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THE BENEFITS OF A BILINGUAL BRAIN: A STUDY FROM THE
PESPECTIVE OF BILINGUALS

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ABSTRACT

According to the Oxford dictionary of English grammar the word "Bilingual" is an adjective that means "to be able to speak two languages fluently" (pg. 49). This is a simple definition. However, there are many definitions to this subject, Baker (2001), Bloomfield (1983), and Dielbold (1961), for example have their own definitions of Bilingualism, but each one with its particularities. For many, bilingualism is a mere linguistic ability, which helps speakers to have the opportunity to speak more than one language. To enhance this vision, the purpose of this work is to show that bilingualism can positively affect people who have these skills, helping them in social and cognitive aspects. With a theoretical framework based on the works of Baker (2001) and Garcia (2009), the present study investigates the benefits that bilinguals acquire while inserted in a bilingual environment, the main hypothesis is that because of this environment, people have more advantages in areas such as leadership, logical-mathematical skills and social skills, not that bilingual people are smarter than the others, but because of that ability they are more predisposed to acquire knowledge. To better understand this phenomenon a research was carried out with the parents of a bilingual school in Joao Pessoa, as their children are inserted in a bilingual context, the parents answered questions according to their own perception of their children.

Keywords: Bilingualism, Advantage, Cognitive Skills, Social Skills and Context

RESUMO

De acordo com o dicionário de Oxford da gramática inglesa a palavra “Bilingual”, no inglês (bilingue, em português) é um adjetivo que significa, “ser capaz de falar duas línguas fluentemente” (pag. 49), esta é uma definição bem simples de bilinguismo. Além desse conceito existem muitos outros, autores como Baker (2001), Bloomfield (1983), e Dielbold (1961) tem suas próprias definições de Bilinguismo, mas cada uma com suas particularidades. Para muitos o bilinguismo é uma mera habilidade linguística, que ajuda os falantes a terem a oportunidade de falar mais de uma língua, porém para engrandecer essa visão o propósito desse trabalho é mostrar que o bilinguismo pode afetar positivamente as pessoas que possuem essas habilidades, ajudando-as em aspectos sociais e cognitivos. Com uma parte teórica baseada nos Trabalhos de Baker(2001) e Garcia (2009) ,O trabalho tem o objetivo de investigar os benefícios que os bilíngues adquirem enquanto inseridos em um ambiente bilíngue, a principal hipótese é que, por causa desse ambiente, as pessoas têm mais vantagens em áreas como liderança, habilidades lógico-matemáticas e habilidades sociais, não que as pessoas bilingues sejam mais inteligentes que as outras, mas sim porque são mais predispostas a adquirir conhecimento. Para entender melhor esta teoria uma pesquisa foi feita com os pais de uma escola bilingue de João Pessoa, pois seus filhos estavam inseridos em um contexto bilingue, os pais responderam perguntas de acordo com a sua própria percepção de seus filhos.

Palavras Chave: Bilinguismo, Vantagem, Habilidades Cognitivas, Habilidades Sociais e Contexto

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1 - INTRODUCTION

As human beings we are always trying to reach the best for ourselves. And to do so we are always creating new technologies to reach that goal, what is sometimes left aside is our own capacity to reach that goal without any of these high technologies. We can use our minds to reach that goal. Nowadays globalization gives us the opportunity to have more knowledge sources what allows us to learn different things, one of these is a second language. On this stand, we start to train our brains to become bilinguals, but what does it mean to be bilingual? And how does that help us to be a better self? This work aims at discussing bilingualism, more specifically, how a bilingual brain benefits in both cognitive and social aspects of an individual's life. Bilingualism may bring advantages to a learner/speaker, in this sense, this project will investigate the benefits of being in a bilingual environment, demonstrating this phenomenon through real-life situations and, In this case, bilingual teaching in schools and how this teaching affects students' lives.

According to Skinner (1957) children are like “empty vessels” that language must be “put in to”. He believes that children will learn by being conditioned and exposed to a context where a given language is spoken. The author adds saying that language acquisition will only happen through imitation. On another hand, Chomsky (1959) does not agree with Skinner and says that parents do not need to coax a child to learn a language because it will happen on its own. He claims that all human beings are equipped with what he calls a Universal Grammar which builds the basis for all languages, on top of that, all humans possess that natural and biological feature to learn a language by themselves. Because of that even people that do not know how to read or write will still be able to speak in a coherent way. According to him, this grammar is a natural language device which will be active when the child feels the need to communicate so that means that there is no need of formal teaching for first language to be learned.

In this sense, we may conclude that a child learns his/her first language in a natural process, only by the fact of being exposed to it. So, if we think that a child can learn one language why not two or more languages in the same process. Thus, if a child is exposed to more than one language, s/he will likely learn both languages.

Raising a bilingual child requires effort from the parents. They need to expose the child to both languages in different situations from birth, as mentioned before a child's brain is prepared to receive any language that it is exposed to. Therefore, language

acquisition of both languages -first and second - will happen simultaneously and eventually the kid might mix both languages in the same phrase up to when they are conscious of the fact that those are different languages. Such phenomenon happens as it is a natural process, and as so children will not notice that they are learning two languages simultaneously, and that is what we may refer to as bilingualism.

Bilingualism can have many definitions. For Baker (2001) bilingualism is the language ability in two languages; for Bloomfield (1983), it is a native- like control of language, Haugen (1953) considered that even a small proficiency is a trace of bilingualism and Dielbold (1961) on the other hand believes that bilingualism is essentially sociological, he suggests that when a speaker from one language encounters another language, he will learn that language. What calls attention is the fact that Diebold places bilingualisms as a social factor because when we consider that language acquisition is a natural process for a child, for example, we can consider the social context as the environment that a child is going to learn that language.

Every context is important and influences the language learning process. This paper will look at a study that was carried among parents from a bilingual school in João Pessoa, with the purpose of analyzing whether they could see, with no theorical input, some behavior changes and/or increase of cognitive skills, they answered questions about their children and how the bilingual school environment affects the lives of these children out of school.

