auxiliary interdisciplinarity contributes to the use of a disciplinary area as the medium for reaching an objective in a foreign language (English). It is not necessary to teach these two subjects simultaneously. It is possible to use the prior knowledge acquired in one subject in order to teach another.

Additionally, English learning seeks the ability and capacity of communication depending on, as it was mentioned before, the context and the level of each student. Oxford's (1990) divided a useful way to separate direct and indirect strategies that contribute to this process. On one hand, direct strategies include aspects as: the memory, the employing action, the application of visual aids, the cognitive development (analysis), and compensation strategies (overcoming difficulties). On the other hand, indirect strategies are related to affective ones that increase the motivating practices in the class, responses with assessment and the continue incorporation of question. Therefore, it is not necessary to see the teacher as an authority, which intimidating their students to get positive grades, in contrast, the teacher need to have an appropriate management of the lecture that can break the memory paradigm, which just rewards the analytical supervision, and it goes through by transforming and connecting the empiricism and the cognitivist in one single strategy.

1.1.3. Mathematics as a logical thinking

The Law 115 from 1994, in the article 23rd, presents mathematics as an obligatory and fundamental subject in the curriculum of Colombian basic education. However, a lot of people have wondered about the effectiveness in daily life of this subject. It is for that reason that this project wants to create a connection between communication and real situations and this perspective incorporates intercultural and social views, which adopt mathematics as a practical interaction by including "mathematical language" of symbols and the foreign language that the students are going to learn. Likewise, "learning involves building up the knowledge system or architecture which over time and through practice becomes automatically accessible in reception and production" (Scarino A. & Liddicoat

A. 2009, p. 31). Thence, it is an aim to attract the students into the language and mathematics, and not just to perceive them as external participants of the classes.

Mathematics is a human activity that involves the solution of problematic situations. It reaches the way to give responses for internal and external problems (Ernest, 1991). That is the reason of representing this area as one of the sciences of the logical order in human brain. Nevertheless, the thinking competence has been accepted as an integral process in each part of knowledge. Forasmuch as, learning should be thought as a compound core, without dividing them as independent subjects.

Building a solid base both in mathematics and in English language could modify the structure of functional branches of more complex thinking. Following the Basic Standards of Mathematics established by the Ministry of Colombia in 2003, mathematics accepted a coherent model of epistemology that summarized the concept as the accumulated and successively reorganized result of the activity from professional communities, consequence that is configured as a set of information that can be understood (meanings, axioms, and theorems), structured and justified.

In addition, there were incorporated five general processes of mathematics (based on The Curricular Lineaments of Mathematics in Colombia (1998)) which are: to formulate and to solve problems, to model processes and phenomena of the reality, to communicate, to reason and to formulate, to compare and to exercise procedures and algorithms. The items mentioned before describe what means to be mathematically competent. Furthermore, there were including the five types of mathematical thinking that are: The numerical thinking and numerical system, the spatial thinking and geometric systems, the metric thinking and the metric systems, the random thinking and the data

systems, the variation thinking and algebraic and analytical systems. Taking into account these categories, this project focuses its attention on the numerical thinking and the numerical system, likewise, the variation thinking and algebraic-analytical systems.

The numerical thinking and numerical system refer to the comprehension of the use and the meaning of the numbers. The second thinking and it system manages the mental representations of the objects' areas, volumes, masses and the transformations of them, otherwise metric thinking and the metric systems talk about magnitudes and quantities; the random thinking and the data systems deal with probabilistic circumstances, and finally, variation and change in different contexts belong to the variation thinking and algebraic and analytical systems.

1.1.3.1. Mathematical calculations

Mathematics classes are implemented as a connected process, in which "difficulty" increases according to the information that students learn grade by grade. Nevertheless, there are empty spaces that are evidenced in higher levels such as tenth or eleventh grade in the students of the institution. Students need to be immersed in a space in which they can face areas as algebra, physics, calculus or trigonometry; consequently, the four basic mathematical operations (addition, subtraction, multiplication and division) are key elements in the praxis.

Among mathematics there are a wide variety of teaching strategies that emphasizes their practices in social interaction, some of them are similar to English teaching strategies. For example, the conformation of collaborative and cooperative learning those ensure the support between students- teacher and students-partners. One of the most common strategies in mathematics subject is the use of daily problems that the

students can solve using their prior knowledge and their personal experiences with the aim of finding a general answer that can be discussed between the pupils or "visual displays to organize information into things like trees, flowcharts, webs, etc. They help students to consolidate information into meaningful whole and they are used to improve comprehension of stories, organization of writing, and understanding of difficult concepts" (Hall E. 2001-2002).

Following the mathematical thinking, it is established a close relationship between English, as a communicative process that, clearly, is intensely associated with human actions, alike as the proposal of Ministry of Education of Colombia to incorporate mathematics in social contexts with effective results.

1.1.4. Communicative competence

In one hand, the term communicative competence is attributed to Hymes (1972), who defined it as "the knowledge of both rules of grammar and rules of language use appropriate to a given context" (Esther U., Martínez A. & Jaume F, 2008, p. 158). On the other hand, The Ministry of Education of Colombia through the Guide No. 22 (The Basic Standards of Foreign Language: English) defines *competence* as a set of individual characteristics, knowledge and skills that allows a person to do certain actions in a specific context. This concept is essential for this research project due to it is not isolated from the idea of working the comprehension of daily situations they can face if they are in touch with a foreign language.

Otherwise, Michael Byram presents, in his book *Teaching and Assessing Intercultural Communicative Competence*, a list of six competences that includes: *linguistic competence, sociolinguistic competence, discourse competence, strategic*

competence, socio-cultural competence, and *social competence.* These competences occupy a part in this research project, because they contribute to strength the communicative competence itself, the speaking skill with basis in vocabulary and the parameters to follow in the interdisiciplinarity integration been in English and in mathematics.

This author mentions that the *Linguistic competence* refers to the ability to produce and figure out utterances that are considered meaningful by taking into account the rules of the language. *The sociolinguistic competence* deals with the intention which it is used the language forms (this including situational meaning); *the discourse competence* talks about the construction and interpretation of texts. Otherwise, *the strategic competence* concerns the finding out clarification. The *socio-cultural competence* is related to the familiarity with the context. Finally, the *social competence* evolves the interaction, attitude, empathy and the motivation in various social situations. This project covers these competences, especially in the ones that are related to deal daily situations.

In 1995, Celce-Murcia M., Dörnyei Z. and Thurrell S. proposed a scheme of the competences involved into the communicative competence. This process is developed in a progressive evolution by locating the socio-cultural competence as the communicative

competence's core. This is represented in the following chart:

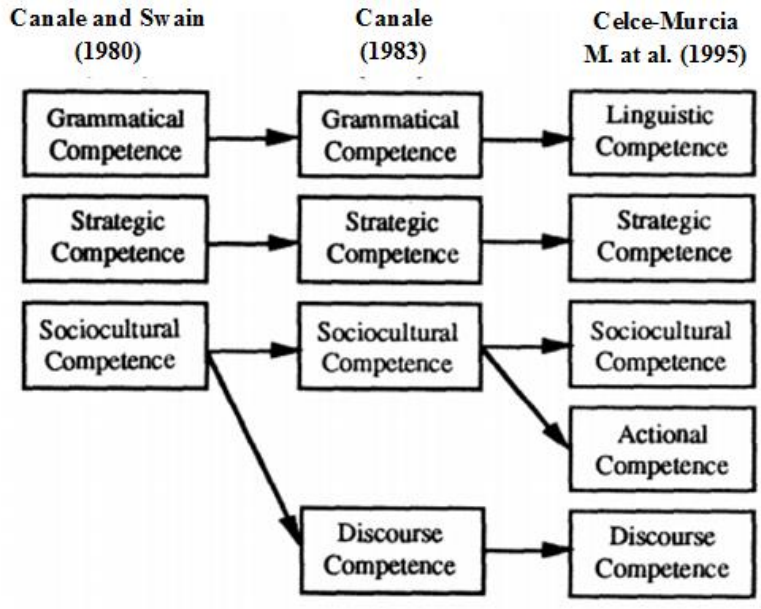


Figure 1. Chronology of communicative competence proposal.

Being the figure 1, an exemplification of the beginning of the communicative competence elements since Canale and Swain (1980), crossing by a variation identified by Canale (1983), in which is included the discourse competence and that is complemented by Celce-Murcia M. at al. (1995). In figure 2 it is possible to determine the proposal of these authors in a scheme too.

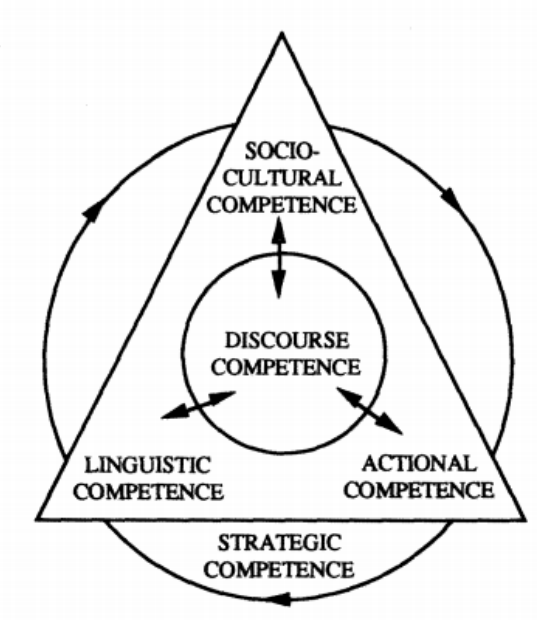


Figure 2. Schematic representation of Communicative Competence.

In Colombia, in the Basic Standards Foreign Language: English these competences are reduced into three: *linguistic competence, sociolinguistic competence* and *pragmatic competence. The socio-linguistic competence* is related to the relationship between the language and the ways of using it. For this reason, it includes the social-cultural conditions that are implicit in the language manage. *The pragmatic competence* deals with the non-textual part of the language; it is a chain of real communicative situations, and *the linguistic competence* takes into account the formal resources of a language.

1.1.5. Speaking skill

Speaking is usually related to the ability of people for expressing themselves throught oral interaction and it is so natural that the majority of time human beings forget to analyze the use of it. Furthermore, "one of the basic problems in foreign-language teaching is to prepare learner to be able to use the language" (Bygate, 1987, p. 3).

Speaking is also defined as "the production of auditory signals designed to produce differential verbal responses in a listener. It is considered as combining sounds in a systematic way, according to language specific principles to form meaningful utterances" (Fattah, 2006 p. 33), but the speaking skill should not be thought just as an assembly of sounds, but as an integrated system that involves certain complementary skills.

On one hand, Thornbury (2005) mentions that the language is a linear production that means that speech is generated utterance by utterance, word by word, sentence by sentence, etc. and, at the same time, it deals with extralinguistic and linguistic knowledge. Extralinguistic knowledge refers to the context in which is used the language and linguistic knowledge deals with the features of the language, this in turn divided into the purpose which conveys the message, the participation of the sender or the receiver and if it is a planned speech or not; with these knowledge distinctions it is possible to identify the accuracy of the speaking skill.

In addition, this author also highlights three categories that influence the spoken production as a non-isolated condition and in which interferes cognitive, affective and performance factors. In this first impact, it is necessary to be familiarized with the topic, the genre and the listener. Secondly, affective features influence the spoken production when they impact the way to face situations in self-consciousness way, and finally, the control in the time and in the discourse.

On the other hand, Hughes (2002) thinks that teaching speaking is not easily separated from other objectives and she shows three different areas that are interrelated as fields into speech and conversation. These levels are: Organization and behavior that

includes psycholinguistics, sociolinguistics, pragmatics, kinesics, discourse and conversational analysis, this one can be associated with the extralinguistic knowledge in the light of the above. Then it is included syntax and grammar, morphology, vocabulary and phonology that are grouped in the structure of the language and the sound separated into phonetics, phonemics and prosody/intonation studies. With this in mind, the side of sociolinguitics is important for building of the speaking competence, as well as, the grammatical structures since the coherence and cohesion of the message, this as a whole and integrated procedure.

These descriptions of the speaking skill allow teachers to ask them which are the appropriate way for grading this ability, if this skill counts with those wide varieties of implications. For that reason, it is proposed the following testing model that it is applied in order to demonstrate the students' performance in determinate domains, according to the standards suggested by the Education Ministry of Colombia.

-Pronunciation marked out of 10 then multiplied by 3
-Vocabulary marked out of 10 then multiplied by 3
-Comprehension, content marked out of 10 then multiplied by 2
-Fluency and style marked out of 10 then multiplied by 1
-Grammar and word order marked out of 10 then multiplied by 1 (Underhill, 1987)

The criteria for grammar and word order takes into account the following rubric (Table 1.):

Table 1. Testing rubric for grammar and word order criteria (Madsen, 1983, p. 168-169).

5 points	4 points	3 points	2 points	1 point	0 points
Uses English with few (if any)	In general uses "good English", but with	Meaning occasionally obscured by grammatical	Grammatical usage and word-order definitely	Errors of grammar and word order make	Speech so full of grammatical

noticeable errors of grammar or word order.	occasional grammatical or word-order errors which do not, however, obscure meaning.	and/or word-order errors.	unsatisfactory; frequently needs to rephrase constructions and/or restricts himself to basic structural patterns.	comprehension quite difficult.	and word-order errors.
Note: The points listed above are multiplied by two.					

This speaking testing rubric uses a differential weighting mark where each category received a specific value in regarding pronunciation and vocabulary proficiency. It manages a *holistic scoring* structure which divides the components in five important criteria (pronunciation, vocabulary, comprehension and content, fluency and style, and finally, grammar and word order) for evaluating the speaking skill.

This test allows multiple changes in terms of appreciation values according to the priority that wants to be given to a specific item or, in contrast, if it is required to measure each criteria in the same way. This technique allows students to speak freely. In this way, it is included the explanation and description technique when the variation is the option of expressing personal opinions and it is possible to apply some guidance in the process.

In addition, this type of grading uses the question and answer technique, which is done between the students, the aim of this part is for the students to recognize the topics by using different types of questions and the variety of vocabulary learnt, even with a minimal standard of self-expression. (Underhill, 1987).

That is why, English language test are not just grammatical features, but also a restructuring according to the environment in a succinct way besides classical attitude to teaching speech that can be taken into account when it is examined the students' environments and conditions as (Hughes, 2002 p. 21)

- The relationship between speech and content.
- The role of training versus the natural acquisition of speech.
- The position of speech in the curriculum.
- The influence of differences between individuals on speaking ability.

The first option complements the pragmatic competence that occupies an important role in this project and the language learning activities that, as it was specified at the beginning of this project, is distinct from language acquisition. Nevertheless, language in this document approves the daily life situations as a way for understanding the language, even if the students do not have contact with the foreign language outside of the classroom. This implies flexibility and adaptation of the evaluation and assessment bestowing a corresponding variation for each situation.

1.1.6. Eclectic approach

It is usual to find legal documents in public institutions of Colombia that mention the Constructivism Approach as focusing part in their praxis, but when the methodologies, strategies or methods are applied in these environments, the reality shows different gaps in their proposals. So it is questionable why this approach or so other are not able to be incorporated to these institutions and why the "Basic Standards of Competences in Foreign Languages: English" cannot be adapted successfully?

Each institution deals with a great variety of students with different needs and contexts. For that reason, it is necessary to identify the circumstances where the strategies are going to be convenient. The aim of this proposal is to avoid the traditional exercises that do not promote the human interaction, trying to change the stereotype of one approach and just one single view.

1.1.6.1. Eclectic approach principles

The eclectic approach was adopted as a functional method that includes some strategies of other methods in order to teach a foreign language. Richards & Rogers (1986) mentioned the importance of the variety of teaching strategies in the classroom, because all the students have different reactions, beliefs and personalities. For this reason, the theory cannot dedicate his attention just in a particular teaching technique, but to the design that comprises the aim to reach of the learners (p.19).

"The eclectic method is mostly used method because every other theory has strength and limitations of its own. Learning of this method benefits from teaching. The eclectic method is a combination of different methods of teaching and learning approaches". (Kumar. P. 2003, p.1). It means that the teacher in charge of the group has the opportunity of choosing between a wide diversity of approaches in order to do an analysis of the ideas that she/he can avoid of them and to find the appropriate approach, which can help the course to improve. An advantage of this method is the flexibility that it presents in front of the continuous changes in contexts and cultures that needs a different method for not just a standard age and the innovation in the classroom with different theoretical basis.

In addition, this author mentioned that “the types of learning activities teachers select are often directly related to their experiences in the real world”. (2003, p.2), that is an aspect that has been underlined repeatedly in this project, because of the importance of real life situations. The join of the benefits of teaching approaches of a foreign language underwrites the four skills of the students, because they are not working with the limitation of the adoption of a whole method by ensuring a meaningful impact in the learning, and even teaching, processes.

Colombia is a multicultural country with clear differences in the educational fields; the politic administrations are independent in each region (even if government talks about decentralization) and the socio-cultural behaviors frame certain spaces, which is why, teaching strategies should not be implemented in a classroom with mandatory statements, but with a process of need analysis of the population and the adaptation of the corresponding approaches than can be enriched each other. Taking into account this situation, "the best argument for adopting an eclectic approach is probably that it has the potential of keeping the language teacher open to alternatives" (Weideman A. 2007, p. 9).

One aspect that can be addressed in this method is that the teachers have the opportunity to work with multiple tools, as well as, a technique that allows the combination of multiple activities. Kumar. P (2003) in his book *The eclectic method-theory and its application to the learning of English* cried about the characteristics of the eclectic method that includes the opportunity of language teaching activities with cognition and linguistic objective, so that, it assumes the view of the Participatory Approach, the Communhicative Apporach and the Situational Approach. All of them promote learning by focusing the starting point on a specific skill. (p.3)

1.1.6.2. Features of eclectic learning

Eclectic learning has features that can be adopted in order to get successful results in the deployment of these conceptions. The first item is that the teacher needs to determine the purposes of each individual method, in this way, the teacher can do a general rapprochement to the students. In a second view, the teacher need to be flexible with both the selection and the application of each method, as well as, to make the method works in an effective way by considering the appropriateness of each method and, finally, to ensure continuity in the chosen methods. These features need to be divided into learner-center at the practice stage, teacher-centred at the input stage and the learner-centred at the production stage. (Gao L. 2001).

"The justifications provided for these many different types of eclecticism provide insight into a number of important strengths and weaknesses of pluralistic approaches to teaching" (Mellow, 2002, p. 1) and the Principled eclecticism has often been proposed in contrast to a single-theory reliance or absolutism, relativism and unconstrained pluralism (cf. Larsen-Freeman, 2000). When this author talks about relativism, she is referring to the dissimilarities between approaches and not the dissimilarities of the contexts, it means that the approaches can complement others for working with multi-strategies, even when in the society teachers find relativity in human being's thoughts.

1.2. CONCEPTUAL FRAMEWORK

1.2.1. Didactic unit

Following the book *Cómo Elaborar Unidades Didácticas en la Educación Infantil* (2003) by Felicidad García, a didactic unit is defined as a topic or a thematic block. It is

the linchpin with all the learning and teaching process which gives unity to the entire annual schedule. For that reason, it should go hand in hand with the purposes of the curriculum.

Barbosa (2006) conceptualized the curriculum as the relationship between the individual, the knowledge and the socio-cultural context. In a didactic unit, these three elements interact in a specific situation, in order to integrate them with the environment. In addition, a well-evaluated performance needs to be focused on the formative goal, even if it includes a summative category. It means the objective and subjective of the criteria and parameters established.

1.2.1.1. Structure of a didactic unit

A didactic unit comes from the idea of achieving a certain goal related to a topic or a task. Then, it is necessary to concretize one or more objectives that can support it, along with a probable division of these ideas to reach. They can be generals and specific ones, in the first kind of objective it is possible to talk widely about the whole stage, whereas the specific ones focus their attention on the context and the cognitive development of the students.

The head of the unit contains the identification information, where the quantity of hours per week of the class and the hours of work oriented and independent are encompassed. In addition, it has the time that the unit will comprise. It oscillates from one week (with two sessions of total work) to four weeks (between eight and ten sessions of total work). In the second instance, the teachers are going to add a justification part,

where they explain the unit precisely, and a formative contents and intentionality (including the title according with the relationship with the problematic axis).

After that, it cannot be forgotten the specification of the strategies. This part of the unit takes into account the competences of the students and the basic and complementary material. The didactic unit must address a recycling session from the previous unit and a test which homogenize the whole unit.

Block (1991) suggested a number of ways that teachers can use in their classes:

- English language teaching materials should be contextualized.
- Materials should stimulate interaction and be generative in terms of language.
- English language skills should encourage learners to develop learning skills and strategies.
- English language teaching materials should allow for a focus on form as well as function.
- English language teaching materials should offer opportunities for integrate language use.
- English language teaching materials should have appropriate instructions; they need to be flexible, authentic and attractive.

A list of resources supports the clearness of what the students are going to do and if it is possible to advance with it.

1.2.1.2. Types of didactic units

According to Sans, quoted by Lineros (2006, p 15), the classification of didactic units is determinate by the language approaches such as the *structural approach*, in which it is organized around linguistics structures and a *notion-functional approach.* In this way, the activities are associated to patterned interactions with form and content. But this didactic unit is going to be based in the structure proposed by Felicidad García (2003), based on modules of concentric learning which highlights a central module with arising subtopics.

The proper organization of the didactic unit is the following (p. 49):

- The identification of the didactic unit.
- The modules mentioned before.
- The initial evaluation.
- The didactic objectives.
- Contents that include concepts, procedures, attitudes, values and norms.
- Cross-curricular topics.
- Material and resources.
- The spatiotemporal organization.
- The development of the unit (in this case by weeks).
- The evaluation of the unit.
- Productions.

Referring to the material of the didactic unit, Tomlinson (1998) proposed some steps divided by the exploration phase or the needs analysis, to look information about the existing material, design the material with the appropriate explanation about each activity; then, it is useful to include a physical production stage (characteristics of that material, for example, the images, icons, size, etc.), to prove that material, and finally, to apply the evaluation.

A didactic unit is the organization of a thematic block. Nevertheless, it is necessary to make a specific diagnostic for each population, level, behavior, etc. For that reason, the didactic unit needs an initial analysis, then, it continues with a chain of steps trying to reach the learning goal projected.

1.2.2. Vocabulary

In order to embark on the role of vocabulary in this research project, it is necessary to answer the question: what does vocabulary mean? Diamond & Gutlohn (2006) advocate that vocabulary is the knowledge of words and their meanings. Besides, the *Multicultural & ESOL Program Services Education* (2007) suggests the vocabulary as the knowledge of "stored information about the meanings and pronunciations of words necessary for communication" (p. 1), while Nation (2001) cries that vocabulary knowledge implies not just knowing a word in the spoken form of it, but that spoken form should be recognized and understood, this taking into account the context rather than guessed at.

Some authors have developed categories of vocabulary, among them is the Wright Group that in their Program Research Base explored the vocabulary teaching and learning given the following distinction of vocabulary:

The term *vocabulary*, broadly defined, includes two categories: receptive and expressive. Receptive vocabulary includes all of the words that a person understands when listening or reading, but may or may not feel comfortable using in speech or writing. Expressive vocabulary includes all the words a person feels comfortable using in his or her own spoken or written communication (p. 1).

On the other hand, Pikulski and Templeton (2004) complements the term of expressive vocabulary and receptive vocabulary graphing them in the following way:

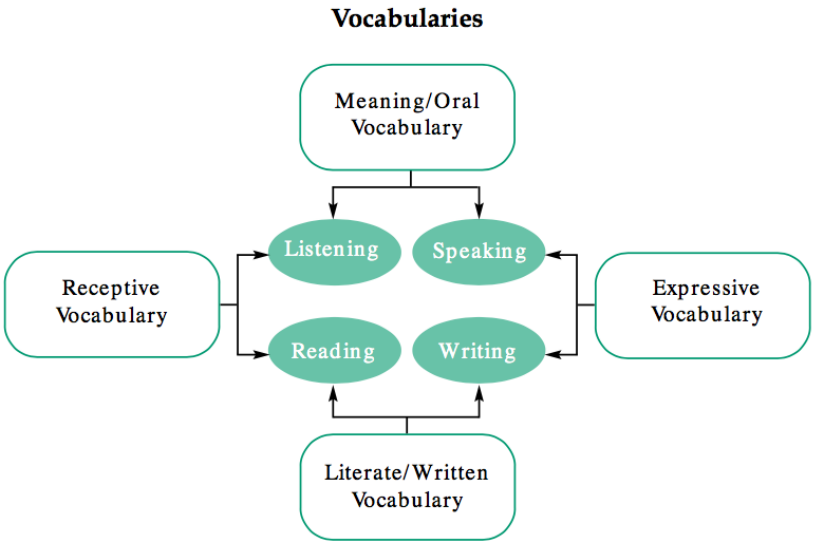


Figure 3. Subdivision of receptive and expressive vocabulary.

It is for this reason that vocabulary requires understanding and recognition throughout the listening, reading, speaking and writing skills which implies an advantage for teaching strategies that can be fragmented depending on the level of the foreign language learners. For example, Prashant Subhash (w.d.) mentions that, nowadays, "methodologists and linguists suggest that teachers can decide and select the words to be taught on the basis of how frequently they are used by speakers of the language" (p. 379).

1.2.2.1. Why is important vocabulary?

Although the organization, behavior, structure and the sound areas are essential parts in speech, Scott Thornbury (2002) in his book *How to teach vocabulary* talks about the importance of getting vocabulary and to know what implies to learn a word. This

author quoted there David Wilkins who says "without grammar very little can be conveyed, without vocabulary nothing can be conveyed" (p. 13). In this part, the mental lexicon places an important role into the communicative competence.

In this document, the new words, the micro-pieces of the language, are conceived as a path for improving English language learning levels and, as it was mentioned before, language requires the connection between a set of utterances, words, phrases, etc. in order to convey a message. Nevertheless, vocabulary is considered as the basis of the speaking pyramid structure.

In this regard, the validity of this vocabulary to be reached is classified as a productive distinction due to it includes speaking more than any other skill which comprises an active character, being a consequence of learning a word through others and without leaving aside the sum of effort required to learn a word or the so-called learning burden.

1.2.2.2. What does imply to know a word?

Knowing a word consist of "being able to recognize the word when It is heard and, at the other end of the receptive-productive scale, being able to produce the spoken form in order to express a meaning" (Nation, 2001 p. 40)., That means, that to know a word is an identification of its definition, likewise as its form.

Richards (1976) lists the essential aspects that a teacher should consider before to teach a word:

1. The possible meanings of the word.

2. Its spoken and written forms.
3. The prefix, suffix, and the root of the word.
4. Its grammatical behavior.
5. Its collocations.
6. Its register.
7. Words that are similar or opposite in meaning.
8. What connotations it has.
9. Its frequency.

The meanings of the words and the spoken knowledge of them are the main base of this research project due to the English level of the students. In addition, the real life experiences that the didactic unit wants to represent in the classroom are a reflection of the frequency of the words. The meanings of the words and the spoken knowledge embraces the explicit learning through the use of different tools divided in two parts, one of them is implicit and proposes repetition, and the other side is explicit, so it talks about clear guidance and feedback.

1.2.2.3. Strategies for teaching vocabulary

Carter & McCarthy (1988) set up that teachers are becoming conscious of the relevance of vocabulary and teachers have paid attention to successful strategies to teach it. For that reason, there has been created different ways of learning and teaching vocabulary in the classroom. These include, among others, the use of images and realia strategies which contribute with the explanation of different topics in real contexts. These strategies face changes according to the level of the students and the environment in which they are applied.

Oxford and Crookall (1990) classified common techniques into four categories:

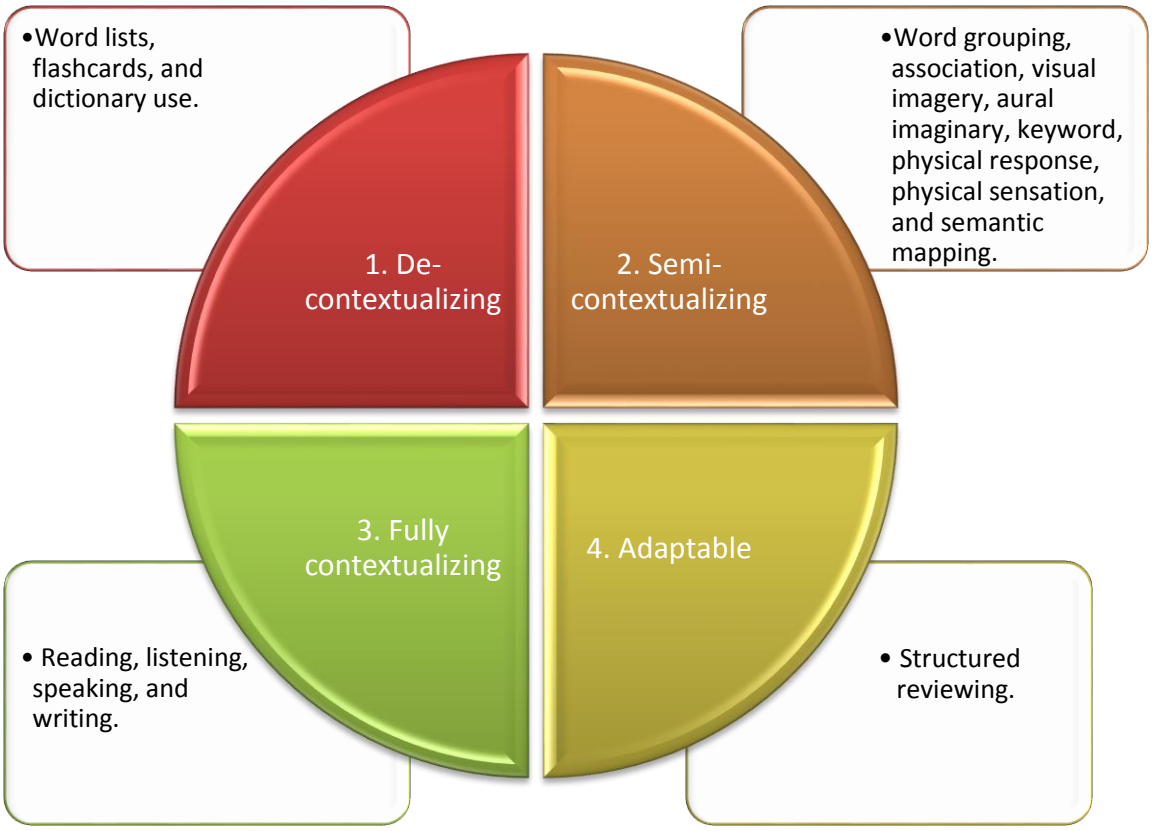


Figure 4. Techniques of vocabulary teaching.

Inasmuch as the enumeration advances increase the level of contextualization of the technique. The didactic unit was designed with the aim of adapt its complexity to the environment of the students. For that reason, it allows the project to incorporate the de-contextualizing and the semi-contextualizing tools appealing in its broad sense for helping the speaking skill development. Likewise, one of the strategies for teaching vocabulary in this research project was to create modules of concentric learning that consist in grouping a set of words of frequent use about topics established in the basic standards of a foreign language of Colombia by taking into account topics of mathematics of fourth grade of elementary school based on the basic standards of this subject. “It is easier to teach words like orange, banana, grapes, lemon, pineapple, mango,

and watermelon together in the context of 'fruits' than to teach anyone of these words in isolation". (Subhash, w.d., page 381).

1.2.2.4. How to measure vocabulary?

Measure vocabulary it is not an easy task, because there is not a specific quantity of words defined for each level, especially if it is taken into account the wide variety of words that a language comprises and even if it is included the learning burden, the receptive and productive distinction and the low or high-frequency words too, the context plays a crucial portrayal in the creation of authentic material for evaluation in the environment of fourth graders in this institution and it can change the models presented for this mission.

For this reason, these tests can be modified according to the necessities of the students, as well as, the level that is going to be evaluated. Norberth Schmitt, Diane Schmitt and C. Clapham (2001) presented a vocabulary levels test that was replaced since the suggestion of Nation (2001). This test contains a list of concepts that need to be matched with its correct characteristic. However, this test is used as a base, but is going to be in a continuous adaptation process till the final test that will measure the effectiveness of the didactic unit application.

Due to the subjective evaluation strategies for vocabulary, the most appropriate rubric for assessing vocabulary development in this institution is the proposed by Antonacci and O'Callaghan in the year 2012, which includes three levels: striving, developing and advanced:

Table 2. Word identification and vocabulary's level taking into account Antonacci and O'Callaghan's theory (2012)[1].

CRITERIA	***LEVEL #3 Advanced (3 Points)***	***LEVEL #2 Developing (2 Points)***	***LEVEL #1 Striving (1 Point)***
Word identification	The student is proficient in saying, reading, or writing the word.	The student has some difficulty saying, reading, or writing the word.	The student has a lot of difficulty saying, reading, or writing the word.
Word meaning	The student knows the comprehensive meaning of the word and can discuss multiple meaning of a word.	The student knows a partial meaning of the word but has difficulty discussing a full meaning of the word.	The student does not know the meaning of the word and cannot discuss about it.
Reading the word	The student offers a rich explanation of the contextual meaning of the word.	The student offers a partial explanation of the contextual meaning of the word.	The student is not able to explain the contextual meaning of the word.
Writing the word	The student uses the word with a high degree of accuracy withing the context of writing.	The student uses the word with some degree of accuracy within the context of writing.	The student does not attempt to use the word within the context of writing.
Word-learning strategies	The student uses a range of word-learning strategies, along with varied resources, to learn new words.	The student uses few word-learning strategies and resources to learn new words.	The student does not use word-learning strategies and resources to learn new words.
Word consciousness	The student demonstrates an awareness and interest in learning and using new words.	The student demonstrates a minimal awareness and interest in learning and using new words.	The student does not demonstrate an awareness and interest in learning and using new words.
Overall level of vocabulary development	**Advanced level 18-13 points**	**Developing level 12-7 points.**	**Striving level 6-0 points.**

[1] Taken and modified from the original version of Antonacci, P., and O'Callaghan, C. (2012). Essential Strategies for Teaching Vocabulary.

Finally, as it was noticed before, oral implications and the process of interaction in spoken production is a result of linguistic and extralinguistic knowledge, but all languages need a basis which in this project that base is the learning of vocabulary as a way for figuring out and constructing its related future areas (implicit and explicit understanding), by taking into account the rubric of assessing vocabulary, the background and the interdisciplinarity.

1.3. Antecedents

Language has been acquiring an important role in mathematics classes, because of the necessity of adapting mathematics curricula to an environment that requires socio-cultural interaction, likewise, English language learning has been related to several subjects and the foreign language has been adopting an important place in interdisciplinary areas. However, in Colombia interdisciplinary subjects (that include English language) focus on the academic content more than the foreign language learning and it is not usual to find a curriculum that addresses these kinds of topic areas in public schools, which implies that this experience is an opportunity to bring students that belong to public institutions a rapprochement to pedagogical perspectives correcting them with traditional subjects.

Taking into account the previous findings process of this document, it is possible to infer that Colombia counts on a wide lack of researches with these implications besides the projects found usually do not involve foreign language learning, they just remark the use of communicative competences in mathematics classrooms.

In University of Northern Iowa (United States) in the year 2010, Krista Hemphill, in her research project called *Using mathematics as a gateway to literacy for English*

language learners, mentioned how it is possible to adopt the language of mathematics (that is universal known) in order to teach language learning students, that were exposed to language acquisition context, but they needed to continue with their core subjects (talking about academic content).

In the aforementioned project, the author stated the absence of visual aids, social interaction and strategies that support the process of getting a competitive English level of proficiency and content learning by incorporating the abilities of mathematical thinking and language learning as comprehension, understanding, construction of meaning, as well as, solving problems, with reading and writing as their axis of study. This can be justified by analyzing the students' position, as it was aforementioned, in the research project, students are going to be in touch with the language inside the classroom, but there are not going to be exposed to language in their daily lives.

This project clearly contributes to this research investigation because it concludes by demonstrating a significant increasing rank of effectiveness in the students that were working with this integration of subjects, even if the environment conditions are different, the focal point embraces by the mathematics language in the teaching of the second language is essential.