To get to the idea for this work a study done in Papua nova guinea was used as a reflection point on the effects of bilingualism in the mathematical logistic skills, and this made us reflect if bilingualism could affect other areas of cognition. Throughout this paper many advantages of bilingualism will be point out, besides language. Today a rising number of bilingual schools in Brazil can be found, there are many parents who are interested that their children have a bilingual education, because of that Flory (2009) says:

“Atualmente, é crescente o número de pais brasileiros que escolhem uma educação bilíngue para seus filhos, sendo que, geralmente, a segunda língua escolhida é o inglês. Nesse contexto, surgem escolas de

imersão em inglês, com o intuito de que a criança cresça bilíngue, mesmo que não fale a segunda língua em casa.”¹

This quote gives us the idea of what context Brazilian students are living in, and it confirms the idea that the English is globalized language as stated by Melitz (2016), in his Paper “English as a Lingua Franca: Facts, Benefits and Costs”, where he talks about how far English went and how further can it go as a language with an economic advantage. It also makes us reflect on the idea that bilingualism has its advantages as there are more and more parents adhering to this mode of study. To add to this Garcia (2009) says:

“Many bilingual education programs in the world today are either for the social elite (for instance, many international schools like the Lycée International de Saint Germain-en-Laye [...]), or for deprived immigrants or refugees requiring temporary bilingualism for transition to the majority language (for instance, transitional bilingual education programs in the U.S.). Yet many bilingual schools can, and do, cater for populations of mixed social backgrounds with no more problems than those faced by similar monolingual schools.” (Pg. 139)

Even though bilingual schools are seen as a choice for a certain type of population, there are many schools that are accessible to the population, for example the Dom José Maria Pires school, which is a public school in the state of Paraíba.

After this introductory session, this research is divided into 3 more chapters. Chapter 2 conceptualizes and theorizes Bilingualism, also talks about the study that led to the research of this paper, that was done in Lae, Papua New Guinea that helps us to reflect about how bilingualism affects children thus being a theoretical basis for the study. Chapter 3 will analyze the data gathered in this research. why it is relevant, to do that some questions were asked, they were: 1- does being in a formal bilingual context influence children's skill?; 2 - what are the skills, other than language, that parents observe in their children's behavior? And 3 – Does bilingualism really brings a tangible

¹ Translation of the quote – [Nowadays, there is a growing number of Brazilian parents who choose bilingual education for their children, and the second language chosen is usually English. In this context, immersion schools emerge in English, with the intention that the child grows bilingual, even if he does not speak the second language at home.]

advantage?. These questions will guide the research, so that at the end of the paper, the answers may be found. And finally, the last chapter - Chapter 4, presents some final considerations, limitations of this study and suggestions for further research.

2 – BILINGUAL BRAINS, BUT WHAT IS BILINGUALISM?

2.1. A GENERAL OVERVIEW OF BILINGUALISM

Every time we hear the word “bilingual”, we automatically think of something related to language, as bilingualism is closely related to language. However, the purpose of this research is to demonstrate the extent to which bilingualism is not only about language, it also implies how we react to that language. Several theorists (Peal and Lambert, 1962; Cummins 1976; Harmers and Blanc 1983; Hernandez and Costa 1983; Dawe, 1983) propose that the brain of bilinguals may have advantages over monolingual brains, such as decision making, code switching and even mathematical skills. Though, before proceeding into that discussion, we need to define what bilingualism is.

According to Baker (2001) bilingualism is not simply the knowledge of two languages, but it is also the way a person uses a language in each and every context, for him a person may be able to speak two languages but one of the languages will lack something. One language can be used for conversation for example and the other can be for reading skills, because of that Baker (2001) distinguishes between “language use” and “language ability”. Thus, according to Baker (2001) “Some bilinguals may be fluent in two languages but rarely use both. Others may be much less fluent but use their two languages regularly in different contexts. Many other patterns are possible” (pg. 15).

Baker (2001) places bilingualism as having two dimensions, namely, (a) the elective bilingualism: a person chooses to learn a second language in schools or courses for example; and (b) the circumstantial bilingualism: a person is forced to learn a new language because of the circumstance, for example a war refugee that has to leave his country and ends up in a place that uses a different language. He argues that:

“Elective bilingualism is about choice. Circumstantial bilingualism is often about survival with little or no choice. The difference between elective and circumstantial bilingualism is thus valuable because it immediately raises differences of prestige and status, politics and power among bilinguals.” (pg. 04)

Bilingualism, therefore, can happen in different ways, sometimes for need, and sometimes as a matter of choice, however both are beneficial for the brain's development, the context that someone is inserted in can change that person in many ways, circumstantial bilingualism for example, may happen for different reasons. And from the context it is possible to consider the situation that these people are situated which interferes in the way that bilinguals learn. For instance, if a refugee family goes to an English-speaking country, it is possible that they have gone through experiences that will affect their learning process, these might be good influences such as trying to learn fast to settle in that new place, or these factors might generate resistance in order to maintain their origins. So, circumstantial bilingualism is used by people as a social tool of interaction in a foreign country.

To add to that idea Garcia (2009) discusses cognitive and social advantages of bilingualism, she states that "[...] language practices are socially constructed, the benefits of bilingualism are often maximized or diffused depending on external social and linguistic factors" (pg.94). On another note, Garcia also emphasizes the importance highlighted by Baker, that is, context will mark the language. Garcia divides the cognitive advantages in four parts: 1) Metalinguistic awareness; 2) Divergent thinking; 3) Communicative sensitivity; and, 4) Ability to learn multiple languages.

Garcia (2009) (*apud*. Tunmer, Pratt, and Herriman, 1984, pg. 12) says that "metalinguistic awareness is the ability to treat language as an object of thought" (pg.95), this awareness makes people understand the language in its entirety, not only its structure or grammar, but also its meaning. She mentions several authors who talk about that, but, narrowing it down, this can be summarized as:

"In 1961, Leopold, studying the development of the bilingualism of his daughter Hildegard, attributed her ability to recognize and appreciate the arbitrary nature of meaning, that is, the looseness of the link of word and meaning, to her bilingualism. Ten years later, Lanco-Worrall (1972) confirmed the bilingual children's greater word awareness, as bilingual children were more willing to change the names of objects than monolingual children. When asked, "Which is more like cap, can or hat?", bilinguals tended to respond to meaning, monolinguals to sound. Lanco Worrall concluded that bilingual children's semantic development happened faster than that of monolingual children." (pg. 95)

With the above examples, it is possible to say that bilinguals see words and their meaning and that impacts their critical thinking, sociolinguistic interaction, since the ability to read a sentence and see what is written between the lines is of utmost importance to create that awareness. On top of that she concludes saying that “[...] because bilingual children see words printed in separate ways, they are capable of faster understanding the symbolic representation words in print” (pg. 96). This faster understanding is one of the benefits that a bilingual brain has on an individual.