Secondly, a research study in the University of South Florida called *Classroom discourse and teacher talk influences on English language learner students' mathematics experiences* (Petkova M. 2009) emphasizes the place that occupies the discourse in mathematics when the students are ELLs. This investigation justifies the code of communication such as the core of language and mathematics instruction. This code can

be divided into the speech and the method, both of them as an action highly collaborative and collective. The methodology utilized in this project was to use of different questioning techniques, to provide feedback and the use of simple terminology. This angle is clearly framed in this research, due to the importance of the receptor and receiver and the meaningful part of interaction in the communication process.

The author of this research recommends to further investigation projects an initial view of patterns of teacher's discourse, the effect of culture, besides teaching strategies which could engage students and teachers in the educative growing. Hence, the contact between oral resources and symbolic or visual interpretations (in this case mathematics tools) supply to the schooling of understanding by the students.

Finally, it is for that reason that this proposal is associated with *Mathematical learning and language use: perspectives from bilingual students in a context of problem solving*, a doctoral thesis developed in Universitat Autónoma de Barcelona by Francesc Reverter Sabaté in the year 2012, which examines a similar situation mentioned above in students of California that were working in mathematics classroom without a close approximation to English language. The document exposed the use of oral ability as a complement for the written one. It is a response of vocabulary that is unknown in English, which is not an issue when they are solving mathematical tasks.

This is why, this investigation wants to facilitate the students understanding of instructions by using mathematics. If the students learn how to interpret appropriately, it does not matter if sometimes they omit a part of the information of the foreign language that they do not know; they are going to reach the expected goal while they learn English.

1.4. OBJECTIVES

1.4.1. General objective

To design didactic units based on students' prior knowledge in Mathematics in order to strength English vocabulary.

1.4.1.1. Specific objectives

* To determine the advantages and disadvantages of using Eclectic approach in an English foreign language classroom through auxiliary interdisciplinary content.

* To identify the basic principles of using interdisciplinary content (mathematics) in an English foreign language classroom.

*To evaluate the pedagogical intervention based on the diagnostic test and in the outcome test.

CHAPTER 2

2. METHODOLOGICAL FRAMEWORK

In this chapter, it is explained the type of research, which influenced the data collection instruments choice, the tools that were applied in a specific time and population, followed by the analysis of the obtained results in each phase. Thus adding the comments about the findings.

2.1. Qualitative paradigm

Hancock B. Ockelford E. and Windridge K. present in his book *An Introduction to Qualitative Research* (2009) how qualitative research can be related to the explanation of

social phenomena. It means that this method seeks to answer questions that are born from the observation of certain behaviors which affect directly or indirectly the direct object.

The authors mention seven different questions that this research method wants to answer. The first three questions are why, how and in what way is developed the inquiry. This project identifies that a specific population which does not have direct contact with a foreign language, but it has the opportunity to get involved with new strategies. This, by taking into account the mathematics as an enhancer of English through the implementation of a didactic unit that carries out an approach that includes different strategies and methodologies from other pedagogical methods. The didactic unit is the core to a large extent that answers the second set of questions which are how much? How many? How often? And to what extend? of the project.

On the other hand, "qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that makes the world visible" (Denzin & Lincoln, 2003, p. 3). That is why, this process requires a continue exploration and descriptions from them.

2.2. Action research

In general terms, action research has been conceived as "a process of systematic inquiry that seeks to improve social issues affecting the lives of everyday people" (Hine, G. 2013, p. 151). Otherwise, Eileen Ferrance arguments that in action research the participants do an examination about their own educational practice in a systematic and careful way by using the different techniques of research.

The Department of Education and Training Professional Learning and Leadership Development Directorate (2010) in the document titled *Action Research in Education* characterizes the action research as integrated, reflective, flexible, active, relevant, cyclical, focused, collaborative, and planned[2].

Each of these characteristics were associated to the objectives that this project wanted to reach. This process is idyllic for this study because its purpose is to interference in the classroom, placing teachers as transformers of their own environment and creating changes in education since their students and managers' real and near experiences. Carr and Kemmis (1986) recognized that the action research has as objective the advancement and understanding of the practice by its practitioners and the improvement of the situation in which the practice is developed and it is important to highlight that "It provides practitioners with new knowledge and understanding about how to improve educational practices or resolve significant problems in classrooms and schools" (Mills, 2011; Stringer, 2008).

2.2.1. Types of action research

Eileen Ferrance in her book *Action Research* (2000) lists four types of action research: individual teacher research, collaborative action research, school-wide action research, and district- wide action research:

[2] Refer to the appendix 21 for detailed information, which was taken and modified by the original document titled *Action Research in Education* (The Department of Education and Training Professional Learning and Leadership Development Directorate, 2010, p. 2).

1. The *individual teacher research* is focused on a single classroom issue, with a mentor that preferably has access to technology and assistance with data organization and analysis, as well as, a potential impact in the curriculum, the instruction and the assessment (this practice is informed by data and the information is not always shared).
2. The *collaborative action research* is based on a single classroom, but it gives the option of several classrooms with common issue: it incorporates substitute teachers that have a significant effect in the curriculum, instruction, in the assessment, and even in the policy. This can improve the collegiality and formation of partnerships.
3. The *school-wide action research* has as focal point the school issue, problem, or area of collective interest, and a leadership or external partners; it pursues the school restructuring and change whether in its policies, parents' involvement or evaluation programs. It is specially a team building that even if it has disagreements on the process, it improves the collegiality, the collaboration and the communication.
4. Finally, the *district-wide action research* spotlights the district issue and the organizational structures, likewise it works with a facilitator that searches the allocation of resources, the professional development of activities and the organizational structures of them. In addition, its side effect is the improvement of communication through the team building of a shared vision.

According to the previous definitions and characteristics, this inquiry is founded in the school-wide action research due to it relies on a specific problem that is not necessary developed by the homeroom teacher, but for a leader that has been studying the population. Besides, this proposal provides a result that can be adapted for restructuring the learning and teaching of the students and teachers involved in the process.

The cycle of this type of research can be explained by the models exposed by Emily Calhoun (1994) and a resent one described by Richard Sagor (2005):

On one hand, the first model consists in an initial phase of selecting an area, which continues with the collection, organization, analysis and interpretation of data, and finally taking action (see Figure 5) by incorporating the mentioned parts. On the other hand, the process is similar, but he divided it in four stages: clarifying vision, articulating theories, implementing action (including collecting data), ending with reflecting and planning (see Figure 6).

The second model defragments the first model, so that, it is created a division in stages and that assumes a role slightly more accurate. It is in this point where it is narrowly connected to this project that is going to be organized following three essential parts: a pre-text, the text part and the post-text[3]. Giving the importance to the text part that starts with the introduction lingers to the review of literature, research method, research context, findings, conclusions and recommendations for further research.

[3] A stipulated format found in the sixth chapter of the book *the art of action research in the classroom* by Christine Macintyre (2000).

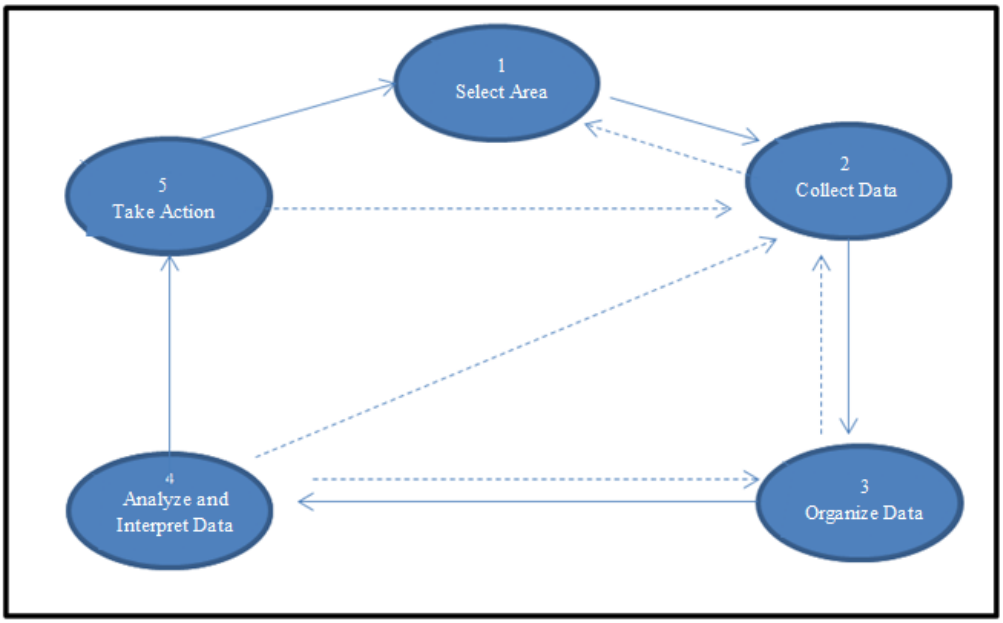


Figure 5. The action research cycle, Calhoun E. (1994). [4]

So as to advance in terms of findings in the second step mentioned in the explanation of the Figure 5 about action research cycle or in the third stage of the diagram of the Figure 6, in which it is necessary to create a data collection plan that includes data gathering instruments as field notes, audio and videotapes recording, structured observation schedules, questionnaires, interviews, as well as journals.

[4] Source: How to Use Action Research in the Self-Renewing School (p. 2) by Emily Calhoun (1994). Alexandría, VA: Association for Supervision and Curriculum Development.

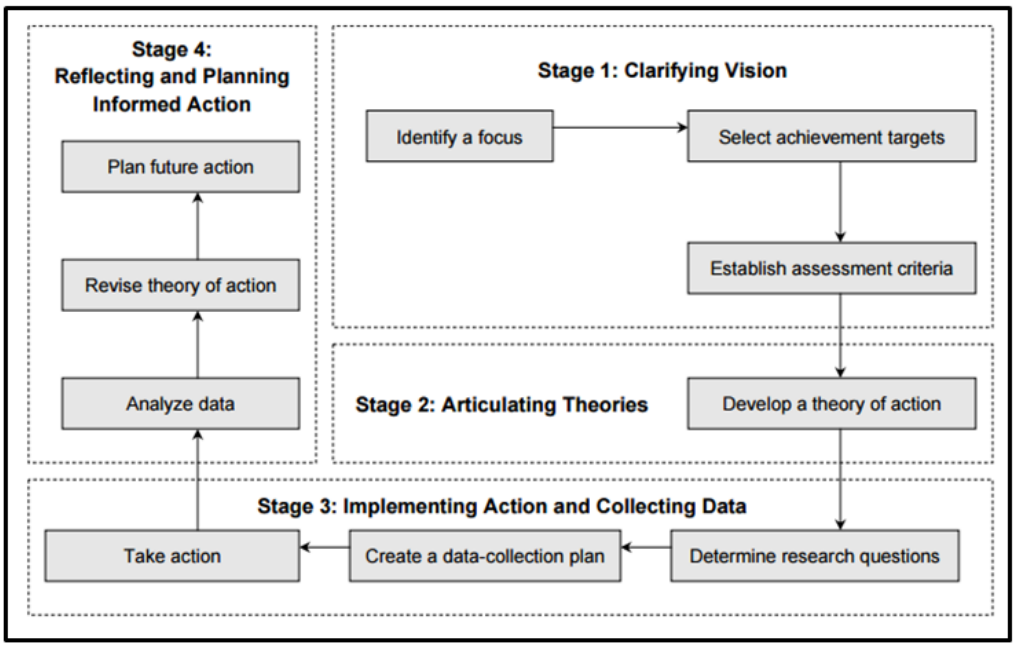


Figure 6. The action research cycle, Sagor R. (2005)[5].

The first stage's target is the identification of what the researcher wants to accomplish. In this part, the inquiry requires to clarify the goals and to enunciate what attributes provide success to each goal. The second stage seeks the answer for what he or she believes is the approach with the greatest potential for achieving the goal. This, taken into account the population and the environment in which is developed the project. The third step in this model is the choice of the data collection instruments in order to understand the efficacy between the action and the theory; and finally, based on this data, how can a person can adjust the result in future actions.

In the book, *Qualitative and Action Research: A Practitioner Handbook* recommends four essential periods for analyzing qualitative data. The first one is to

[5] Source: The Action Research Guidebook: A Four-Step Process for Educators and School Teams by Sagor R. (2005) (p. 7). Thousand Oaks, CA: Corwin Press.

gather all the data in a clear, readable form. Second, to sort the data according to the research question. Then, to create analytic files; and finally, to code the data. Being this a qualitative research project the **"**researcher must use his or her intellect to analyze and interpret the collected information. The intellectual process of qualitative analysis includes critical reading, finding connections between data, forming judgments and determining answers to complex research problems" (Alberta Teacher´s Association, 2000 p. 27).

The outcomes attained were organized with the use of inductive reasoning that involves a systematic and iterative process of searching, categorizing and integrating data by describing the meaning of research findings from the perspective of the research participants. In addition, this type of data collection instruments' analysis in qualitative research involves developing generalizations from a limited number of specific observations or experiences (ACAPS, 2012).

2.2.2. Methods

Action research presents multiply sources for collecting data. These instruments are bound with the qualitative paradigm and, at the same time, they are connected with the requirements of this research project's objectives. Eileen Ferrance (2000) mentions among them the interviews, portfolios, diaries, field notes, audio tapes, photos, questionnaires, focus groups, anecdotal records, checklists, journals, videotapes, case studies, surveys, records – tests, report cards, attendance, self-assessment, samples of student work, performances. This inquiry makes use of observations, interviews, field notes, samples of student's work, journals and questionnaires.

Roberto Hernández, Carlos Fernández and Pilar Baptista (2010), in their book *Metodología de la Investigación,* give the meanings of these instruments in the following way:

Observation. The main purposes of qualitative observation seek the understanding of a social context, the analysis and description of different environments, as well as the activities and the significance that individuals give to them, social relationships among individuals and socio-cultural patterns, problem analysis, and hypothesis establishment.

Interviews. Search to understand the feelings, opinions and prior knowledge of the participants. In this way, the interviewer will be able to evaluate and structure the different parts of the didactic unit, which is going to be applied in the future. Martens (2005), quoted by Hernández et. al, classifies the questions of an interview as: opinion, expression of feelings, knowledge, sensitive, background and simulation questions. In the light of the above, the questions of opinion, expression of feelings, knowledge and sensitiveness are going to be selected.

Field notes. fulfill the role of a determinant instrument of data collection. These records can be taken while observing and mainly at any time. It is also necessary to mention the importance of proper organization and classification of this tool for enhancing the research progress (Organized by date, event, environment, etc.). Chiseri-Strater and Sunstein (1997) have developed a list of what should be included in all field notes:

1. Date, time, and place of observation

2. Specific facts, numbers, details of what happens at the site

3. Sensory impressions: sights, sounds, textures, smells, taste

4. Personal responses to the fact of recording field notes.

5. Specific words, phrases, summaries of conversations, and inside the language.

6. Questions about people or behaviors at the site for future investigation

7. Page numbers to help keep observations in order.

Journals. Journals serve the purpose of field diaries, in which descriptions of the context, maps, diagrams and lists are collected for analyzing all relevant information dealing with the project.

2.3. Context

2.3.1. Institution identification.

The location of the direct object of study is the school called Manuel del Socorro Rodríguez, which is a mixed public institution, located in Rafael Uribe Uribe district, in the capital city of Colombia (Bogotá D.C.). It has three sections: preschool, elementary and secondary school, this last level counts with an agreement with SENA, institution in which the students can study different majors, getting the title of technique professional. (see Appendix 1).

The Institution Educational Project of the school characterizes the context in the following way:

Manuel Del Socorro Rodríguez School is an institution that offers education to children and teenagers, especially in the district of Rafael Uribe Uribe and Tunjuelito. It features with two branches:

Branch A includes the grades concerning to preschool, elementary and secondary school. Branch B clusters solely preschool and elementary grades. Moreover, it has 2.700 students (approximately).

This institution has school transport to Tunjuelito and Ciudad Bolívar neighborhoods. Likewise, it counts with snacks for each student. The school is public, they participate in the program called *40 por 40* (forty by forty), which integrates the students in extracurricular activities such as: swimming or theater. The academic areas are in charge of one homeroom teacher for each group (in elementary school) and one teacher apart of the headroom teacher for specific areas (physical education, English, music and theater). The institution runs in two shifts; the morning shift starts at 6:30 am and ends at 12:15 pm, and the afternoon shift from 12:15 pm to 6:00 pm. That is to say, both schedules receive six academic hours, divided into three blocks.

In terms of physical resources, just some classrooms have television. There is a room with computers, which is used only in the technology class. The classroom is large with dim light. Nevertheless, the students count with a wide recreational space.

2.3.1.1. Population.

The group is integrated by thirty-four students. On the one hand, there are twenty-one male children and thirteen female children. fifteen boys are nine years old, two boys

are ten and another boy is eleven years old. On the other hand, there are twelve girls. Eleven girls are nine years old and one girl is ten years old (see Figure 7).

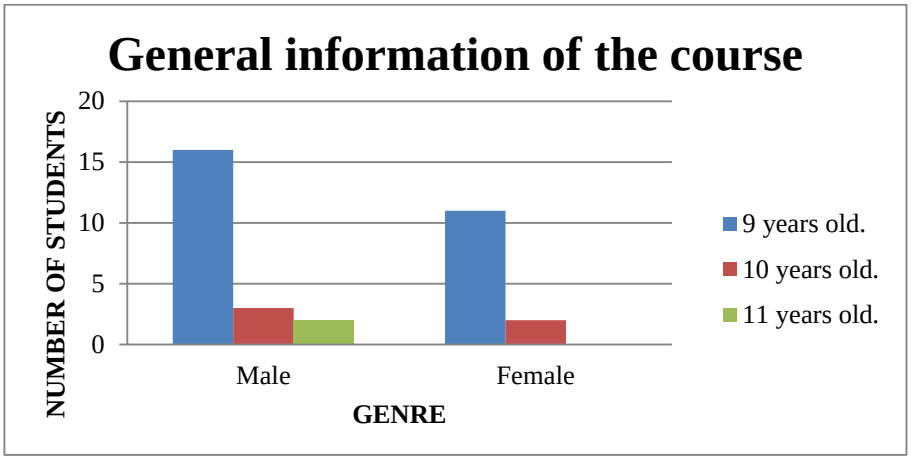


Figure 7. General information of the course.