Divergent thinking is another benefit that Garcia (2009) discusses, that is, bilinguals have the ability to *divert* and *create thinking* which means that they are able to create more. The author gives an example based on Baker (2001) which demonstrated that when a bilingual is questioned about different ways of using a tin can, for example, bilinguals tend to have more answers, Baker states:

Divergent thinking is investigated by asking questions such as: ‘How many uses can you think of for a brick?’; ‘How many interesting and unusual uses can you think of for tin cans?’; ‘How many different uses can you think of for car tires ?’. On this kind of question, the student has to diverge and find as many answers as possible. For example, on the ‘uses of a brick ’question, a convergent thinker would tend to produce a few rather obvious answers to the question: to build a house, to build a barbecue, to build a wall. The divergent thinker will tend to produce not only many different answers, but also some that may be fairly original: for blocking up a rabbit hole, for propping up a wobbly table, as a foot wiper, breaking a window, making a bird bath (pgs.144-145).

For him the answer is more creative and elaborated. Because they are exposed to different languages, their knowledge increases, they begin to understand the world with a greater complexity, once they understand that there are more than one language and that they are different from each other, Divergent thinkers open their minds to new possibilities that monolinguals or convergent thinkers do not do.

The third cognitive benefit is the Communicative sensitivity. This means that bilinguals are more sensitive to the messages, due to constantly making linguistic choices in each situation they live in and it helps them to understand others from different contexts. Finally the last cognitive advantage is the ability to learn multiple languages, Garcia (2009) points out that because bilinguals are experienced learners it is easier for

them to learn a third language, they know already their own style of learning and as such they understand their own limits so this does not imply a problem when given the opportunity of learning a third language, for example.

In looking at the cognitive benefits discussed above, it leads one to believe that a bilingual brain is more capable of innumerable things, but beyond cognitive skills, bilingualism also offers other social benefits. These social benefits are ranked by Garcia (2009) in 5 categories:

- 1) Socioeconomics Benefits;
- 2) Global Interactions;
- 3) Local Interactions;
- 4) Potentializing “acts of identities”;
- 5) Culture awareness and construction.

Before going into these categories, Baker (2001, *apud*. Ferguson et al. 1977) stresses ten aims of bilingualism. These aims are relevant for the present paper as they are related to the social benefits of bilingualism, it is important to understand that bilingualism has an important role in some societies, so it's significant to be acquainted with each one:

- 1) To assimilate individuals or groups into the main stream of society; to socialize people for full participation in the community.
- 2) To unify a multilingual society; to bring unity to a multi-ethnic, multi-tribal, or multi-national linguistically diverse state.
- 3) To enable people to communicate with the outside world.
- 4) To provide language skills which are marketable, aiding employment and status.
- 5) To preserve ethnic and religious identity.
- 6) To reconcile and mediate between different linguistic and political communities.

- 7) To spread the use of a colonial language, socializing an entire population to a colonial existence.
- 8) To strengthen elite groups and preserve their position in society.
- 9) To give equal status in law to languages of unequal status in daily life.
- 10) To deepen understanding of language and culture.

These aims together with the 5 categories exposed previously will be discussed in the following subsections.

2.1.1 Socioeconomics Benefits

Bilingualism itself can ‘bond’ two nations, considering English, for example, which is a very important language in areas like business, communication and even social interaction, Garcia mentions a study conducted by Portes and Rumbaut (1996, 2001 a, b) on what they called process of *selective acculturation* where immigrants, who were trying to adapt to their new life, made cautious choices about their language. About that Garcia expresses that:

[...] when ethnic networks and strong communities support children to deal with prejudice, navigate the education system, and find a place in the labor market for the ethnic language, bilingualism can bring equal, if not greater, benefits.

This statement makes us think about how important socioeconomic factors are, and how issues like immigration and education, in this case, may affect language and that is one of the reasons we cannot see language just as language used to communicate but also as a social practice. Besides, and according to the aims of bilingualism mentioned before, the fourth statement “To provide language skills which are marketable, aiding employment and status” fits perfectly with this idea because bilingualism is also a social practice that can spread and create cultures as a way of breaking barriers.

2.1.2 Global Interactions and Local Interactions

With globalization being a reality, people tend to be more in touch with each other, Garcia (2009) says that “The ability to communicate flexibly, through different media,

and in more than one language is increasingly important in today's globalized world". This is important because according to her, the ability of writing and reading are very important, to the world's social, political and economic aspects. Bilingualism narrows the distance between people and the world, not only because of language skills, but also because of the social interaction and cultural awareness that it promotes. However, Garcia (ibid) also argues that bilingualism is not enough for that interaction, people that face bilingualism need to be familiar with the codes and different speeches in each context and related areas, the author states that

“The need is no longer to be dominant in two languages, but rather to be familiar with many discourse modes and codes. Translanguaging has become essential to participate in global and local interactions. For example, it is important to be able to read in one language and speak in another, or vice versa. It is also important to be able to switch between codes, to translate, to be able to mix and choose appropriate norms.” (pg. 95)

By Translanguaging Garcia (2009) means that “Translanguaging are multiple discursive practices in which bilinguals engage in order to make sense of their bilingual worlds” (pg. 45). And again making a connection with the aims of bilingualism we could say that the 1st, 2nd and 3th aims, which are (i) To assimilate individuals or groups into the main stream of society; to socialize people for full participation in the community; (ii) To unify a multilingual society; (iii) To bring unity to a multi-ethnic, multi-tribal, or multi-national linguistically diverse state and To enable people to communicate with the outside world, respectively, can fit with this idea of global interaction, because it promotes that interaction.

Local infractions benefits are quite similar to the global ones, the difference being the ability that bilinguals have to talk to people that surround them, such as parents, relatives, friends, caretakers, etc. Technology has been a great ally in matters of communication, bilinguals have the ability to use that technology to strengthen their relationships with relatives that are far away and even have a different culture. And these interactions leave the local scale and turn global as they gain visibility and importance.

2.1.3 Potentializing “acts of identities”

Language contributes greatly to someone’s identity, language will say important things about a person and about a nation, Garcia (2009) says that “A multiple identity developed through participation in different communicative networks gives children the possibility of developing more broadly, of drawing from many multiple perspectives”. That is no doubt that when someone has multiple perspectives of the world around them, their concepts of respect, empathy and many other social abilities will be broader. It is, then, possible to parallel this idea to the 5th, 6th and 7th aims, as they combine because in the search of their identity people often find themselves leaning about their own experience with religion, political and social aspects of their lives.