In the year 2014, the inquiry started with third grade with a passive observation. In the year 2015, this process continued with the same population, but in this case, they began fourth grade. This population was chosen because of the socio-cultural problems that these children face, the English level managed in the classes, and the contribution on the part of the research project for the evolved teachers and students.

The research project was developed (after the passive observation's stage) during the normal schedule of the English classes, two times per week. The homeroom teacher allowed the researcher having the total management of the class after having approved the activities for each session.

This school proposes in its curriculum the insight of the "method of processes" (Lawrence Stenhouse, 1975), which indicates that the structures of knowledge are inherently problematic and debatable. This way, the curriculum assumed a hypothetical

view, which can be changed in everyday school practices, making use of forms of teaching and assessment in accordance with the general characteristics of children.

Manuel Del Socorro Rodríguez School focuses the curriculum on the training of competent people in specific fields of technology and science, and secondly, to form people with axiological criteria and social sensibility. Therefore, the curriculum promotes the competences development and preparing the students for solving problems of this society.

This institution expanded the boundaries of academic knowledge to make an agreement with the *Servicio Nacional de Aprendizaje (SENA)* institution, with the aim of providing opportunities for education during and after the secondary school.

2.3.1.2. Class development.

Everyday school practices make use of forms of teaching and assessment in agreement with the general characteristics of children and young people. The Institution Educational Project organizes the lectures following the statements described below:

Class: when the student faces the new information with their prior knowledge (hierarchy in structures) and observing, in this way, the representation of a social, physical and mathematical environment.

Objectives: To foster learning spaces and conditions that allow the student to adjust new knowledge to the prior one.

Evaluation or assessment: the feedback existing between the prior concepts, the acquired and constructed knowledge. The institution evaluates how the students assimilate and accommodate the new knowledge and how they give a meaning for it.

Methodology: Classes promote methods aimed to discover new knowledge. The resources in this part are going to be clearly interconnected with the relationship between environment and new learning.

The main component of the mission of this school is the integral development of the students, including the education in autonomy by promoting the scientific, technologic, cultural, artistic, sporty and socio-political knowledge in order to transform the reality. Otherwise, the vision describes a student able to develop investigative capacities and habits with the appropriate use of their acquired knowledge. Within philosophical, psychological, epistemological, and sociological foundations which pretends to approach the students with their communication, values, aptitudes, attitudes, abilities and skills.

Since 2009, Manuel Del Socorro Rodríguez School has assumed the learning and teaching course from the cognitivist paradigm. This one supports the learning as a process in which it produces the modification of meanings in an internal and intentional way, starting from, and the interaction of the information that promotes the contexts and the individual activities on it.

In the year 2010, this institution adopted a strategy of "teaching and learning based on comprehension". The Teaching for Comprehension is an approach extracted from Constructivism model that was developed from the "Zero project" of Harvard

University. The I.E.P. of this school particularizes the comprehension as "a flexible performance capability".

The Teaching for Comprehension approach permits "a greater flexibility than the Constructivist approach. This method implies commitment to three ideas: a) For understanding results that fundament each type of mental representation approach; b) the pupil has to construct the mental model personally; and c) once achieved the conception capacities, the students show a wide range of comprehension. For this reason, the pupil that studies electricity and electric circuits could examine a wide variety of phenomena and reach the supporting part in their teachers with the objective to test the electrical flow". (Perkins & Unger, 1999, p. 106).

During the first stage it was necessary to perform an analysis about the mission, vision, foundations, and the curriculum approach of the institution with the objective of doing a comparison among the proposed by the school, the basic standards of education and the goals of this inquiry.

2.4. Instruments and procedures

The phases of this action research study are listed below with explanations of these phases given thoroughly following.

2.4.1. First phase- seeking permission

This study starts with the identification of the place in which the didactic unit was going to be applied. Followed by the authorization of the school by one of the directors, where it was necessary to emphasize the answer of the two headroom teachers. One of

these teachers was the person in charge of the group in the year 2014 and the other one in the year 2015.

The first permission was directly requested to one of the English teachers of the institution. In the entrance permission it was necessary to explain the objectives of the research project accompanied by the pre-project evaluated and approved by the Universidad la Gran Colombia. This step supported the continuity of the inquiry with the students and the possible results that were going to be showed to the institution in order to contribute with the performance of the school.

The used instrument in this phase enabled to clarify questions about the social context, the analysis and general description of the environment. At the same time, it was implemented the journals for contributing with the register of the acquired reports. In addition, the activities and the significance that individuals gave provided a view about the social relationships among individuals and socio-cultural patterns, problem analysis, and hypothesis.

2.4.2. Second phase - reliability

For this project, five empirical instruments in action research were used. The first was the informal interview to four in-service teachers at the school Manuel del Socorro Rodríguez which has as a purpose to do an exploration about their perception of the third and fourth graders' English and mathematics level. The questions in these interviews were related to the curriculum and the strategies used in the classes. The first teacher portrayed the difficulties in the school, in terms of socio-cultural problems, in which it was not an intervention, talking about the evident lack of synchronization between the

educational project of the institution, the standards presented by the Ministry of Education in Colombia, and the curriculum. This opinion is deducted from an excerpt of the interview which is shown below[6]:

Interviewer: How is carried out the topic's election that are going to be addressed within the curriculum of the institution?

Teacher of the institution: The curriculum of the institution is established by this one. Nevertheless, it is studied the possible changes that this one can suffer each year, depending on the presented outcomes of the last year.

Interviewer: Has the curriculum into account the population or just the quantitative results obtained in previous years?

Teacher of the institution: This institution faces complex socio-cultural issues. Although an analysis of topics is made per year, I believe that the Ministry of Education expectations are not met.

Interviewer: Is it to say that there is not a close relationship between the basic standards of competences suggested by the Ministry of Education and the institution?

Teacher of the institution: There is a relationship, but it does not encompass completely the topics suggested and, undoubtedly, there is not reached the results exposed in the curriculum.

[6] Translation made by the author. Find the original version in the appendix 1.

On the other hand, it was necessary to use another instrument with the objective of complementing the information obtained through the interview. The second tool was an observation phase which seeks to recognize the variations between the teachers' description about the level of the students, the pedagogical strategies and the students' performance.

It was employed a diagnostic-survey that consigned the topics presented in the curriculum of the school and in the Basic Standards of Competences in both subjects, mathematics and English. This instrument was complemented with a survey that allows the inquiry to create a route of contents and plans.

In this stage of the project, it was implemented a pre-test which was based on the content and the abilities that the students should have in fourth grade according to the basic standards of education in mathematics and in English. By following these ideas, the second phase consisted in the diagnostic instruments elaboration taken into account the reliability and the validity of them into a quantitative research. Joppe (2000) defines reliability and validity as:

> The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are.

Finally, the five instrument used to confirm the reliability of the research was field notes accompanied by journals. The passive observations evidenced a dichotomy between the institution's educational project and the reality of the classes. The mission

and the vision of the school highlight the integrality and the autonomy. Noneless, the classes were headed by traditional techniques in which the teachers were the center of them. Clearly, the technology mentioned in these statements were not an advantage in the school because of the resources that this one and the students count with and the school does not tend to support the cultural and socio-political knowledge in the classes of fourth grade. But, the institution promotes the sports and the arts apart of the disciplinary areas.

In this way, the observation stage searched the population's characteristics description. Besides the collected information, the homeroom teachers gave a general information about the group and the follow-up cases. In addition, the students answered a survey in which was asked the name, the genre and the age. The observation's phase was adopted till the Department of Health and Human Services (2008)'s definition of this data collection instrument as "a way of gathering data by watching behavior, events, or noting physical characteristics in their natural setting" (p. 1). Taken into account an overt observation where the object of study is consciousness that they are being observed.

The school counts with a strong foundation in terms of the theoretical framework that it wants to be consolidated in the practice, all the same they are not applied in a wide and significant way during all the classes leaving aside the procedural aspect they want to reflect in the objectives, creating at once a disconnection with the basic standards of education established by the Ministry of Education of Colombia.

The Faculty Development and Instructional Design Center of the Northern Illinois University describes the assessment as a process of gathering data. This

subdivided into three types of assessment: diagnostic, formative and summative assessment. The diagnostic assessment refers to the identification of strengths and weakness of the students; the formative assessment provides a feedback while the learning is in process; and the summative assessment evolves a feedback that is given after the learning has been completed.

In addition, the journals (Apprendix 5, 6, 11, 13, 17) registered the process of each session of the design and implementation of the didactic unit with the complement of the interviews that evidenced the progress both in students and in the teachers.

2.4.3. Third phase- Design and implementation

This third phase of the research project expresses the diagnosis stage and the pedagogical intervention that pointed specific issues that influenced the structuring of the instrument (the didactic unit) that was going to be applied in the population. Within these interrelationships are the Basic Standards of Competences and the real context, the Basic Standards of Competences and the didactic unit, the Basic Standards of Competences of a foreign language (English) in Colombia, and the Basic Standards of Competences in mathematics in the didactic unit design.

2.4.3.1. Diagnosis

The diagnosis stage incorporates the recognition of the population's English and mathematics level. In this way, it was necessary to encompass the topics of the curriculum and the basic standards of competences in English and mathematics and

to find an evaluation mean that created a connection between the results of the diagnostic test and the objectives of this inquiry.

These diagnostic tests were applied first in a pilot population that had similar characteristics to the object of study. The objectives of these tests were to identify the English level of the students by using their speaking skill with the support of written questions. To compare, it was necessary to use the Basic Standards of Mathematics and the Basic Standards of Foreign Language: English of Colombia with the prior knowledge of the pupils, and to analyze the possibilities of incorporating interdisciplinarity in the population.[7]

The first diagnostic test had the target of finding the lowest result between pronunciation, vocabulary, comprehension or content, fluency, style, and grammar. The lowest outcome was going to be the base for the structure of the didactic unit. In this case, the vocabulary showed an important influence in the low efficiency of the group.

The elements related to the diagnostic tests were specially based on the monologues and conversational English language projection of the students in fourth grade. Supplemented by the evaluation of the performance of the random, metric

[7] The main purpose of the Basic Standards of Mathematics and the Basic Standards of a foreign language in Colombia (taking into account the definition of the Ministry of Education in Colombia) is clear and public criteria that enable to judge if a student, an institution or an educational system complies with the common quality expectations.

and spatial thinking established in the basic standards of education in mathematics of Colombia.

2.4.3.2. Pedagogical intervention

The pedagogical intervention started with the analysis of the diagnostic tests' outcomes. The results showed a lack of vocabulary in the students and, at the same time, a disconnection between the Basic Standards of Competences in both subjects (mathematics and English) and the curriculum presented by the school. The math scores were more related to the established by the Ministry of Education of Colombia than those obtained in English.

For this reason, it was necessary to classify the topics and to define the objectives of the didactic unit mainly based on the Basic Standards of Competences and the real context. It means that, similarly, the curriculum was linked within the same standards since a coherent structure between what the students did not know and what they should know. However, it is supplemented taking into account the needs of the population, giving priority to English using topics related to mathematics.

The Interviews represents, in this opportunity, a path for the evaluation and a closer step for the reconsideration of the future action for the objective of this project that are going to be closely related to journals that occupy a place in the implementation of the didactic unit and the new strategies that are going to be proposed.

2.4.3.2.1. The Basic Standards of Competences and the real context.

On one hand, the Basic Standards of Competences in a Foreign Language (English) settles as its rationale "to set up basic levels of quality, those who are entitled from boys and girls members of all regions of Colombia "[8]. That is why, the students of the institution Manuel del Socorro Rodríguez, being a public institution, should be ingrained to the principles presented by the Ministry of Education of the country. Furthermore, it ensures a learning that allows them to communicate in the language appropriately, in this way they can use their knowledge effectively in real communication situations.

On the other hand, the Basic Standards of Competences in Mathematics incorporates "in the process of teaching in the students a mathematics vision as a culturally mediated human activity and impact on social, cultural and political life of citizens"[9] and that, in this inquiry, was bound as a mere *procedural knowledge*[10]. This research project addresses the mathematics as a practical connection between real life situations and the communication process presented in a foreign language.

The standards of a foreign language in Colombia establish that the students of fourth grade begin with the A2 or the *waystage* level followed the Common European Framework that receives the name of basic level in Colombia. On one

[8] This excerpt was taken and modified by *Guía No. 22 Estándares Básicos de Competencias en Lenguas Extranjeras: Inglés (2006),* drawn up by the Ministry of Education of Colombia.
[9] This excerpt was taken and modified by *Estándares Básicos de Competencias en Matemáticas* founded by the Ministry of Education of Colombia.
[10] The procedural competence is defined in the Basic Standards of Competences as close to the action, that is related to the techniques and strategies to represent concepts and to transform these representations; with the skills to develop, compare and exercise algorithms and to argue persuasively (Ministry of Education).

hand, The Common European Framework of Reference (CEFR) mentions that a Basic User which has exceeded the A1 level (the previous level to A2):

> Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

On the other hand, the Basic Standards in a foreign language of Colombia present that, in the same category, the person can comprehend short stories presented in a simple language, develop strategies that help to understand some words, expressions and sentences, as well as, he or she comprehends the basic language about him or her family, friends, games, known places, and referring to spoken interaction and production, the student can speak in English with short sentences in order to express his or her ideas and feelings about family and school topics. The vocabulary of this students is limited to close and known topics and referents.

The diagnostic tests addressed the prior level to the one that a student of fourth grade should start due to the Basic Standards of Education establish that the A2 level is worked from fourth grade to fifth grade of elementary school. For this reason, it is taken as a point of departure that the students should have been reached the A1 level required in the first three grades of their educational process.

These comparisons strengthened the idea of applying an interdisciplinary didactic unit which takes advantage of the mathematics' level of the students for

learning general and useful vocabulary in a foreign language (English). Evidencing a distant level by the students of the school, in terms of contents, it was required to compare the Basic Standards of Competences and how would be combined in the didactic unit.

2.4.3.2.2. The Basic Standards of Competences and the didactic unit.

As it was mentioned before, the Basic Standards of Competences' target, both in mathematics and in English, is the need for basic quality education for all citizens. Nonetheless, this was not evidenced within the contents presented in the curriculum of the school Manuel del Socorro Rodríguez or in the student's outcomes neither. For that reason, the thematic block or the didactic unit, proposed in this inquiry, presented a connection between the curriculum of the institution and the Basic Standards of a Foreign Language. Nonetheless, this last source presented more complexity in the topics, as well as, the concordance of them with the population.

The standards of mathematics and English offer undoubtedly a common interaction with the objectives of the didactic unit due to the standards search the recognition different types of logical and mathematical thinking used to make informed decisions, to provide reasonable justifications or refute the apparent and fallacious and to exercise critical citizenship.[11]

[11] This excerpt was translated by the author from the original text: *Estándares Básicos de Competencias en Matemáticas* founded by the Ministry of Education of Colombia.

2.4.3.2.3. The Basic Standards of Competences of a foreign language (English) in Colombia and the Basic Standards of Competences in mathematics in the didactic unit design

Based on the Basic Standards of Mathematics **"**The five general processes that are contemplated in the Math Curriculum Guidelines are: formulate and solve problems; mold process and phenomena of the reality; communicate; reason, and formulate, compare and exercise procedures and algorithms"[12]. For that reason, it was taken into account the mathematics as an appropriate tool for teaching real life situations in a foreign language with the target of teaching English. In this way, mathematics was one step for reaching an improvement in the vocabulary of the students. Besides, the topics of mathematics were chosen because the students had a better result in the diagnostic test in those topics than in English. That means, mathematics' topics (known by the students) were used in order to teach topics of English that the students should know in fourth grade.

In addition, it was addressed the numerical, spatial and random thinking (in mathematics) because of the existing connection between them and the English topics' teaching. For example, in order to teach the clock and the hours, the line graphs allowed to learning process to be more interesting in terms of communication and vocabulary by creating surveys that the students could do to another person.

[12] Translated by the author from the original document: *Estándares Básicos de Competencias en Matemáticas,* established by the Ministry of Education in Colombia.

Talking about the Basic Standards of Education in a foreign language, it was regarded solely in the monologues and conversational skills (considering the aims of this research project) encompassing the communicative competences (pragmatic, linguistic, and sociolinguistic). The idea with this was to foster one of the requirements presented by the Ministry of Education about the speaking skill in a foreign language: to speak in English, with brief and isolated words and sentences, in order to express ideas and feelings about family and school topics.

Having identified the list of topics and the method that were going to be applied began the design of the didactic unit which incorporates three different modules of concentric learning. The modules worked with topics from English and mathematics, but with a base on vocabulary acquisition.

Table 3. Topics chosen for the didactic unit design.

Main topic	*Disciplinary topics* *(English)*	*Interdisciplinary topics* *(Mathematics)*	*Vocabulary* *For both disciplinary and interdisciplinary topics*
The clock	Date	Line graphs	• Day. • Month. • Year. • Number. • Celebration. • Lines. • Graphs. • Birthdays. • Christmas. • New year. • Teacher's day. • Children's day. • Mother and father's day. • Halloween.

			• Valentin's day. • Percentages. • Draw. • Costume. • Prefer. • Majority. • Minority. • Data.
	Time	Ordinal and cardinal numbers.	• Time. • Ordinal. • Cardinal. • Family nucleus. • Clock. • Past. • Present. • Future. • Heritage.
	Hour	Benchmarks	• Hour. • Seconds. • Minutes. • Hands. • Less than. • Greater than. • Equal.
The survey	Food	Bar graphs	• Vegetables. • Fruits. • Junk food. • Health food. • Candies. • Average. • Write. • Calculate- • Addition. • Multiplication. • Add.

			• Bar. • Measure.
	Music	Pictograms	• Rhythm. • Figure. • Key. • Clue. • Represent. • Like. • Dislike. • Instrument. • Sound. • Numbers. • Amount.
	Clothes	Line graphs	• Summer. • Fall. • Spring. • Winter. • Create. • Label. • Position. • Color. • Chart. • Horizontal. • Vertical. • Peaks. • Valleys.
The fruits	Characterization	Sizes	• Adjective. • Small. • Big. • Tiny. • Giant. • Less than. • Greater than. • Centimeters. • Meters.