2.1.4 Culture awareness and construction

Today cultural competence is considered an addition for learning skills. Many studies have shown that culture is always affecting and changing language, Baker (2001), for instance, says that this adds to what he calls *inner thinking*. According to him, inner thinking is the ability to see the context around that language, that means the cultural aspects that are within that language and in the case of bilinguals, both 1st and 2nd languages. Garcia shows a study carried out in Singapore held by Baetens Beardsmore (1994), where he identifies four aspects of cultural competence, they were: knowledge, feelings, behavior, and metacultural awareness. Each of these aspects brought different perspectives to bilingualism.

Knowledge is considered a cognitive feature, that is, it provides skills which gives the speaker knowledge about cultural aspects which includes things like language, tradition history and institutions. *Feelings* are the “affective components” (ibid. pg.100), that means, the ways through which individuals are able to find their identity through culture. *Behavior* is related to the ability of acting according to what the culture “states”, meaning that culture influences people’s behavior. Finally, there is *metacultural awareness* that is understanding, respecting and tolerating cultural diversity.

The socioeconomic benefits bring a broader idea to what bilingualism may offer to people. Garcia (2009) argues that “Bilingualism enables individuals to become aware of differences in culture, as well as to construct their own hybrid culture that enables them to negotiate both cultural systems” (pg. 101). This is important to notice because bilingualism is a reality in many countries today and those people who are bilingual are

creating their own culture and that is why being bilingual is important for them. With that idea, considering Brazil as a monolingual country, bilingualism becomes important so that people have a greater knowledge of world meaning as they learn about new cultures and the ways in which this may influence their own culture. We see for example how Brazil's culture becomes more popular every day because of the internet. The study will see how bilingualism affects children from a community in Brazil.

2.2 BILINGUALISM IN PAPUA NEW GUINEA

This subsection talks about the study that led to the main research for this paper, an study held by Clarkson and Galbraith (1992) in Papua New Guinea, who based on the study of Cummins (1979, 1987) about the *threshold theory* and balanced bilingualism, this investigation aimed at demonstrating how bilingual students with a higher level of proficiency, would have greater results in mathematical tests. To do so the researcher started looking into the contexts students were inserted in. The idea that people that lived in bilingual environment could have those abilities, raised one question, can people that attend to bilingual school have the same achievements? And more not only with mathematics but also in other areas of cognition. That is why this study is on this paper, because it led to the whole research that will be exposed and analyzed in chapter 3.

2.2.1 Mathematics and Language

Papua New Guinea is a small country in the continent of Oceania and is a former Australian colony that has been independent since 1975. More than 700 world's languages are spoken in there, English is one the official languages together with Melanesian Pidgin, also called Tok Pisin, according to an written by Jackson and Standish (1999) published at the Britannica encyclopedia Tok Pisin is a creole language that is combined with English and German, and Police Motu. Despite being a multilingual country, it is not only language that occupies an important status in the educational curriculum According to Clarkson and Galbraith (1992) mathematics is also a fundamental part in Papua New Guinea's educational curriculum. This being so, the authors conducted a study to test Cummins two hypotheses, namely: (i) the *threshold hypothesis*; and (ii) the *developmental interdependence hypothesis*.

The threshold hypothesis (Cummins, 1976) discusses the idea of a *balanced bilingualism*, that is, when something is balanced, or more to the point, bilinguals are balanced between two contexts of learning environment. In order to achieve the balance that is required by the languages, two thresholds can be considered, both at a language competence level. According to Baker (2001) “The first threshold is a level for a child to reach to avoid the negative consequences of bilingualism. The second threshold is a level required to experience the possible positive benefits of bilingualism.”(pg. 167) , this can also be considered as *subtractive* and *additional environments*. The cognitive advantages are reached when the upper threshold is exceeded says Clarkson, (1992, *apud* Cummins 1976), meaning that when a person is able to keep balance between two, the cognitive benefits begin.

With the overview of this perspective a question comes up, what this has to with mathematics? To answer this question Clarkson says “Cummins's theory is general in nature and not restricted to mathematics. However, it predicts consequences for mathematics learning (Cummins, 1979), and a number of mathematical education studies have used these ideas.” (pg. 35). Many authors argue that the greater a student has in language proficiency, higher are the chances of getting better results in mathematical tests (e.g. Dawe 1983; Cathcart 1980, 1982; Hernandez 1983; Tuck 1983).

According to Clarkson and Galbraith (1992) the purpose of their research was to investigate the role of mother language and English in student’s mathematical attainment. To do so, they posed two guiding questions:

“First, do Papua New Guinean students in grade 6 who show higher competence in both their original language and English have higher levels of achievement in mathematics than other students? Second, do students who have lower competence in their original language and English have lower levels of achievement in mathematics”

These questions would help them understand and analyze the results later on the research. There was an implicit supposition that language ability affected also other abilities as well, like logical thinking, and fast thinking for example, and to work with mathematical problems, these skills are very useful.

2.3.2 The Method used

Their sample was composed by 227 students from the 6th grade. These students were enrolled in urban primary schools. English was not their first language in the language they used mainly to communicate outside classes. English was their medium of instruction as Clarkson and Galbraith (1992) clear when they that “English was the language of teaching”(pg.37), that means that they only spoke it in class and as such it is believed that students would have a good level of English. It is important to bring into mind that to be considered balanced bilinguals, meaning that they would have cognitive advantage, the students needed to have a good proficiency in both languages, in this case Tok Pisin (Melanesian Pidgin) and English.

The instruments used were tree types of tests: (a) *a general mathematics test*; (b) *a test composed of mathematical word problems* and (c) *a number competence test*. The scores obtained in each test by each student were analyzed by the authors.

The *General mathematics test* consisted of a 20-question quiz with different kids of question selected from the 6th grade syllabus, the figure bellow is an example of how the test was, and what kind of questions students would find in their tests.