		• Kilometers.
Shapes	Proportions	• Circle. • Triangle. • Rectangle. • Trapezoid. • Lines/ rays. • Points. • Figures. • Shapes.
Colors	Equivalent-fractions	• Review. • Middle. • Cut. • Numerator. • Denominator. • Ordinal and cardinal numbers. • Colors. • Parts. • Slice. • Addition. • Multiplication.

2.4.4. Didactic unit design

The didactic unit was based on the structure and examples provided by Felicidad García (2003), but it was modified in order to be pertinent for this project. In this project, the didactic unit is the essential instrument to strength the vocabulary (see Appendix 2). It made use of mathematics topics related to fourth graders under the standards of education in Colombia. This one was divided into three crucial moments represented in models of concentric learning, which was a tool for the organization and classification of the topics and subtopics that will be applied in the classes.

These parts of the didactic unit comprehended general and basic information about classification of content that involved the context of the students intrinsically, as well as, a significant rise in the difficulty throughout the implementation of each session. This can be evidenced in the corroboration of their English level at the end of this project.

In this didactic unit is resumed the Eclectic approach because it took place in all the moments of the discharge. Kumar (2003) mentioned that the activities that are chosen at the moment of using this model will be related to real life experiences (2003), and that was the idea of this thematic block, to present the information in order to the students could manage these areas as subjects that are not far of their daily life. A clear example is the use of fractions in real context. It is different if the students copy from a math book the subtraction's procedure for fractions whilst if they see a fruit and they start to remove an orange wedge, the pupils will comprehend that each part of the object is the numerator of a fraction.

In relation with the population, the school, the diagnostic test, the basic standards of competences of Colombia in both subjects, the auxiliary interdisciplinarity and the vocabulary. The curriculum shows a near relationship with the standards of English and mathematics for fourth graders whereof the topics were derived and selected from the communicative competence (in the case of English) and in mathematics focused the attention on the numerical thinking and the numerical system, likewise, the variation thinking and algebraic-analytical systems. The topics were chosen with the target of finding an association between the main themes and the interdisciplinarity. In this way, it was necessary to use one workshop per session that integrates the two areas (English and mathematics) and the new vocabulary that the students should learn class by class.

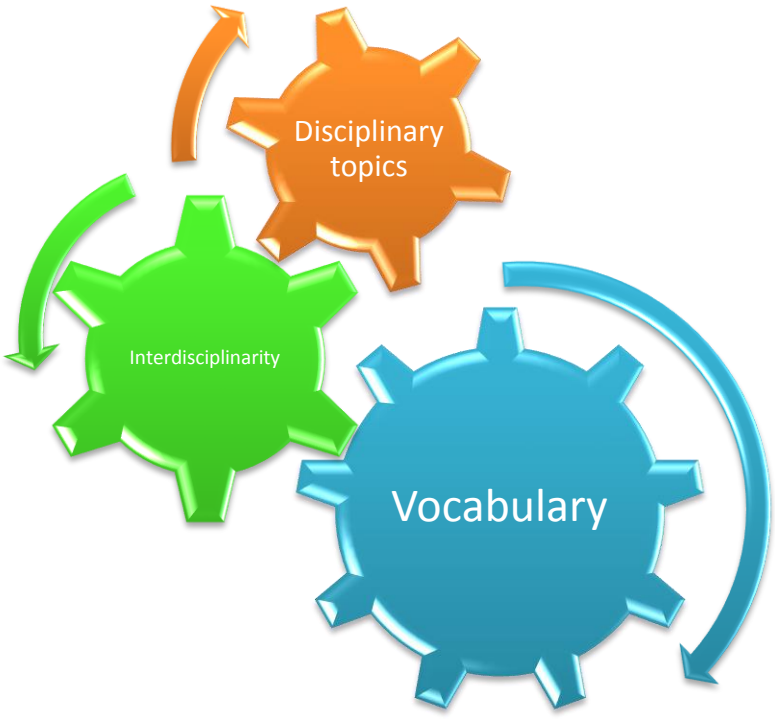


Figure 8. The main components of the didactic unit.

After the identification of the vocabulary and the current English and mathematics' level of the students the didactic unit needed a flexible method that was related with the necessities of the population. That is why it was chosen the Eclectic Method. This pedagogical approach represents a mixed of different methods including the teaching and learning strategies based on three important aspects for this research project. First, it is a method thought for the teaching of a foreign language, second it is realistic any sense that each population is different and the method should be adapted to the student, not the other way around, and third, the activities are directly related to their experiences in the real world.

In addition, this phase was emphasized in journals. The journals were examined through the comparison with the other data collection instruments with the objective of

creating connections between the advances of the population whether in the social interaction itself or in the contents presented in the thematic block (see Appendix). In this way, the content list (see Table 3) was summarized in a module of concentric learning[13] (see Figure 9).

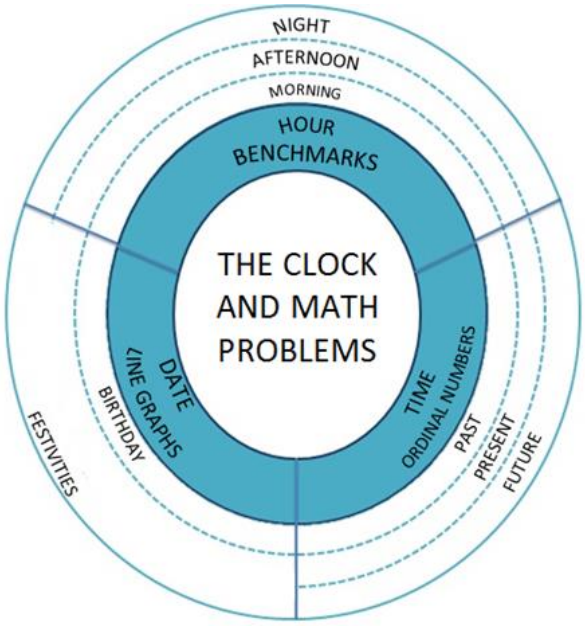


Figure 9. Module of concentric learning example.

In this way, it possible to distribute the topics according to the topic of English that was going to be taken into account and the auxiliary topic of mathematics which allowed the main topic to be reached.

In the first didactic unit, it was evaluated the main topic, as well as, the recognition of the new vocabulary. Taking into account the spoken and the written

[13] This is an example of a module of concentric learning that was created by the author refering to the topics, but with the structured established by Felicidad García in her book *Cómo elaborar unidades didácticas en la Educación Infantil*.

production, as a way for the identification of the words. The students participated in a successful way, but they had difficulties because it was a class that involved the use of the English language in a higher level than the current one. The second unit was based on a topic which incorporates the prior learnt vocabulary and the new one (elemental issue exposed in the institution educational project of the institution). Finally, the third unit created a link between the last two units and the vocabulary. It has in mind the strategies that did not work and the students had a base in their understanding of the language. For that reason, the more successful unit was the last one, because it considered the aspects not on the move, but focused on the previous teachers and students' experiences.

Each session's response of the didactic unit was evaluated and analyzed by the use of data collection instruments as journals, field notes, interviews, pictures, tests and surveys and non-constant video recording. In this research project, these instruments were analyzed through the classification of the answers in codes of similarities that allowed the identification of the most important topics of each interview or field note. It was segmented with the target of triangulate the results with the future results of the diagnostic unit application.

CHAPTER 3

3. DATA ANALYSIS

The analysis of the data collection instruments' outcomes was divided into four steps (Fernández L. 2006). The first step was the procurement of the information, this with the support of the qualitative tools which were used in each intervention of the inquiry. Second, to capture, to transcript and order that information. Then, it was necessary to

codified the information. Codify is the process whereby it is cluster the obtained information in categories that concentrate the similar ideas, concepts and topics discovered by the researcher[14]. Finally, those processes were integrated in categories with the target of doing a relationship between the theoretical and methodological framework with the aims of the project.

In addition, taking into account the general and specific objectives exposed in this research project, it was possible to categorize three essential parts found during the methodological and theoretical process (Table 5).

Table 5. Codification and categorization of the information.

CATEGORIES	*CODES*	*ABBREVIATION*
PEDAGOGY	• Standards	ST
	• Eclectic approach.	EA
INTERDISCIPLINARY FIELD	• Interdisciplinary field.	IF
SPEAKING PRODUCTION	• Vocabulary.	VC

3.1. Pedagogy

The first category evidences a perspective about advantages and disadvantages related to pedagogy. At the same time, pedagogy is referred in the role of standards and the Eclectic method. On one hand, educational standards have an important place within the institution

[14] Translated and modified by the author. Taken by *Qualitative interviewing. The art of hearing data.* (Rubin, H.J. y Rubin, I.S. 1995)

because it is located a minimum of topics for each group, in this way, the Ministry of Education of Colombia is ensuring a clear level of quality for the schools. Nevertheless, the results obtained in the diagnostic tests showed an unbalance between the proposal and the practice, especially in English. This can be evidenced in the following results:

3.1.1. First part of the diagnostic test:

This part contained nine questions, each of them related to personal information, like and dislikes. It was based on the Basic Standards of Education, both in mathematics and in English, evidencing English in the main topic for being measured and mathematics as a way for it. In this session was evaluated the vocabulary more than the construction of complete sentences through the recognition of basic arithmetical operations.

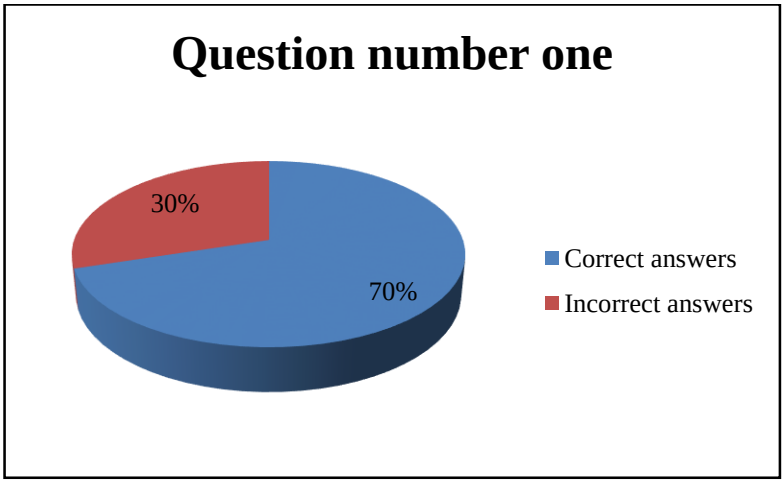


Figure 10. Percentages of the results (question number one), diagnostic test.

In the first part of the exam (Figure 10) the number of questions for all the group were one hundred forty-four, of which one hundred one were answered correctly. That means, the seventy percent (70%) of the questions were answered correctly, taking into account, the spoken production.

The vocabulary had to be explained (the meaning of basic words as: age, their favorite food or color, hobbies, birthday, friends, brothers and sisters). During this session of the diagnostic test, the headroom teacher did a little explanation about units of measure (hundreds and thousands). The students developed the writing part successfully, but they could not produce questions to their partners or answers in a spoken way.

In most of the cases the teacher had to clarify some concepts in Spanish or help them with the vocabulary they did not know (common verbs or numbers). That means, they had an acceptable performance in terms of content, but with a lack of vocabulary in the foreign language.

3.1.2. Second part of the diagnostic test

The second part included questions two and three. These questions deal with mathematics. The first point was a pictograph, the students had to analyze the key (that indicates the value of each picture), and they completed the table with the given information. Finally, they filled the questions.

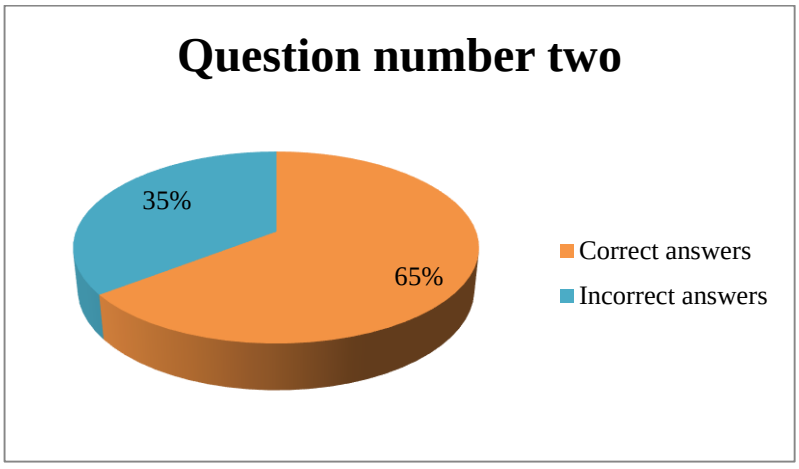


Figure 11. Percentages of the results (question number two), diagnostic test.

Sixty-five percent of the points were answered correctly, whereas that, thirty-five percent were not according to the exercise.

The students required an explanation about the value of the key and the function in the example. They asked information about the gaps they had to complete in order to check if they were wrong or not. Some students needed more than one elucidation about the place of the given data and the relation with the words and images.

The point number three was a graph, this one with a specific characteristic of three days of the week and with information about them.

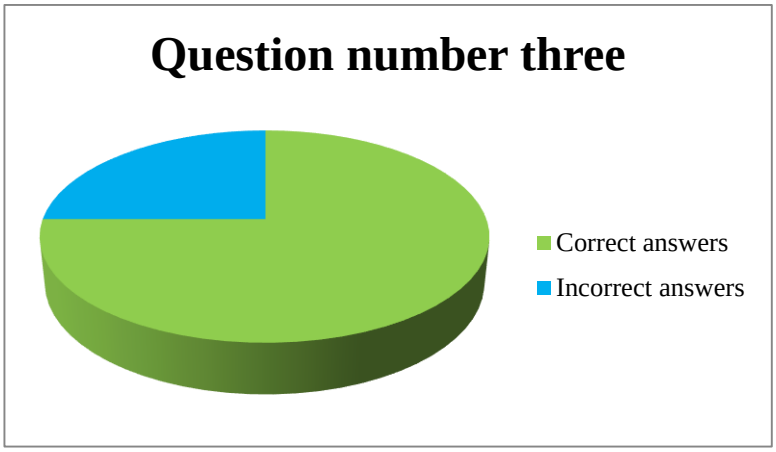


Figure 12. Percentages of the results (question number three), diagnostic test.

This question did not have subset of questions. For this reason, the total of question for all the group were sixteen and the number of them that were answered correctly were twelve.

The students understood the sentence they had to take into account for completing the bar graph. They had difficulties with the vocabulary of the days' names, but they inferred the information.

3.1.3. Third part diagnostic test:

This session was focused on mathematics too, in the topic of fractions and decimals. The students had to find the equivalent fraction following the picture and according to the given

numbers. Otherwise, in the part of decimal numbers, the pupils had to conclude if the statement was false or true by looking at an image.

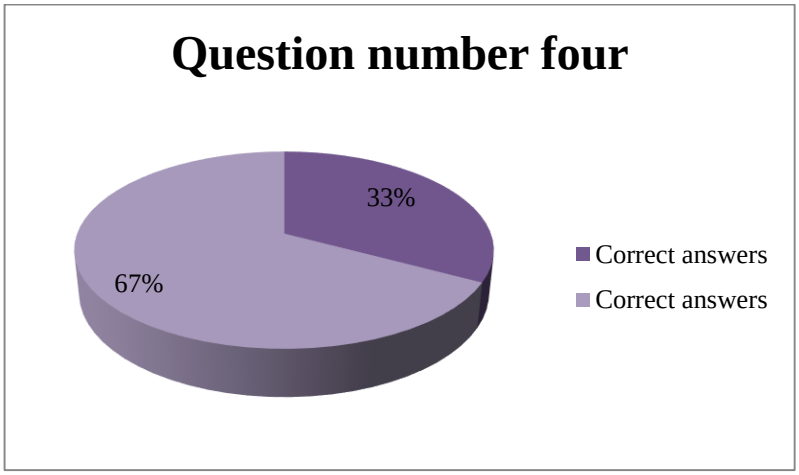


Figure 13. Percentages of the results (question number four), diagnostic test.

Sixty-seven percent (67%) of the questions were not answered correctly, because they did not have the opportunity to study fractions and decimals this year. For this reason, I did a brief induction about these topics. Nevertheless, they are broad topics that need to be developed step by step.

By following the general performance of the students it was possible to apply the speaking criteria mentioned above:

-Pronunciation marked out of 10 then multiplied by 2

-Vocabulary marked out of 10 then multiplied by 2

-Comprehension, content marked out of 10 then multiplied by 2

-Fluency and style marked out of 10 then multiplied by 2

-Grammar and word order marked out of 10 then multiplied by 2 (Underhill, 1987)

Table 4. Results pilot exam.

SCALE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**FINAL SCORE**	
PRONUNCIATION				**X**							4	8

VOCABULARY	**X**										1	2
COMPREHENSION, CONTENT							**X**				**7**	14
FLUENCY AND STYLE					**X**						**5**	25
GRAMMAR AND WORD ORDER	**1**		**2**		**3**		**4**		**5**		**2 x 2=4**	8
			X								57	

The final score was fifty-seven (57) points from one hundred (100) points. The students had an acceptable result, taking into account that they do not have interdisciplinary classes that include English. This performance was described in the rubric so that each speaking skill was evaluated with the same score. In one hand, the higher score was related to comprehension about the content; they managed the overall information and the main idea of each activity. In the other hand, the lower result was evidenced in the vocabulary that represented the major factor for their lack of understanding of the diagnostic test.

Thus, Eclectic approach discloses the opportunity of connecting a functional methodology with the teaching of a foreign language, relating different types of students with diverse learning processes in just one environment. This approach was adopted by the students of the institution Manuel del Socorro Rodríguez as an opportunity for reaching their own learning strategy that exposes them to a non-lineal education (see Appendix 16 and 18).

3.2. Interdisciplinary field

In this category, it is identified the main principles of how an auxiliary interdisciplinarity can contribute to enhance vocabulary in a foreign language. It is suggested that the English teacher creates a connection between the prior knowledge of mathematics (by having a collaborative work with the teacher of this subject) and the new vocabulary in the English class. In this way, the objective of this project is not directed to the teaching of both subjects, but how can the teacher of English address a disciplinary subject (mathematics) as the mean for the

foreign language class improvement, and not to encompass the Content and Language Integrated Learning (CLIL classes).