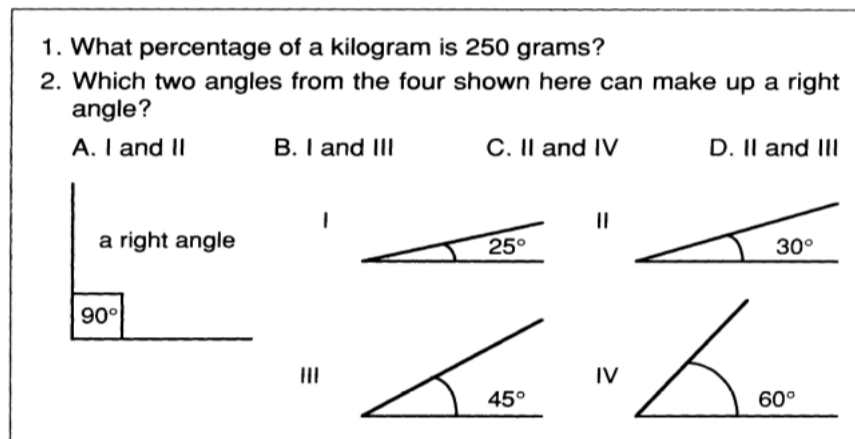


Image 1. Sample Items from General Mathematics test, courtesy from Philip C. Clarkson and Peter Galbraith

As shown by the figure, the first questions were straightforward, this meant that the students knew what to do in each question without having to interpret a mathematical problem, which means that students would, instantly, understand what the question wants just by reading it.

The next kind of question, on the other hand, was *a test composed of mathematical word problems*, they are the famous “Math Problems” that we are all familiar with. The researchers would test not only mathematical skills but also interpretation and language comprehension. Here is sample of these questions:

“Danny had some biscuits. He gave his friend four biscuits and kept the same number for himself. How many biscuits did Danny have at the start if there were none left over? One cup of milo holds 230 ml. How many ml will there be in five of these cups altogether?” (pg. 36)

A *Number competence test* was also held, and was composed by 25 questions with basic operations like $250 \times 32 = ??$, $268 + 332 = ??$. There were also 5 questions about fractions. The purpose of that test was to see and understand how language skills would affect children interpretation of each question. In other to solve the problems, the assumption for analyzing this type of question was that kids with higher language proficiency would score higher in this type of math test.

2.2.3 What Papua New Guinea bilingualism revealed

For investigative purposes, the researchers divided the children in three language categories considering both of student’s languages - Tok Pisin (Melanesian Pidgin) and English - the categories were: (i) High/high (both languages with high level of proficiency); (ii) One dominant (one of the languages overcoming the other); (iii) and Low/low (both languages of a low proficiency). The results are displayed are in the table below:

Table 1: General scores on the math tests, Clarkson and Galbraith (1992)

Table 1
Means, Standard Deviations, Adjusted Means, and F Values
for the Three Categories of Language for the Three Tests of Mathematics Achievement

Test	Maximum possible	Language category			F
		High/high	One dominant	Low/low	
General Math	20				
M		14.08	12.32	8.34	
SD		3.15	3.08	3.16	
Adjusted M		13.76	11.96	9.12	17.05*
Word Problem	20				
M		14.92	14.28	8.40	
SD		2.65	3.27	3.64	
Adjusted M		14.53	13.89	9.29	27.00*
Number Competence	25				
M		22.33	21.33	16.71	
SD		2.24	2.82	5.41	
Adjusted M		22.07	20.88	17.60	12.92*

Note: $n = 24$ for the high/high group, 72 for the one dominant group, and 41 for the low/low group except for the Mathematics Word Problem Test for which $n = 42$ for the low/low group.
* $p < .05$.

As we can see the students that were in the categories High/high were the ones who had the highest scores in the general math test where the maximum score was 20. The High/high scored an average of 14.08; the One dominant had an average of 12.32 and the Low/low categories scored 8.34. The same pattern was found in the following tests: the word problem test, where the scores from the highest to the lowest was 14.92, 14.28 and 8.40 out of 20; and the number competence test with scores of 22.33, 21.33 and 16.71 out of 25 representing the High/high, One dominant and Low/low respectively.

Although very small there is still a difference between High/high and One dominant, that is, due to bilingualism the children did better in their exams. Referring to the results, Clarkson and Galbraith (1992) stated that:

Some may argue that the higher mathematics scores and the high competence in both languages are all simply aspects of greater intelligence. The use in the study of a recognized and culturally appropriate measure of general intelligence as a covariate may have strengthened the results. None was available to the authors. However, the authors are confident that the test of cognitive development used in this study accounted for much of the variance in the dependent variables that a measure of general intelligence would have accounted for (pg.42)

Something that is being recurrent in this research paper is that the focus here was not on students' grades, nor on their linguistic proficiency, but how the linguistic proficiency helped their performance at the mathematical tests, it was observed that

students who had a higher linguistic proficiency were able to reach higher grades in the tests, this shows that this proficient has helped them to be willing to acquire knowledge. So if it helped them in mathematics, probably it will help in other areas of cognition, that study of the next chapter will show if it is possible and in which areas bilingualism might affect.

3 – CASE OF STUDY

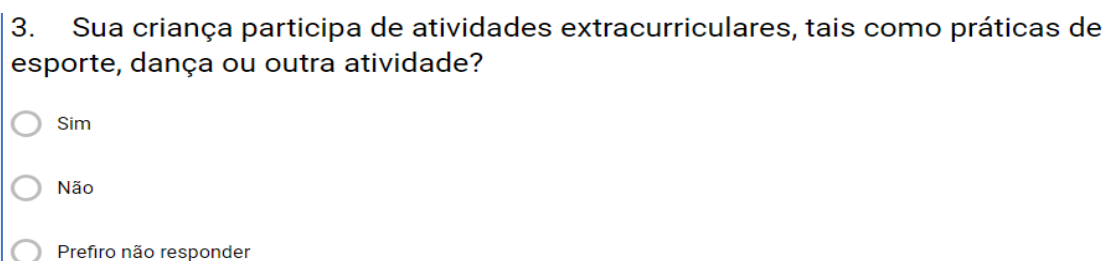
This study was held in a Portuguese/English bilingual school with the purpose of investigate the benefits that bilinguals acquire while inserted in a bilingual environment. To give a broader idea of what context this research is inserted in it is important to say that the school is a private school, located in the neighborhood of Bessa, in the city of Joao Pessoa. The institution is a bilingual school that was founded in João Pessoa in 2012, but it has already been in Brazil for many years, it is a network of schools that is franchised. The school has classes for children, fundamental education I and II, where pupils can start as early as 18 months old and reach high school. However, 7th, 8th, and 9th grades are not yet available at the school in Joao Pessoa. For this study 10 parents from the previously mentioned school were invited to answer a questionnaire (Appendix 1) about their perception upon their kids. According to some theories (see Chapter 2) a bilingual brain is successful not only with language abilities, but also with logic thinking abilities, social abilities and even problem-solving skills. The survey conducted with parents attempted to include all these skills. In doing so, the present study intends to answer the following research questions:

- 1) Does being in a formal bilingual context influence children's skill?
- 2) What are the skills, other than language, that parents observe in their children's behavior?
- 3) Does bilingualism bring a tangible advantage?