Nonetheless, it is necessary to clarify two main reasons which explain the chosen of mathematics (disciplinary area) as the medium for teaching English. The first aspect is the emphasis of the institution in mathematics branches (especially when the students are in high school levels). The second feature was the preference and the performance of the students in the Mathematics and English subjects.

For this, it was applied another diagnostic which wanted to consolidate the preference subject between English and Mathematics. The survey entailed two simple questions in Spanish. The first one discloses the subject that the students prefer (mathematics or English) and the second question gives four general reasons (from which needed to be selected just one), in which the students chose one of the first two options (see Appendix 16).

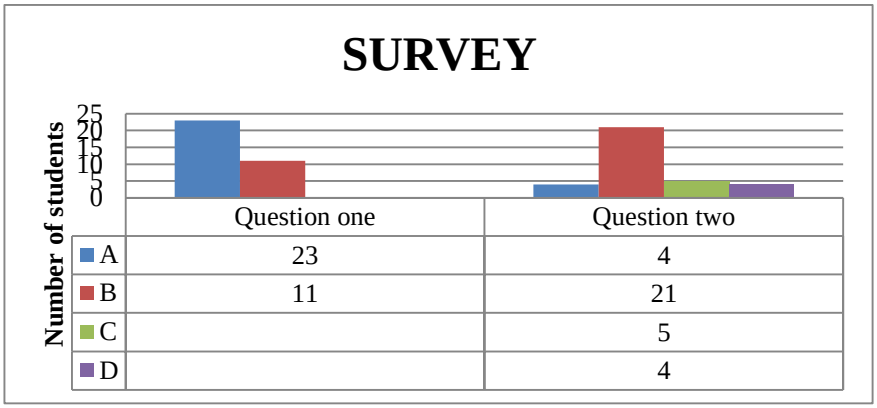


Figure 14. Survey results.

Question number one

Question: which of the following subjects do you prefer?

In this question twenty-three people chose the option *a* (mathematics)*;* eleven people selected the second choice (English). It means that, sixty-seven percent of the students prefer Mathematics subject and thirty-three percent selected English subject.

Question number two

Question: Why do you prefer this subject?

In the second part of this survey, 45% of the students chose that the subject is the one which is going to be more useful in the future. 22% thought that the activities are the ones which intervene in the decision. Further, 18% of the pupils indicated that the cause of the first answer is the way the teacher explains and, finally, three students selected that they understand and it is for that reason that they like the subjects.

In addition, from the people that chose that the principal reason of their preference is because of the understanding of the subject, 66% selected English and 34% chose mathematics. Whereas that, four people that preferred English and six students that chose mathematics thought that these subjects are important because they are going to be useful in the future. In contrast, the activities in class are more important for two people that like English and three people who incline by mathematics. Finally, the teacher explanation was essential for the decision of three students that like English and one that selected mathematics.

For this reason, the project seeks the creation of didactic units that support the English Foreign Language classes, improving in this way, the labelling of contents for taking into account mathematics for teaching the topics of English vocabulary that is going to sustenance the active participation of the students during the class.

3.3. Speaking production

Speaking production was specified in the theoretical and methodological framework and it was emphasized in one of its parts, vocabulary. This, based on the results of the diagnostic test

which displayed vocabulary with the less score between pronunciation, vocabulary, comprehension, fluency and grammar (Underhill, 1987). Besides, the diagnostic test about vocabulary and the outcome test were based on the principles of what should consider a teacher before to teach a word as Richards (1976) lists: the possible meanings of the word, the spoken and written forms, the prefix, suffix, and the root of the word, as well as, its grammatical behavior, and collocations. In addition, it is necessary to identify synonyms and antonyms, connotations, and finally its frequency. Nevertheless, this research project did not embrace all these points, because of the level of the students. That is why, the words took into account the meaning, the spoken and written form, synonyms, antonyms, and the frequency. Hence, it was added a rubric for evaluating the vocabulary's results (O' Callaghan, 2012).

3.4. The diagnostic test about vocabulary

Based on the results of the diagnostic test vocabulary that was created by following the rubric proposed by Antonacci, P and O'Callaghan (2012) which identifies six vocabulary evaluation's criteria: word identification, word meaning, reading the word, writing the word, word-learning strategies, and word consciousness[15].

[15] Refers to table 2 (word identification and vocabulary's level) for information about the vocabulary evaltuation's criteria.

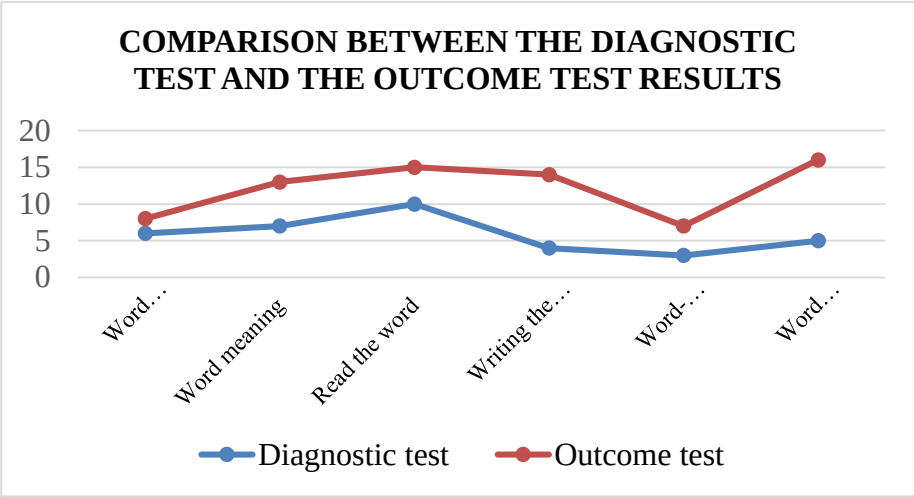


Figure 15. Comparison between the diagnostic test and the outcome test's results.

On one hand, in average of the diagnostic test, the students had the best result in reading the words that they found. By contrast, the lowest result was evidenced in the word-learning strategies. The students do not use word-learning strategies and resources to learn new words. This was proved in the outcome test that, even if it has an improvement, it has the lowest result too.

On the other hand, the pupils showed the best score in the word consciousness, taking into account this criterion as the demonstration of interest learning and using of new words. In conclusion, the students revealed an advance in terms of vocabulary, because they went from a s*triving* level, that means a categorization number one, to a *developing* level (categorization number two). [16]

The main objective of the research project establishes to determine the advantages and disadvantages of using Eclectic approach in an EFL classroom through auxiliary interdisciplinary content. In this way, the vocabulary rubric's result shows the Eclectic approach as a support for

[16] These results are based on the rubric of evaluation about vocabulary proposed by Antonacci P, and O'Callaghan C, (2012), in the book Essential Strategies for Teaching Vocabulary.

teaching a foreign language by making use of previous knowledge in a disciplinary field, in this case Mathematics.

3.5. Conclusions

In order to draw conclusions, it is important to highlight the main objective of this project, which was to design didactic units based on students' prior knowledge in mathematics in order to strength English vocabulary, going toward the use of mathematics as a path for learning a foreign language. This by following three steps, the first one was contemplated in a general diagnosis. The second phase was encompassed by the design of a didactic unit with interdisciplinary teaching activities with an emphasis in auxiliary interdisciplinarity, in which the main focus was the English language. Finally, these activities were applied and they were followed by different types of instruments of collecting data.

In conclusion, the diagnostic process started with a passive observation that evidenced the necessities of the students regarding the English language and the mathematics' contents and activities used in each class. Firstly, the students' behavior showed a disinterest for the English class, there was not a reflection of participation of the students, so the teacher was the center of the class. Otherwise, the class was given in a ninety percent (90%) in the students' native language and the students were not able to produce a comprehensible message in a foreign language. Secondly, the students adapted the information of mathematics to simple commands and they were capable to answer questions about topics related to the subject.

In both classes was verified a dissociation between the Basic Standards proposed by the Ministry of Education of Colombia and the content that the students were

managing. On the other hand, the classroom presented characteristics that located the students as a vulnerable population. This was the reason for classifying this document as a qualitative research, in which were going to be evaluated more than the measurable results.

The diagnostic test acted in accordance with the observation stage in which it was determined the difficulties in the speaking skill in the vocabulary's section, being this a limiting factor for advancing in their communicative competence. Likewise, this observation phase and the diagnostic test introduced the idea of a didactic unit that comprehends the topics of mathematics and English language with the main purpose of improve the use of vocabulary in a foreign language through a disciplinary subject, in this case, mathematics.

3.5.1. The didactic unit

The didactic unit was created taking into account the context of the population, the result of the observations, the diagnostic test and the standards of mathematics and English. At the same time, Felicidad García (2003) purposes a model of didactic unit for elementary school with a focus in the modules of concentric learning.

A different class was manifested around new purposes, reflections and experiences both students and teachers. Analyzing this project, it was demonstrated a modification in the class, talking about academic content, likewise, the students development. That is to say that, this involvement permitted to change the sense of the classroom and transform it in a significant place for learning.

The didactic unit demonstrated an advantage in teaching and learning through interdisciplinarity due to the organization, the planning and the main objectives embodied in a thematic block, as well as, the use of a flexible approach that reflected the subjectivism presented in the students and the action research stages offered by Sagor Richard (2005) that incorporated a close relationship between the teacher and the student and the students themselves. On the other hand, a didactic unit is an example of authentic material that is personalized according to the necessities of the population.

3.4.2. Application of the didactic unit

Interdisciplinary fields that include a foreign language are not usual in this context, because it is understood that the academic content can be more difficult if it is taught in another language apart of the students' native one. Nevertheless, according to the results presented in this project it was possible to identify an increasing range in how they figured out both areas, standing out the performance of English subject.

Evidently, the application of this project led to break the stereotype that the students had of English and, remembering that these students gave priority to mathematics because they thought it was more useful in the future, they open their minds to a new vision for the use of a language.

The students' learning role turned from a traditional lecture, where the teacher was the center of the class, to a class where the student had an active participation in all the activities and in which they could work in groups (aspect that was not evidenced since the first cycle of the application) and that allowed students to integrate the topics from English and mathematics in a comfortable way. Although this project involved

complex areas of study such as spoken production and mathematics, it was possible to engage students in both subjects, but especially to their improvement in their English performance with an emphasis on their acquisition of new vocabulary. The majority of the activities were successful, taking into account the progressive process presented in the first activities as adaptation strategies and the last ones as the road traveled in which the English took a different place in their conception and perception of a foreign language as an opportunity for finding their abilities.

This document underlined the behavior of the students in both classes, but especially in English subject. In spite of this situation, there was an appropriate connection between the English and mathematics subjects, which apparently showed an antagonistic part in this research project, but that displayed different ways of conceiving the learning, and even the teaching English and during the application of the didactic unit, it was recognized too, a change in the students' attitude in front of the class, and even if this study had not proposed this outcome, it was feasible to infer that a change in the methodology of the class can contribute to the management of it and to the pupils' demeanors.

The main aim of this project was to claim for an emphasis in the communicative competence more than just a class based on strong areas as mathematics taught through a foreign language. For that reason, the tools and the activities were authentic material for the classes, especially created for the didactic unit. It is worth mentioning that this didactic unit can be adapted for the necessities of the population because of its flexibility in the strategies, in the methodology and in the application of the exercises, being the classroom a non-conventional place without changing the ideal of a class in it is able to

learn from the environment with real life situations and with active roles and it was underwritten to English language teachers a new vision of teaching that represents a renewal in terms of what the integrity of knowledge raises. For that reason, it was able to promote the improvement of the vocabulary in English through another subject.

On one hand, the classroom itself suffered a change. The teacher realized the importance of the participation of the student in the activities and the creation of reliable material that was related with the specific population. On the other hand, the students noticed their abilities in the practice and the relationship between knowledge, contents and real life experiences (as it is evidenced in the objectives of the didactic units).

It also necessary to highlight that the research was mostly qualitative and the results were evaluated after having done a process of implementation and observation. For that reason, it was not applied a specific standard exam at the end. But, the students had a continue tracing evidenced in the data collection instruments.

Finally, this research project allowed students to improve their speaking skill through reinforcing vocabulary acquisition and being in touch with other strategies that showed them another way for applying a language apart of their native language in a mathematics subject by giving the opportunity to know a new way for teaching.

3.6. Recommendations and implications

From the data analysis it was possible for this project to identify certain questions that were not part of the research core. For that reason, this research project enabled to recommend people that are going to lead another research like this one that take into account the following suggestions:

The conclusions mentioned an aspect that was important to recognize, even if it was not established at the beginning of the project and it was the social impact that a project like this one can have in the behavior of the students talking about their socio-cultural problems.

The students did a good performance during the didactic unit application inside the classroom. The didactic unit counted with an activity outside of the classroom (in which they had to ask questions to the people around in order to collect data for their bar graphs' elaboration), but what should happen if more activities were done outside of the institute? In this case, teachers need to have into account what type of context they are going to use (talking about real life situations) and how much time they are going to use in advance for it.

In this project the students were immersed in interdisciplinary activities that they have never taken before and the teachers of the institution did not make use of this tool for teaching. So, the training of teachers for teaching interdisciplinary areas can be a useful inquiry in a future. In addition, it can be analyzed if these types of projects need homework as a support for the autonomous learning of the students and how much time can be applied on it, as well as, how much time can be projected for the induction of the topics and for further inquiries can be born the idea of including the use of Information and Communications Technology (ICT) in auxiliary interdisciplinarity.

Finally, this research project was based on auxiliary interdisciplinarity. This includes a balance scale tilted to one of the two areas. But, it is possible to analyze the results if the didactic unit incorporates activities that can work for both subjects in the

same level in order to reach an objective that enriches the two parts immersed in the inquiry.

REFERENCES

ACAPS (2002) Qualitative and Quantitative Research Techniques for Humanitarian Needs Assessment, 12.

Alberta teachers' association (2000) Action research guide, 27.

Antonacci, P., and O'Callaghan, C. (2012). Essential Strategies for Teaching Vocabulary.

Aram, J. D. (2004) Concepts of Interdisciplinarity: Configurations of Knowledge and Action. Human Relations, (p. 380).

Barbosa, Juan. (2006). *Ambientes virtuales de aprendizaje*. Taken from: http://recursostic.javeriana.edu.co/multiblogs/ava.php

Block. D. (1991). *Some thoughts on DIY materials design*. *ELT journal*, 45 (3), 211-217.

Boisot, M. (1972) Discipline and interdisciplinarity. In *Interdisciplinarity: Problems of Teaching and Research in Universities*. Paris: OECD.

Brewer, D. G. (1999) The Challenges of interdisciplinarity. *Policy Sciences*. (p. 327-337).

Bygate M. (1987) *Speaking.* Oxford University Press. (p.3).

Byram M. (1997). *Teaching and Assesing Intercultural Communicative Competence.* (p. 7-47).

Canale, M. (1983). From communicative competence to communicative language pedagogy. In J. C. Rithards & R. W. Schmidt (Eds.). Language and communication. New Yolk: Longman.

Canale, M & Swain, M. (1980). Theoretical bases of communicative approaches to second language teaching and testing. Applied Linguistics, (p. 1-47).

Calhoun, E. (1994). *How to use action research in the self-renewing school*. Alexandria, VA: ASCD. (P. 2).

Carter, Ronald and Mccarthy, Michael (eds) (1988) Vocabulary and Language Teaching. Longman, London.

Carr, W. and Kemmis, S. (1986). *Becoming Critical: Education, Knowledge and Action Research*. Lewes: Falmer

Celce-Murcia M., Dörnyei Z. and Thurrell S. (1995). *Communicative Competence: A Pedagogically Motivated Model with Content Specifications,* (p. 10-11).

Chettiparamb, A. (2007) *Interdisciplinarity: a Literature Review.* University of Southampton, (p. 13).

Chiseri-Strater and Sunstein (1997) *FieldWorking: Reading and Writing Research.* Blair Press: Upper Saddle River, NJ. (p. 73)

Congreso Nacional de la República de Colombia (Febrero 8 de 1994). *Ley General de Educación.* (Art.19, 23, 26).

Diamond, L. and Gutlohn, L. (2006) *Teaching vocabulary Retrieved* http://eltj.oxfordjournals.org/cgi/content/abstract/50/1/52.

Denzin N. & Lincoln Y. (2003). *Handbook of Qualitative Research.* (p. 3).

Ernest, P. (1991). *The philosophy of mathematics education*. London: The Falmer Press.

Elleen Ferrance (2000) *Action research*, 1-6.

Esther U., Martínez A. & Jaume F. (2008). *Teaching Intercultural Communicative Competence through the Four Skills.* (p. 158).

Fernández, L. (2006) ¿Cómo analizar datos cualitativos? Institut de Ciències de l'Educació. Universitat de Barcelona.

Flick, U. (2007) *Introducción a la Investigación Cualitativa.* Primera edición. Coruña Madrid Fundación Paideia Galiza Morata 2004 reimpresión 2007

García, F. (2003) *Cómo elaborar unidades didácticas en la Educación Infantil* (p.49, 59, 135-172)

Gao, L. (2001). *Eclecticism or Principled Eclecticism*. (p. 363). Taken from: http://www.legitimationcodetheory.com/pdf/2011Gao.pdf.

Golding, C. (2009). Integrating the disciplines: Successful interdisciplinary subjects. (p. 2). Taken from: http://www.cshe.unimelb.edu.au/resources_teach/curriculum_design/docs/Interdisc_Guide.pdf

Grady, M. P. 1998. *Qualitative and Action Research: A Practitioner Handbook.* Bloomington, Ind: Phi Delta Kappa Educational Foundation. P 29-30

Hall, E. (2001-2002). *Glossary of Math Teaching Strategies, National Center on Educational Outcomes*. [on-line resource, consulted on June 29th, 2015] taken from: http://education.umn.edu/NCEO (p. 1)

Hancock, B. Ockleford E. and Windridge K. (1998). *An Introduction to Qualitative Research.*

Harmer. (2007). *The practice of English language teaching*, Longman ELT; 4th edition.

Hemphill, K. (2010). *Using mathematics as a gateway to literacy for English language learners*. United States. University of Northern Iowa.

Heckhausen, H. (1972) Discipline and Interdisciplinarity. In *Interdisciplinarity: Problems of Teaching and Research in Universities*. Paris: OECD, (p. 83-89).

Hernández, R., Fernández C. & Baptista P. (2010) *Metodología de la Investigación.* Quinta edición. (p. 11-15).

Houwer, J., Barnes-Holmes D. & Moors A. (2013) What is learning? On the nature and merits of a functional definition of learning, (p.1). Taken from: http://www.liplab.ugent.be/pdf/learningpreprint.pdf

Hughes, R. (2002) *Teaching and Researching Speaking.* Pearson Education. (p. 7, 21).

Hymes, D. (1972). *On communicative competence*. In J.B. Pride and J. Homes (eds) *Sociolinguistics.* Harmondsworth: Penguin.

Jones, C. (2010). *Interdisciplinary Approach - Advantages, Disadvantages, and the Future Benefits of Interdisciplinary Studies*. (p. 1)

Joppe, M. (2000). *The Research Process*, from http://www.ryerson.ca/~mjoppe/rp.htm

Krashen, S. (1982). Principles and practice in second language acquisition. First printed edition 1982 by Pergamon Press Inc. First internet edition July 2009. University of Southern California. (p. 10)

Kumar, P. (2003) *The Eclectic Method-Theory and Its Application to the Learning of English*, (p. 1-3). Taken from: http://www.ijsrp.org/research-paper-0613/ijsrp-p1844.pdf.

Larsen-Freeman, D. (2000). *Techniques and Principles in Language Teaching* (2nd ed.). Oxford: Oxford University Press. (p.182).

Lineros, R. (2006), *Elaboración de unidades didácticas y actividades de aula para la clase de español segunda lengua (E/L2) en contextos escolares* [on-line]. Taken from: http://www.contraclave.org/espanolex/Unidades%20didacticas%20EL2.pdf

Macintyre, C. (2000). *The art of action research in the classroom.* David Fulton Publishers. (p. 101-106). Pedagogía. (p. 39).

McCarten, J (2007)Teaching Vocabulary, Lessons from the Corpus, Lessons for the Classroom, 3.

Madsen, H. S. (1983). Techniques in testing. En H. S. Madsen, *Techniques in testing.* New York: Oxford University Press. (p. 147-169).

Marshall, C. & Rossman G. (2006). *Designing Qualitative Research.* SAGE Publications. Fifth edition. (p.157).

Mellow, D. (2002). *Toward principled eclecticism in language teaching: The two-dimensional model and the centring principle*. *Teaching English as a Second Language Electronic Journal*, *5,* (p. 1). Taken from: http://tesl-ej.org/ej20/a1.html.

Ministry of Education of Colombia (1998). *Curricular Lineaments of Mathematics in Colombia*.

Ministry of Education of Colombia (2003). *Basic Standards of Mathematics*. (p. 1-72).

Ministry of Education of Colombia (2006). Basic Standards of Competences of Foreign Languages: English (p.10-17, 20-21).

Mills, G. E. (2011). *Action research: A guide for the teacher researcher* (4th ed.). Boston: Pearson. Osterman, K. F. & Kottkamp, *Reflective practice for educators: Improving schooling*

Nation, I.S.P. ed. Long M. And ed. Richards J. (2001). *Learning Vocabulary in Another Language.* (p.40)

Nikitina, S. (2006). Three Strategies for Interdisciplinary Teaching: Contextualizing, Conceptualizing, and Problem Centring. Journal of Curriculum Studies, (p. 251-271).

Northern Illinois University, Faculty Development and Instructional Design Center.

OECD (1972) *Interdisciplinarity: Problems of Teaching and Research in Universities.* Paris: OECD.

Oxford, R. L. and Crookall, D., (1990) "Vocabulary learning: a critical analysis of techniques," *TESL Canada Journal* 7/2, 9-30.

Oxford, R. (1990). *Language learning strategies: what every teacher should know*. Boston, MA: Heinle & Heinle. (p. 17).

Payne, L. S. (1999). Interdisciplinarity: Potentials and Challenges. *Systemic Practice and Action Research*. 12 (2), (p. 173-182).

Prashant Subhash Mothe, Adarsh Senior College, Omerga Dist.Osmanabad (MS) India

Perkins, David N. & Unger Chris (1999). *Enseñar y aprender para comprender. En: Diseño de la Instrucción. Teorías y modelos. Un nuevo paradigma de la teoría de la instrucción.* Parte I, Aula XXI Santillana. Madrid, (p. 106).

Petkova, M. (2009). *Classroom discourse and teacher talk influences on English language learner students' mathematics experiences*. United States, *University of South Florida.*

Sapiro, V. (2004). *Interdisciplinary and Collaborative Teaching at the Uw-madison: Overcoming Barriers to Vitality in Teaching and Learning,* (p. 1-45).

Squires, G. (1992) Interdisciplinarity in Higher Education in the United Kingdom. *European Journal of Education*.

Reverter, F. (2012). *Mathematical learning and language use: perspectives from bilingual students in a context of problem solving*. Spain, Universidad Autónoma de Barcelona.

Richards, J., (1976). the role of vocabulary teaching'. tesol quarterly, 10(1), 77-89.

Richards, J. and T.S. Rodgers. (1986). *Approaches and methods in language teaching: a description and analysis*. Cambridge: Cambridge University Press. (p. 19). Taken from: https://aguswuryanto.files.wordpress.com/2008/09/approaches-and-methods-in-language-teaching.pdf

Ritchie, J. and Lewis, J. (2003) *Qualitative Research Practice: A Guide for Social Science Students and Researchers.*

Sagor, R. (2005). *The Action Research Guidebook: A Four-Step Process for Educators and School Teams.* Thousand Oaks, CA: Corwin Press, (p. 7).

Scarino, A. and Liddicoat, A. (2009). Teaching and learning languages (p. 31).

Schmitt, and M. McCARTHY, eds. Vocabulary: Description, Acquisition and Pedagogy. Cambridge University Press, 199-227.

Schmitt, Schmitt and Clapham (2001) *Developing and exploring the behaviour of two new versions of the Vocabulary Levels Test* (p. 55).

Shaywitz, SE. (1998). Dyslexia. New England J Med, (p. 307).

Stringer, E. T. (2008). *Action research in education* (2nd ed.). New Jersey: Pearson.

Sun, J. (December 2013) International Journal on Integrating Technology in Education. *Globalization and Language Teaching and Learning in China* (IJITE) Vol.2, No.4.

The Department of Health and Human Services (2008) Data Collection Methods for program evaluation: observation, 1.

Thornbury, S. (2002) *How to Teach Vocabulary.* Pearson Longman. (p. 13).

Thornbury, S. (2005) *How to Teach Speaking.* Pearson Longman. (p. 1, 2, 11-18, 25, 26).

Tomlinson, B. (1998), *Materials Development in Language Teaching,* Cambridge, Cambridge University Press.

Underhill, N. (1987). Testing Spoken Language. En N. Underhill, *Testing Spoken Language*. New York: Cambriage University Press. (p. 61-64, 97-98)

Weideman, A. (2007) *The old and the new: reconsidering eclecticism in language teaching*. (p.9) Taken from: http://www.reformationalpublishingproject.com/rpp/docs/6_eclecticism_in_language_07.pdf

BIBLIOGRAPHY

Acero, Efrén. El Diario de Campo: Medio de Investigación del Docente. En: Revista Actualidad Educativa. Año III. Nº 13. S.f. p. 13

Coady J. and Huckin T. (2000). *L2 Vocabulary Acquisition a Synthesis of the research. Second Language Vocabulary Acquisition: A rationale for pedagogy* (p. 273-291).

Colegio Manuel del Socorro Rodríguez (W.D). *Horizonte institucional Colombia*. (p. 1-19)

Harmer. (2001). *The practice of English language teaching*, Longman ELT; 3rd edition. (p.271)

Hearn I. & Garcés A. (coords.) (2003), *Didáctica del inglés para primaria.* Pearson educación. Madrid, España.

Howard J. (n.d.) *Guidelines for designing effective English language teaching materials*. Christchurch College of Education.

Lucio R. (1992), *La construcción del saber y del saber hacer, Revista Educación y Pedagogía*. P. 39

Pinto A & Zambrano Y. (2009), *Diseño de una unidad didáctica modelo para enseñar lenguaje académico a los estudiantes del centro latinoamericano de la puj, a partir de material audiovisual.* Universidad Javeriana, Bogotá.

Sans, N. (2002), *Criterios para la evaluación y el diseño de materiales didácticos para la enseñanza de ELE* [on-line], taken from: http://www.mec.es/sgci/br/es/publicaciones/seminarios/seminarios00/02_criterios.pdf

Strauss, A. and Corbin, J. (1990) *Basics of Qualitative Research.* (p. 99).

Tryphon & Voneque. (2001), *Piaget –Vigotsky: la génesis social del pensamiento*. Editorial Paidós. (p.159)

APPENDICES

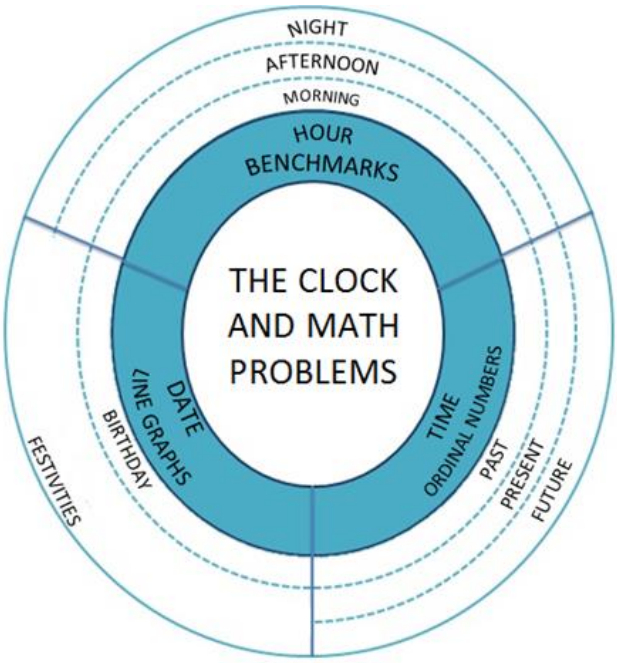
Appendix 1. General information of the institution.

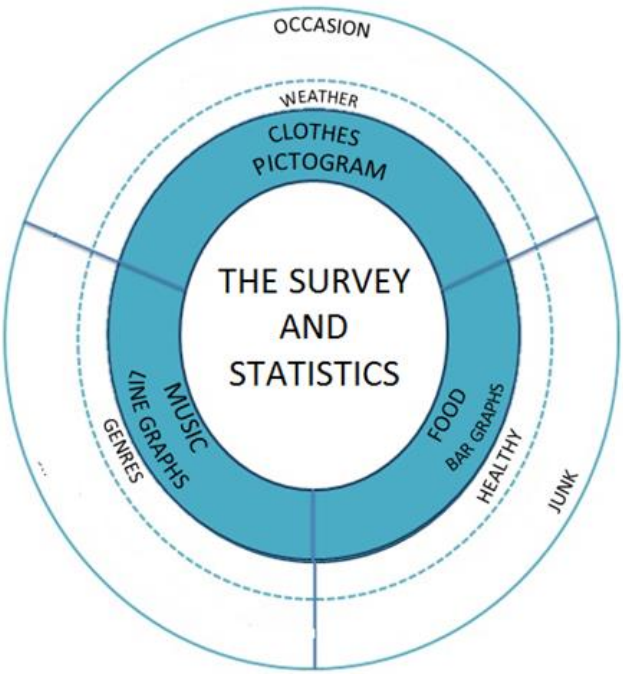
<table>
<tr><th colspan="8">INSTITUTION INFORMATION</th></tr>
<tr><td colspan="8">Institution name: Manuel del Socorro Rodríguez.</td></tr>
<tr><th colspan="3">Levels of education.</th><th colspan="2">Type</th><th colspan="3">Genre</th></tr>
<tr><td>Preschool _</td><td>Elementary School</td><td>Secundary school</td><td>Public</td><td>Private</td><td>Male</td><td>Female</td><td>Mixed</td></tr>
<tr><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
<tr><th colspan="8">Address</th></tr>
<tr><td colspan="8">District/number: Rafael Uribe Uribe/ 18.</td></tr>
<tr><td colspan="8">City/ National district: Bogotá D.C/ Cundinamarca.</td></tr>
<tr><td rowspan="3">Center A:</td><td colspan="3">Av. 44 South No. 23A-52</td><td rowspan="3">Center B:</td><td colspan="3">Cra. 27 No. 45-35 south.</td></tr>
<tr><td colspan="3">Tel. 2798736</td><td colspan="3">Tel. 727 48 40</td></tr>
<tr><td colspan="3">Neighborhood: Santa Lucia</td><td colspan="3">Neighborhood: Claret</td></tr>
<tr><th colspan="8">Schedule</th></tr>
<tr><td colspan="8">Morning: 6:30 am- 12: 15 pm
Afternoon: 12: 15 pm – 6:00 pm
Additional activities: Saturdays.</td></tr>
<tr><th colspan="8">Support professionals</th></tr>
<tr><td colspan="2">Psychologist</td><td colspan="2">Caseworkers</td><td colspan="2">Occupational Therapist</td></tr>
<tr><td>YES</td><td>NO</td><td>YES</td><td>NO</td><td>YES</td><td>NO</td></tr>
<tr><td>X</td><td></td><td>X</td><td></td><td></td><td>X</td></tr>
</table>

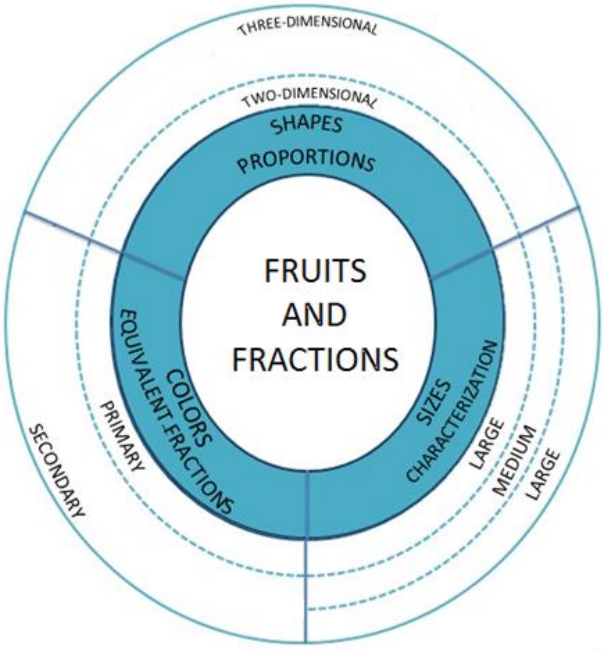
Appendix 2. Didactic unit.

DIDACTIC UNIT IDENTIFICATION	
Real time of application	Three weeks.
Location	Third term.
Stage	Primary education.
Level	Fourth grade (nine years old).
Public school	I.E.D. Manuel del Socorro Rodríguez.

MODULES OF CONCENTRIC LEARNING







- Terminal objectives

-Personal identity and autonomy

1. To use analytic and communicative skills in English by experimenting their own capabilities in mathematics.

2. To remember vocabulary by practicing in real life situations.

-Physical and social environment

1. To discover strategies for learning English and mathematics by collaborative work.

-Communication and representation

2. To contrast foreign language strategies with mathematic didactics by proving the effectiveness of each of them.

3. To distinguish specific topics by relating English subject aims and mathematical objectives.

4. To explore the student's speaking capacity by getting vocabulary in each zone.

- Didactic objectives

-Personal identity and autonomy

1. To construct understanding of a basic level of English by exemplify daily situations that the students face.

2. To find answers for different questions by analyzing the presented contexts.

-Physical and social environment

1. To discuss about variety by regarding different point of views and by concreting results in groups.

2. To separate roles in each group by choosing someone to lead the working time.

3. To relate English and mathematics by supporting themselves in all the activities.

4. To explain their results by sharing information with the partners.

-Communication and representation

1. To increase the vocabulary in English (or even in mathematical language) by developing the activities in each workshop.

2. To recognize shapes, sizes and colors by practicing with real objects.

3. To narrate experiences of each activity by talking in front of their partners.

4. To categorize the fruits by following their perception about the topics.

-Didactic contents

- Personal identity and autonomy

Concepts:

- Exemplification of real situations.
- Analysis of context.

Procedures:

- To use daily experiences and to adapt the classroom for the scene.
- To contribute to the other people ideas.
- To complement their learning process with analysis.

Attitudes:

- To participate in the activities and to complete the exercises satisfactorily.

- Physical and social environment

Concepts:

- Fruits: characteristics.
- Surveys: analysis of graphs.
- Clock: importance of transitional stages.

Procedures:

- The identification of the principal concepts.
- The explanation of the vocabulary.
- The classification of the information.

Attitudes:

- To recognize the topics and their place in the activity.

- To create different environments of learning and teaching activities.

-Communication and representation

Concepts:

- The illustration of images and the helping role of the teacher in the correction of mistakes and the appropriate assessment.
- The interpretation of numbers as a way for communication.
- The management of materials that improve their senses.

Procedures:

- To decode information and to apply it by finding answers.
- To design their own progress by discovering their learning status.
- To modify their initial perspectives by changing the proportion and the equivalent part of fractions.

Attitudes:

- Transformation of value judgments of mathematics and English subjects.
- Complementation integral of learning and teaching strategies.

-Materials and resources

Resources:

People: headroom teacher, teacher in charge of the activities, students.

Environmental: the classroom.

Materials:

Provided by the teacher: cards, photocopies, fruits, and workshops.

- Development of the unit: activities

- First week:

These activities have the objective of recognizing the fruits by the analysis of their different shapes, sizes and colors. The classroom is divided in three zones (each of them with one of the topics).

Cooking workshop: fruits.

- Explanation about vocabulary that they need in order to do the activities.

Zone one: Sizes

The students (by groups) classify different types of fruits in four boxes that are located in front of them with the name of specific sizes (Huge, big, small and tiny).

Zone two: Shapes

The students create Origami figures and identify two and three-dimensional shapes according to it.

Zone three: Colors

The cut fruits represent fractions and the students identify which of them is the corresponding for each problem. Then, they compare one fruit with the other one and explain if they are equivalent fractions or if the proportions are equal or different.

- Second week:

The students interpret information and graphed by using bar, pie and line graphs, as well as, pictograms. The classroom is divided in three zones (each of them with one of the topics).