3.1 The Methodology

The survey was carried out through an online resource, namely Google forms. In order for this study to be carried out, the researcher talked to the school's pedagogical

coordinator so that she would indicate parents who might be interested in the research, so the researcher contacted those parents by e-mail, expounding on the research, and invited them to participate. The parents were invited to answer the questions being as neutral as possible. The questionnaire was composed of 10 questions divided in two parts, the first part with general questions to detect student's age and understand a little bit about their relationship with English. The second part of the survey had to do with the abilities that parents could perceive in their children. The questionnaire was held in Portuguese, of a multiple-choice type, as may be seen below:



3. Sua criança participa de atividades extracurriculares, tais como práticas de esporte, dança ou outra atividade?

☐ Sim

☐ Não

☐ Prefiro não responder

Image 2 - Format, example of the questions

The sample consisted of 10 kids from the described bilingual school and students ages ranged between 1 and 13, bearing in mind that the parents were the ones responding to the questionnaires as the focus was put on their observation of their children's behavior/ability in terms of children's development. These questions are presented next:

1. Em qual faixa etária sua criança se encaixa? Caso tenha mais de um filho, marque a alternativa pertinente a cada criança
2. Sua criança já estudou em alguma escola regular? Ou seja, uma escola não bilíngue?
3. Sua criança participa de atividades extracurriculares, tais como práticas de esporte, dança ou outra atividade?
4. Qual língua sua criança utiliza quando está com os amigos da escola?
5. Você observa que sua criança apresenta familiaridade quanto à resolução de problemas de raciocínio lógico-matemático? (Por exemplo, apreender conteúdos matemáticos, resolver problemas matemáticos e de lógica, compreender e identificar padrões).

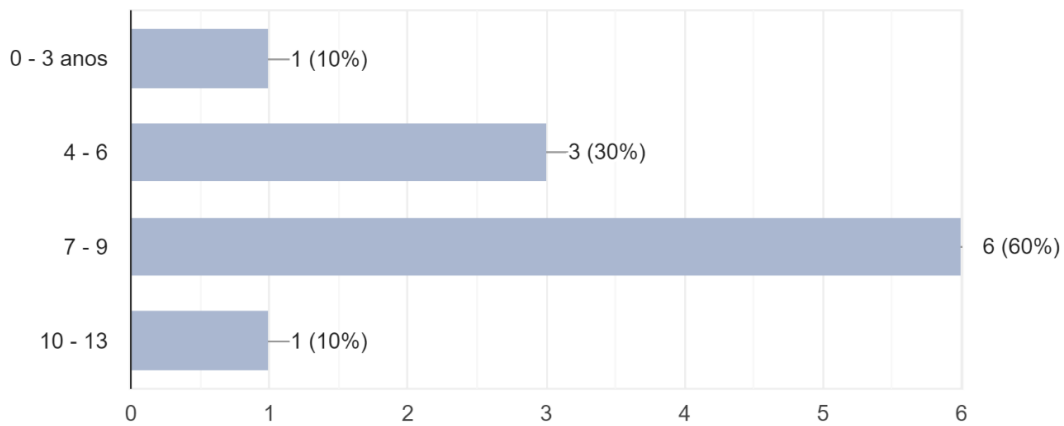
6. Você observa habilidades como liderança, trabalho em grupo, comunicação e empatia em sua criança, quando a observa em brincadeiras com outras crianças?
7. Você observa que sua criança toma decisões, quando inserido em brincadeiras com outras crianças?
8. Sua criança participa de discussões, ou promove discussões que são do interesse dela, por exemplo, ao trazer argumentos para conseguir algo que deseja?
9. Essas decisões se mostram pensadas e/ou argumentadas?
10. Seu filho consegue manter uma conversa na língua inglesa, demonstrando compreensão do que é falado?

Questions one through four were the open-ended ones to collect student's demographics. Questions five to ten are the ones concerning language, logical and cognitive abilities. This division is necessary, because in this way it is possible to divide students in different groups and categorize them so as to analyze the data grouped accordingly. All the questions had three alternatives in the checkboxes, they were Yes, No and Rather not answer.

3.2 Qualitative results

Every question in the survey had a purpose to bring a new information about the kids that were involved in the study, the chart below shows the results in percentage for each question. However, it is important to talk about questions one and four as they had a specific goal of knowing who the students were as regards their level of English. The first one asked about student's age and question 4 attempted to understand whether they use or not English outside of school. Question 10 also brings that subject to light; nevertheless, this will be discussed latter when each question is analyzed. Just as a matter of presenting the data, question 1 and 4 will not be included in Table 2 (below) as they do not belong to the multiple-choice category and as such do not present their answers in terms of percentage.

Questions 1



Question 4

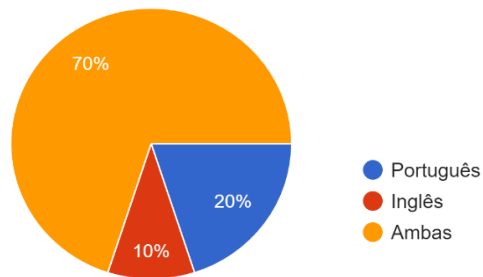


Table 2: Questionnaire responses by percentage

	Yes	No	Ratter not answer
Question 2	50%	50%	-
Question 3	60%	40%	-
Question 5	100%	-	-
Question 6	90%	10%	-
Question 7	90%	10%	-
Question 8	90%	10%	-
Question 9	90%	10%	-
Question 10	100%	-	-

*Question 1 and 4 are not included because they do not fit in the multiple-choice category.

As the graphs and the table show the results were very positive towards assuring that bilingual brains have more advantages than monolingual ones. In other words, bilingual brains can bring some advantages like Socioeconomic Benefits; Global Interactions; Local Interactions; Potentializing “acts of identities” and Culture awareness and construction, some of these aspects will be discussed in the analysis of each question presented next.

3.3 Quantitative Discussion

In view of the numbers seen in the graphs and tables presents above, it is now time to turn to a more detailed qualitative discussion of each question of the questionnaire, starting with question one, “In what age bracket does your child fit?” the purpose of this question is to categorize the kids according to their age group. In this sense, when the age is diagnosed it is possible to detect what school level the child is in. In this case, as we are talking about a bilingual school, a 3-year-old for example would be in the Toddler level, on the other hand, a kid who is 12 years old would be in year 6. This means that based on the level their language ability is expected to be different from each other. Results show that 10% of the kids were between the ages 0-3; 30% ages 4-6; 60% ages 7-9; and 10% 10-13. These numbers lead to the conclusion that the major part of the kids that were involved in this study were between 7- 9 years old, meaning that they were students from years 1-3, where they have more advanced English and Portuguese classes than the first two categories.

Moving on to the second question 2. “Has your child ever attended any regular school? That is, a non-bilingual school” this question searches the experience that kids had before the experience of a bilingual school. With such information it was possible to observe that even though not always being a bilingual student, they can be bilinguals. For this question 50% said yes and 50% said no. Those numbers build the idea that even though a child did not always attend a bilingual school, bilingualism is present in those kids and it has affected them as the next questions settles.

Regarding question 3 “Does your child participate in extracurricular activities, such as sports, dance, or other activity?” By posing this question the study aimed at finding out how kids spent their free time, whether they stayed more at home or in other

activities. Sixty percent (60 %) of the kids are involved in extracurricular activities, as opposed to 40% who are not. Many studies show how extracurricular activities are good to motivate and engage kids on achieving better results at school (Simão 2005; Roldão 2006) Cunha (2013) concludes that:

“É inegável a importância da motivação ao longo do percurso escolar dos alunos. Esta é determinante para o aluno se relacionar de forma mais positiva com a escola, estabelecendo objetivos e metas a alcançar e além disso faz com que o aluno se sinta melhor em sala de aula. A motivação permite ao indivíduo despende esforços rumo ao sucesso escolar e isso faz com que este se sinta melhor consigo mesmo, ao nível da autoestima e da autoeficácia. A prática de atividades extracurriculares tem sido relacionada com a motivação escolar, salientando a divergência de opiniões de diversos autores.”(pg.30)²

With that stated we can conclude that extra curriculum activity motivates the students to do better at school, and as 60% of the students participated in those activities they can be motivated to engage in languages.

Next question: 4. “What language does your child use when s/he is with friends at school?”. This is an important question because when kids are playing, they are expressing truly themselves through play. In other words, when a kid speaks with his/her friends in both languages it means that s/he is comfortable with that language and this is very good for the linguistic development of the child, feeling comfortable, brings them more confidence to talk and communicate, creating then a safe environment to learn and this concept brings us back to what Garcia (2009) said: “The need is no longer to be dominant in two languages, but rather to be familiar with many discourse modes and codes” (pg. 95). Thus, the results show a positive use of the linguistic code students are exposed to in their formal environment, that is, 70% percent of the kids, use both English and Portuguese to communicate with friends, and only 20% uses only Portuguese, however, 10% use only English.

Question five, “Do you notice that your child is familiar with solving problems of mathematical-logical reasoning? (For example, grasp mathematical contents, solve

² Free Translation: The importance of motivation throughout the students' school journey is undeniable. This is crucial for the student to relate more positively to the school, setting goals to achieve and also makes the student feel better in the classroom. Motivation allows the individual to expend efforts towards school success and this makes him feel better about himself, at the level of self-esteem and self-efficacy. The practice of extracurricular activities has been related to school motivation, despite the divergence of opinions of several authors.

mathematical and logic problems, understand and identify patterns)". This question brings the cognitive aspect discussed in Chapter 3 that, is by posing this question it would be possible to compare the present study to the results obtained in Papua New Guinea. The fact that the results of that research were positive, assuring that kids who have higher language skills were better at solving mathematical situations, brings us the impression that this can also happen in different languages and places and in this case are also inserted in a bilingual reality, still in different parts of the Globe and with different languages. The number reached from the answers to this question are of 100% yes. What this means is that the improvement in math skills are visible for the parents of the bilingual kids involved in the present research.

Moving forward to question 6: "Do you observe skills such as leadership, group work, communication, and empathy in your child when you see them playing with other children?". As it is possible to observe, this question is related to social skills and interaction, in the sense that language is used for much more than just communication in today's world, for instance, the many languages spoken out there which not only official languages are, but streets language, internet language, social media language even emoji language. These languages help people to develop abilities and the environment that individuals live in at all times is bombardig us with ideas of how to behave, how to act and how to think. The bilingual children of this study are not only learning language, but they are learning how to be leaders, coworkers, and how to communicate better, in a similar way that is reflected in the 1st aim of bilingualism described in Chapter 2, and as shown by the answers given to this question, which amounted of 90% of the children who are equipped with this set of abilities. It is interesting to point that the 10% who answered no referred to kids aged between 0-3, in this sense, the more exposed the kid is to this bilingual environment and the more input in the second language, more likely they are to show this characteristic.

Following question 6, question 7 asks: "Do you notice that your child makes decisions when engaged in play with other children?" this is an important question as this is when children start engaging in critical thinking and thinking for themselves. Children are often exposed to many different ideas from their parents, from school, however those moments s/he gets the opportunity to start to choose their own way.

Questions 8 and 9 are connected and they are "Does your child participate in discussions or does s/he promote discussions that are in his best interests, for example, by bringing arguments to achieve something s/he wants?" and "Are these decisions

thought and / or reasoned?”. As mentioned before children are exposed to many ideas, this can be positive, because according to what was discussed in Chapter 2, bilinguals are exposed to different languages and contexts, and these contexts are rich with culture, and by culture we are not talking only about the nation culture, but also about the culture that is built around that person, in their family, their school their work and in many other ways. In this sense, children will start to learn new ways of discussing and arguing. Ninety percent (90%) of the respondents said yes, my child participates in this type of discussion thinking about what s/he wants to achieve. This clearly proves that these children brain is starting to work towards logical and critical thinking. Once more, the 10% who said no is not significant as these children are aged between 0-3.