Communication workshop: the survey.

Zone one: Music

The students are in charge of one survey related to genres of music. They ask partners or teachers of the institution for answering the questions. Then, they do a line graph and explain it in front of the group.

Zone two: Food

The students do a survey about favorite food of the students and they complete the empty bar graph with the results, they divide the answers in healthy and non-healthy food. Finally, they do a presentation explaining the results.

Zone three: Clothes

The students ask their partners or teachers of the institution for answering questions about clothes, taking into account the weather and the occasion. Then, they do a pictogram with the information.

-Third week:

These activities address the transitional periods of the day and mathematical problems, which are divided in three zones with different topics (hour, time and dates).

Transition workshop: The clock.

Zone one: Hour

The students solve mathematic problems, each of them has a part of the solution in cards, but they look the other ones that can be place in the blank spaces.

Zone two: Time

The students complete a family tree and they talk about the characterization of their families. In this activity the students use ordinal numbers.

Zone three: Date

-The last activity is connected with this activity because they identify the present, they recognize the benchmark that is in the floor and they organize themselves according to their birthday date.

-To find in a balloon a puzzle that they assemble, this has a multiplication that the students need to solve. The balloons have topics of festivities (Christmas, Halloween) and the groups need to identify the color with the corresponding date in order to know which they need to break.

Appendix 3. Workshops of the didactic unit.

The workshop works one day per week, in the afternoon shift, (on Tuesday).

Workshop done in the first week:

<table>
<tr><td colspan="2">Cooking workshop: fruits (age: nine to eleven years old).</td></tr>
<tr><td colspan="2">Objectives:
1) To link numerical symbols with their corresponding equivalent portion by exemplifying fractions with cut fruits.
2) To distinguish two and three-dimensional shapes by creating figures in cardboard.
3) To represent sizes by ordering images of fruits according to their volume.</td></tr>
<tr><td colspan="2">Contents:
1) Sizes and two-dimensional and three-dimensional shapes.
2) Primary and secondary colors.
3) Fractions.</td></tr>
<tr><td>Materials</td><td>Phases of implementation:</td></tr>
<tr><td rowspan="6">• Fruits.
• Images.
• Scissors.
• Boxes.
• Cards with names.</td><td>The teacher explains vocabulary about fruits, sizes, shapes and colors.</td></tr>
<tr><td>Zone one/ sizes</td></tr>
<tr><td>1) Organize the boxes in different order (small, huge, tiny, medium, and big).
2) Distribute the fruits in their corresponding characteristic.
3) Explain the name of the fruit and the size of this one.
4) Regroup the fruits and the boxes in the initial position.</td></tr>
<tr><td>Zone two/ shapes</td></tr>
<tr><td>1) Put the images in the floor.
2) Categorize the fruits.
3) Explain in which figure is the fruit and if that figure belong to a two-dimensional or three-dimensional category.
4) To return the materials to their original place.</td></tr>
<tr><td>Zone three/ colors</td></tr>
<tr><td>1) Locate the problems that are written in a card.
2) Deduce the fraction by looking the fruit.
3) Make that two fruits have equity and proportions.
4) Organize the place.</td></tr>
<tr><td colspan="2">Evaluation
The students will share their experiences with their partners, talking about which new vocabulary they learnt.</td></tr>
</table>

Workshop done in the second week:

Communication workshop: the survey (age: nine to eleven years old).

<table>
<tr><td colspan="2">Objectives:
• To create a graph by following instructions and applying basic statistics.</td></tr>
<tr><td colspan="2">Contents:
1) Descriptions and explanation of graphs.
2) Music.
3) Clothes.
4) Food.</td></tr>
<tr><td>Materials</td><td>Phases of implementation:

The teacher in charge addresses vocabulary about clothes, music and food (that are mentioned in the surveys).</td></tr>
<tr><td rowspan="3">• Photocopies.
• Images.
• Markers.</td><td>Zone one, two and three</td></tr>
<tr><td>1) Give to the students a survey depending on the zone.
2) Ask the teachers or students of the school about their preferences in music, clothes and food.
3) Recollect the information.
4) Distinguish the answers.
5) Draw a graph.
6) Explain what they understood and how they graph it.</td></tr>
<tr><td colspan="2">Evaluation
Each group is going to do a presentation showing the product of the activity.</td></tr>
</table>

Workshop done in the third week:

<table>
<tr><td colspan="2">Transitional workshop: the clock</td></tr>
<tr><td colspan="2">Objectives:
1) To practice benchmarks by ordering a puzzle that includes vocabulary.</td></tr>
<tr><td colspan="2">Contents:
1) The time.
2) Solving mathematical problems.
3) Benchmarks.
4) Hour.
5) Dates.</td></tr>
<tr><td>Materials</td><td>Phases of implementation:

Introduction about the time. Why it is necessary to talk about the periods of the day, as well as, the space those festivities occupies here in Colombia.</td></tr>
<tr><td rowspan="2">• Photocopies.
• Cards.
• Markers.
• Balloons.
• Puzzles.</td><td>Zone one/ Hour</td></tr>
</table>

	1) Distribute the students by groups. 2) Give them the materials. 3) Disorganize the cards. 4) The students complete the exercises with the possible solutions. 5) They socialize their results.
	Zone two/ Time
	1) The teacher gives the material. 2) Each photocopy has three different generations; they have the opportunity to complete the activity whit their personal experience. 3) They explain the family nucleus by using ordinal numbers.
	Zone three/ Date
	1) Divide the students by groups. 2) Each group has a color (that represents a festivity). 3) The group searches the balloons and they find inside of them the puzzle. 4) They arm the puzzle and give the solution. 5) They write the solution in the whiteboard.
Evaluation To talk to the students of the others zones in order to know what they learn of the activities.	

Appendix 4. General information about data collection instruments.

LOG OF DATA-GATHERING ACTIVITIES			
Date	**Activity**	**Who**	**What**
05/11/14	Observation. Journal.	Third grade students from I.E.D Manuel del Socorro Rodríguez. • English class.	Systemizing the procedures of mathematics class.
05/11/14	Observation. Journal.	Third grade students from I.E.D Manuel del Socorro Rodríguez. • Mathematics class.	Relation between the procedures of the English and the mathematics class.

09/05/15	Test.	Fourth grade student from I.E.D. Castilla.	Testing the reliability of the diagnostic test.
18/06/15.	Test.	Fourth grade students from I.E.D Manuel del Socorro Rodríguez. • English class.	Application of the diagnostic test.
09/ 07/15	Survey.	Fourth grade students from I.E.D Manuel del Socorro Rodríguez. • English class.	Choice of the main subject that supports the other one.
10/09/15	Field notes. Interview. Journal.	Fourth grade students from I.E.D Manuel del Socorro Rodríguez. • English class.	Complement the activities with the application of the first part of the didactic unit.
15/09/15	Journal. Interview. Field notes.	Fourth grade students from I.E.D Manuel del Socorro Rodríguez. • Mathematics class.	Modify the activities with the application of the second part of the didactic unit and interpret the reaction of the students.
22/09/15	Survey. Journal. Field notes.	Fourth grade students from I.E.D Manuel del Socorro Rodríguez. • English class.	To conclude the application of the third part of the didactic unit.

Appendix 5. Journal.

Data collection instrument: journal.
Date: 05/11/14
With regard to the lineaments 1/ it is possible to infer that, in this process of foreign language learning, 2/ the students are in a silent stage 3/ that is why, the students do not understand or speak English 4/. Nevertheless, they preserved 5/ some concepts seeing in the class 6/ and they learn in a repetitive and sequential way 7/. The approach that the teacher used was framed by the traditional paradigm, 8/ likewise, for knowledge-lineal transference 9/. Code: conceptual introduction. 1. Epistemological and pedagogical orientation. 2. Foreign language, English. 3. Starting levels, in which they are not higher interaction. 4. English skills.

Code: knowledge.

5. Conserve and protect.
6. Ideas, reality representation.

Code: structures.

7. Methodology and strategies.
8. Common pedagogical model.
9. Yield information.

Appendix 6. Journal.

Data collection instrument: journal.
Date: 05/11/14
The approach of the class is traditional 1/ and the students have not an active intervention 2/ on it. The prior knowledge 3/ was connected with the content, 4/ but not with the mathematics standards proposal 5/ about the link between the content in real life situations 6/. Code: methodology. 1. Pedagogical approach. 2. Participation in the class. Code: knowledge. 3. Processed information or past experiences. Code: pedagogical concepts. 4. Curricular orientation. Code: practicum. 5. Daily activities that enhance meaningful learning.

Annex 7. Test.

Data collection instrument: test.	
Date: 09/05/15	
What?	Pilot test of the diagnostic test.
Who?	Student of a public school that was coursing fourth grade of elementary school.

How?	The topics were associated to the standards of mathematics and English for fourth grade level.
When?	The exam duration was one hour and it was applied before to introduce the students of the in the project.
Why?	The student was related to the context of the students of the school I.E.D. Manuel del Socorro Rodríguez.
What for?	Reliability of the diagnostic test.
By whom?	The student had an introduction about the objective of the test.

Appendix 8. Test.

SEGMENTATION AND OPEN CODIFICATION	
Data collection instrument: test.	
Date: 18/06/15.	
What?	Test that was modified following the result of the pilot test.
Who?	Fourth grade students from I.E.D Manuel del Socorro Rodríguez.
How?	It was mentioned the topic of persona information, pictograms, bar graphs and fractions, but it was omitted the topic following instructions.
When?	The exam took place in the classroom of the students mentioned in the participant population.
Why?	Because the first observation showed that this kind of population could have concordance abilities with the language.
What for?	To measure the performance of the students in both areas.
By whom?	The test had a warm-up included at the beginning of the activity, likewise, a brief introduction of the topics.

Appendix 9. Survey.

SEGMENTATION AND OPEN CODIFICATION	
Data collection instrument: survey.	
Date: 09/ 07/15	
What?	The higher perception referring to the mathematics and English subject.
Who?	Students from the institution that are coursing fourth grade of elementary school.
How?	Which of the subjects were their favorite one and the reason for that decision.
When?	This data collection instrument was applied in a range of time of ten minutes, individually and it was filled by twenty-six students.
Why?	The students asked why was done the survey, because it was not usual their opinion for the construction of activities in the classroom.
What for?	The survey was done with the objective of identifying which subject was the preferred by the students.

By whom?	Warm-up before to start the application of the survey.

Appendix 10. Field notes.

Data collection instrument: Field notes.
Date: 10/09/15
The classroom counts with thirty-two students 1/ and the noise outside causes 2/ that the students concentration 3/ stay in a different course, 4/ for that reason, it is possible to say that they have a low level of attention during the classes. 5/ The violence in the classroom environment is evident, 6/ because the relationship between the students is not polite. 7/ In addition, the students are not independent, 8/ so they use to wait for a specific instruction 9/ all the time 10/. Code: population context. 1. Identification of the quantity of students. 2. Sensory stages. 3. Students' conditions. Code: standards. 4. Reach of the competence. Code: interventions. 5. Difficulty for following rules of coexistence. 6. Physically or verbally attacks. Code: behavior interference in learning processes. 7. Students with traditional paradigms, where the teacher is the center of the class. 8. Regulating orders. Code: transitions. 9. During the majority of the class.

Appendix 11. Journal.

Data collection instrument: journal.
Date: 10/09/15
The organization of the classroom represented 1/ difficulty 2/ in the starting of the implementation 3/ because they usually do not work in groups. 4/ Then, the students received

an introduction 5/ about the vocabulary 6/ and the content, 7/ since they were not related to the topics, 8/ neither in mathematics nor in English 9/.

Code: environment.

1. Planning and organization of room.

Code: state of the situation.

2. Disgruntled about the convenient condition for the activity.
3. First session of the didactic unit implementation.

Code: methodology.

4. Individual learning.
5. Explanation.

Code: curriculum.

6. Repertoire of words that the student remembers of their prior English classes.
7. The subject-matter, including English and mathematics implications of the level.
8. Prior standards achievements in mathematics and English area.

Code: characterization.

9. Subjects in which is the emphasis.

Appendix 12. Non-structured interview.

Data collection instrument: non- structured interview	
Analysis unit: lines.	
Context: Fourth grade students from I.E.D Manuel del Socorro Rodríguez.	
Date: 10/09/15	
Fragment: 00:01s – 01:03 s.	
1. Student 1: "what we learned today was <u>that</u> fractions '.emm' (laughs) ... that 'um' with fruits we did fractions, we did figures, we did many things and we had so much fun". 2. Student 2: (laughs) "I learned that (laughs) (0.2) with the fractions of the fruits, to separate lower and higher and the (0,1), how do you say this? The…" 3. Interviewer: [figures?].	- The student 1 started to mention her experience without asking her any question. - This student expresses her opinion and feelings about the activity. - Student 2 talked about the experience in terms of content and practice.

4. Student 2: "yes or the other figures that teacher Erika taught us '.emm'. it was as a triangular cube, so cool". 5. Interviewer: well… and (0,1), what did you learn in English? 6. Student 1: "we learnt the numbers in English '.em' how do you say that? '.emm' the other numbers, how do you say…?" 7. Student 2: ['.em' the numbers…(0,1)] 8. Interviewer: [ordinals?]	- The interviewer helps the student with concepts. - Student 2 tried to categorize the figure with names. - The interviewer asked a question about knowledge. - Student 1 learnt the numbers but not the name used to denominate them. - Clarification from the interviewer

Appendix 13. Journal.

Date: 15/09/15			
Study	**Participants**	**Data collection instrument.**	**Example of the unit**
Study about the advance in the speaking production by students regarding vocabulary.	Fourth grade students from I.E.D Manuel del Socorro Rodríguez. • Mathematics class.	Journal.	• "Aquí en *scarfts* nos dio *three*, que era la opción a". • "*Gloves* nos dio cero, entonces no pusimos nada acá". • "En la *c* que es *boot,* que significa botas, que nos dio *one* y en la d nos dio *six*".

Appendix 14. Non-structured interview.

Data collection instrument: non- structured interview	
Analysis unit: lines.	
Context: Fourth grade students from I.E.D Manuel del Socorro Rodríguez.	
Date: 15/09/15	
Fragment: 00:03s – 00:40 s.	
1. Student A: "Well, I learnt today how to write graphs in English and… I had a great time	- Mathematics was the focus point but the student introduces

in the English class. When we did groups and we did the poster. When we went to ask the questions too, I asked the cleaning lady". 2. Interviewer: which survey did you do? 3. Student A: of… about food.. '.um'. 4. Interviewer: food? And which vocabulary did you learn? 5. Student A: '.em' I learnt how to say *candies, chicken*…	the importance of English in the activities. - The interviewer asked a question in order to clarify the specific situation of the student by continuing with a question of knowledge. - The student tries to pronounce in a correct way the new vocabulary he learnt.

Appendix 15. Field note.

Data collection instrument: field note.	
Date: 15/09/15	
What?	Product created by the students and applying to the new vocabulary.
Who?	Fourth grade students from I.E.D Manuel del Socorro Rodríguez in a mathematics class.
How?	The topics were the survey and graphics, which underlies related topics.
When?	The activity spent one hour and thirty minutes.
Why?	The students interacted with other people and they used the language outside the classroom.
What for?	This study involves the evidence of the integration in group learning by the application of both subjects by using new vocabulary.
By whom?	The students were contextualized with the topics of each survey and they did the activity with constantly monitoring strategies.

Appendix 16. Survey.

Data collection instrument: Survey.	
Date: 22/09/15	
What?	Preference and contributions after the activities.
Who?	Fourth grade students from I.E.D Manuel del Socorro Rodríguez in an English class.
How?	What was their favorite activity during all the process and why.
When?	The activity spent one hour and thirty minutes.
Why?	The students had independent learning and their opinion encourages the final goal of the action research method that evolves the constant improvement of investigation and contribution for the institution.
What for?	To identify which moment was more significant for the students and to analyze if they had an important change in these areas.

By whom?	The students had freedom for developing this activity, because they could give their views.

Appendix 17. Journal.

Data collection instrument: journal.
Date: 22/09/15
The students showed interest in the puzzle. 1/ They spent enough time to assemble it, 2/ without the common interruptions 3/ and they built the mathematical exercises. 4/ They mentioning, 5/ solved 6/ and expressed them 7/ (with the help of the teacher) in English. 8/ The group work 9/.improves 10/ by comparison with the first session 11/. Code: analytic activities. 1. Interface between mathematics and its influence in English. Code: procedure. 2. Commitment, engagement, undertaking, compromise. 3. Decreased in failures activities. 4. Step by step construction between prior knowledge and the production of new meanings. . 4/ They mentioning, 5/ solved 6/ and expressed them 7/ (with the help of the teacher) in English. 8/ The group work 9/.improves 10/ by comparison with the first session 11/. Code: speaking production. 5. To refer and remember specific vocabulary. 6. To make use of a language to manifest an idea. 7. To share an opinion following specific characteristics. Code: strategies. 8. Collaborative learning. 9. To be better in some activities. 10. The didactic unit was arranged following the necessities of the context.

Appendix 18. Field note.

Data collection instrument: Field note.	
Date: 22/09/15	
What?	The evidence of the use of the new vocabulary.

Who?	Fourth grade students from I.E.D Manuel del Socorro Rodríguez in an English class.
How?	To build a puzzle and to identify the expressions for talk about the result.
When?	The activity spent one hour.
Why?	The students developed analytical thinking without leaving aside the speaking competence.
What for?	To conclude the application of the third part of the didactic unit by evaluating the students with different activities.
By whom?	Puzzle with mathematical operations. Organization of cards with benchmark topics.

Appendix 19. Characterization of action research.

Characterization of action research.

✓ *Integrated*	**Conducted as part of a teacher's normal daily practice.**
✓ *Reflective*	A process which alternates between plan implementation and critical reflection.
✓ *Flexible*	Methods, data and interpretation are refined in the light of the understanding gained during the research process.
✓ *Active*	A process designed to generate change in small steps.
✓ *Relevant*	Meets the needs of teachers and their students.
✓ *Cyclical*	Involving a number of cycles with each clarifying issue leading to a deeper understanding and more meaningful outcomes.
✓ *Focused*	On a single issue of school improvement.
✓ *Collaborative*	Teachers and leaders working together to improve student outcomes.
✓ *Planned*	An organized approach to answering a question.