Finally question 10, “Is your child able to have a conversation in English, demonstrating understanding of what is said?”. This last question has given support to the claim that these kids are fully bilinguals, having a 100% of parents agreeing that their children are able to do so. Looking at these results, it is possible to draw the conclusion the bilingual context that kids are inserted in influences their skills, their logical and critical thinking, their mathematics skill, their social abilities and decision making, and adding to all of that, these children are able to speak and understand both languages, so answering to the third question of research, it is possible to say that bilingualism can bring a tangible advantage to people.

Despite the sample size of this survey being rather small, this research proves to be fruitful as it corroborates with the hypothesis that being a bilingual is more than just language. With these results, it will be possible to present back to parents showing them that these kids are not only developing language skills but becoming future citizens of the world.

4 - FINAL CONSIDERATIONS

Bilingualism is a reality today and it is growing rather fast leading more people to feel the need to learn a new language, this is one of the reasons why bilingual schools are becoming more popular. On another note, bilingualism is much more than just understanding two languages, it goes in tune with being able to communicate in these languages and feeling comfortable about them. Language here was not only treated as a means of communication, but the features that create a nation spreading their culture.

Being a bilingual person, it is possible to learn two different cultures and to respect and even embrace a new culture. Chapter 2 discussed benefits that Garcia placed for bilinguals, first they will acquire social skills being able to talk to more people in more places, creating abilities like leadership and critical thinking. Language also carries its own identity and carries the culture of that people, bilinguals can, then, embrace both language and create their unique identity. And, finally, bilingualism can help to unite nations, bringing the idea of tolerance and respect from different cultures.

The pilot study reported here was carried out in the city of Joao Pessoa in a bilingual school, where parents were asked to answer 10 questions about their perception on their children as regards their observation of characteristics as leadership, critical thinking, reasoned thinking, as well as logical and mathematical skills. The fact that this study was conducted by parents was very relevant as they do not have any pedagogical point of view, not being able to analyze the kids, they just need to know their children. The research proves that parents see the improvement that their children are making while they learn a language, but they are also learning how to become part of the society.

As this research was held with children as the sample, an interesting aspect can be observed, about children learning, it was possible to observe that they are able to do many great things even at a young age, and if we compare to an adult person thinking that children learn better, about that idea Garcia (2009) says:

“Yet, in formal educational settings, adults, able to use their metalinguistic skills in a first language more efficiently learn more quickly than younger learners. Children's communicative needs are also simpler than those of adults, and children's language practices are often supported through gestures and visuals. Thus, the language that children need is less complex and more contextualized than that needed by adults, leading many to think that they are better bilingual acquirers. In short, there is little evidence for a "critical period" for second-language learning, except perhaps for the development of a native-like accent, and adults are quite capable of becoming bilingual” (pg. 67)

Often people tend to believe that children are more capable than adults to learn a language, but Garcia explains that it is not about being more capable, it is about the complexity of the context that people are inserted in, the environment and the way that they are taught has important role in their learning.

Lastly, this research has shed light on the reasons why bilingualism is becoming so important, as bilingualism has become something increasingly strong in our society. However, it is clear that it is not necessary to be bilingual in order to have access to culture, nowadays technologies help us to better understand the world; and this can also be done in the native language. So what the results of the research has demonstrated is that people who are bilingual, or live in a bilingual environment, even if only for part of the day, tend to learn more easily, since they are already used to doing automatic language exchanges in their brains, and this corroborates with the fact that the brain is elastic and so kids end up learning faster.

Based on the fact that this is a small project, as suggestion for further research would be a comparison to another formal bilingual school environment to see whether these same results would be maintained according to the data obtained, it would be necessary to conduct research in another school context.

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APPENDICES

APPENDIX 1

Original questionnaire in Portuguese, with multiple choice.

1. Em qual faixa etária sua criança se encaixa? Caso tenha mais de um filho, marque a alternativa pertinente a cada criança
 - 0-3
 - 4-6
 - 7-9
 - 10-13
2. Sua criança já estudou em alguma escola regular? Ou seja, uma escola não bilíngue?
 - Sim
 - Não
 - Prefiro não responder
3. Sua criança participa de atividades extracurriculares, tais como práticas de esporte, dança ou outra atividade?
 - Sim
 - Não
 - Prefiro não responder
4. Qual língua sua criança utiliza quando está com os amigos da escola?
 - Português
 - Inglês
 - Ambas

5. Você observa que sua criança apresenta familiaridade quanto à resolução de problemas de raciocínio logico-matemático? (Por exemplo, apreender conteúdos matemáticos, resolver problemas matemáticos e de lógica, compreender e identificar padrões).
- Sim
 - Não
 - Prefiro não responder
6. Você observa habilidades como liderança, trabalho em grupo, comunicação e empatia em sua criança, quando a observa em brincadeiras com outras crianças?
- Sim
 - Não
 - Prefiro não responder
7. Você observa que sua criança toma decisões, quando inserido em brincadeiras com outras crianças?
- Sim
 - Não
 - Prefiro não responder
8. Sua criança participa de discussões, ou promove discussões que são do interesse dela, por exemplo, ao trazer argumentos para conseguir algo que deseja?
- Sim
 - Não
 - Prefiro não responder
9. Essas decisões se mostram pensadas e/ou argumentadas?
- Sim
 - Não

- Prefiro não responder

10. Seu filho consegue manter uma conversa na língua inglesa, demonstrando compreensão do que é falado?

- Sim
- Não
- Prefiro não responder

APPENDIX 2

Below that is QR code to have access to the questionnaire on the online, Google forms



APPENDIX 3

Translation For the questions to English

1. In what age bracket does your child fit? If you have more than one child, check the appropriate alternative for each child
2. Has your child ever attended any regular school? That is, a non-bilingual school?
3. Does your child participate in extracurricular activities, such as sports, dance, or other activity?
4. What language does your child use when he / she is with friends at school?
5. Do you notice that your child is familiar with solving problems of mathematical-logical reasoning? (For example, grasp mathematical contents, solve mathematical and logic problems, understand and identify patterns).
6. Do you observe skills such as leadership, group work, communication, and empathy in your child when you see them playing games with other children?
7. Do you notice that your child makes decisions when engaged in play with other children?
8. Does your child participate in discussions, or does she promote discussions that are in her best interests, for example, by bringing arguments to achieve something she wants?
9. Are these decisions thought and / or reasoned?
10. Is your child able to have a conversation in the English language, demonstrating understanding of what is said?