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EXECUTIVE FUNCTIONS, TEACHING ENGLISH AS A SECOND LANGUAGE AND BNCC: (HOW) DO THEY INTERCONNECT?

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ABSTRACT: This study aims to look for interconnection between Executive Functions – FE (more specifically working memory, inhibitory control, and cognitive flexibility), English as a Second Language (ESL) approaches and Base Nacional Comum Curricular, specially related to English Language competencies and skills. The ESL approaches chosen were TBL and CLIL due to their focus on communication. The research begins with definitions of each topic and then makes a comparison between them, seeking to relate them and understand the interference between them. The study concluded that for students to achieve success in solving the tasks proposed by the approaches to develop the skills listed by the BNCC, the consolidation of EF is essential. This means that the better developed the EF, the more conditions for students to perform the proposed tasks. Therefore, EF plays a key role in the English language teaching-learning process.

Keywords: Executive functions, English language, BNCC.

FUNÇÕES EXECUTIVAS, ENSINO DE INGLÊS COMO SEGUNDA LÍNGUA E A BNCC: (COMO) ELAS SE INTERCONECTAM?

RESUMO: Este estudo tem como objetivo tecer relações entre as Funções Executivas – FE (mais especificamente, memória de trabalho, controle inibitório e flexibilidade cognitiva), as abordagens de ensino-aprendizagem de inglês como segunda língua e a Base Nacional Comum Curricular, especialmente em relação às competências e habilidades da língua Inglesa. As abordagens escolhidas para análise foram o Task-Based Learning (TBL) e Content Integrated Language Learning (CLIL) em virtude de ambas centrarem seu fim na comunicação. A pesquisa inicia com definições de cada tópico e após faz uma comparação entre eles, buscando relacioná-los e compreender a interferência entre eles. O estudo concluiu que para os alunos alcançarem o sucesso na resolução das tarefas propostas pelas abordagens com o intuito de desenvolver as competências listadas pela BNCC a consolidação das FE é essencial. Isto significa que quanto melhor desenvolvidas as FE mais condições para os estudantes performarem as tarefas propostas. Portanto, as FE desempenham um papel fundamental no processo de ensino-aprendizagem de língua inglesa.

Palavras-chave: Funções executivas, língua inglesa, BNCC.

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FUNCIONES EJECUTIVAS, ENSEÑANZA DE INGLÉS COMO SEGUNDO IDIOMA Y LA BNCC: ¿(CÓMO) SE INTERCONECTAN?

RESUMEN: Este estudio tiene como objetivo tejer relaciones entre las Funciones Ejecutivas - EF (más específicamente, memoria de trabajo, control inhibitorio y flexibilidad cognitiva), los enfoques de enseñanza-aprendizaje del inglés como segunda lengua y la Base Curricular Común Nacional, especialmente en relación con el idioma inglés, destrezas y habilidades. Los enfoques elegidos para el análisis fueron el aprendizaje basado en tareas (TBL) y el aprendizaje de idiomas integrado de contenido (CLIL) porque ambos se centran en la comunicación. La investigación comienza con definiciones de cada tema y luego hace una comparación entre ellos, buscando relacionarlos y comprender la interferencia entre ellos. El estudio concluyó que para que los estudiantes alcancen el éxito en la resolución de las tareas propuestas por los enfoques con el fin de desarrollar las competencias enumeradas por la BNCC, es fundamental la consolidación de la EF. Esto quiere decir que cuanto mejor desarrollada la EF, más condiciones tienen los estudiantes para realizar las tareas propuestas. Por lo tanto, las EF juegan un papel clave en el proceso de enseñanza-aprendizaje del idioma inglés.

Palabras clave: Funciones ejecutivas, idioma inglés, BNCC.

INTRODUCTION

According to Meltzer (2010, p. 4), 'over the past several years educators have begun to recognise the importance of Executive Functions processes for educational performance'. Since then, more and more studies have been carried out, and its relevance has only grown. There is a broad understanding that the three main executive functions (EF) are working memory, inhibitory control, and cognitive flexibility (Diamond, 2014). EF are taken as the predictors of academic (Cortés Pascual; Moyano Muñoz; Quilez Robres, 2019), professional, personal life, and health behaviours (Gray-Burrows et al., 2019); therefore, their importance is not only related to education but to tasks people have to perform in life in general (Diamond, 2014).

According to the Center on the Developing Child at Harvard University (2011), even though essential, humans are not born with the ability to control our impulses, make plans, and keep attention. However, the potential to develop them through the experiences we are exposed to since our childhood is possible. One of the paramount responsibilities of society is to offer children support to build these skills. Researchers at the Center compare this development as being similar to an air traffic control system: stay focused, keep and manipulate information, filter distractions, and adapt to sudden situations to manage arrivals and departures in various runways in a hectic airport. These actions in our brain are performed by the EF: the set of abilities that help people to focus on multiple flows of information at the same time, monitor mistakes, make decisions based on available data, rethink plans if necessary, and resist the temptation of acting impulsively because of frustration.

As EF can and should be stimulated from early childhood (Diamond, 2016) throughout adulthood, schools play a crucial role in becoming, along with families' residences, a rich environment to develop them. According to Pureza (2016), enabling teachers with stimulation techniques on the development of EF assumes double importance. Therefore, it is essential for teachers to know about EF and how to

incorporate the strategies that help their students build the necessary EF in the classroom, such as the strategies to develop the EF in the classroom presented in the book *Promoting Executive Function in the Classroom* (Meltzer, 2010). There are already programmes, such as PENcE (2016) that suggest activities that help students to deal with every day as well as academic tasks because EF are skills for life and learning. So, the question that arises is: are EF considered in teachers' training courses? And how about ESL training courses? XXXXX and XXXXX (2022) found studies on one specific EF, e.g., working memory, inside classrooms, but no evidence of EF being addressed in ESL teacher training courses in Brazil. Being aware of the influence of EF in the development of fundamental skills and incorporating strategies in pedagogical practices to strengthen them so that students will be better prepared to carry out tasks, should be a concern to ESL teachers.

This study aims to relate the EF to the theories of second language learning theories and to *Base Nacional Comum Curricular (BNCC)*, the national document that stipulates the competencies to be developed in schools in Brazil. The purpose is to connect common beliefs to support the introduction of strategies to stimulate EF in teacher training courses, specifically in English as a Second Language. To achieve this goal, a general view of EF, English as a Second Language (ESL) theories, and BNCC are addressed, followed by their interconnection.

EXECUTIVE FUNCTIONS (EF)

Neuroscience studies have shown how our brain works while learning and the importance of this knowledge to education. However, 'Unfortunately, few teachers are equipped with enough knowledge of the science of learning and evidence-based methodology, to ensure all students are given sufficient opportunity to develop their cognitive capacity to the fullest (Gamino et al., 2022). The Center on the Developing Child at Harvard University (2011) states that 'Scientists who study executive function skills refer to them as the biological foundation for school readiness' and that they promote the link between school performance and social, emotional, and moral development.

The EF refer to top-down cognitive processes, highly specialized and complex, that allow control and direction of behaviours to reach goals; they are related to the capacity to adapt to new situations and problem resolutions daily (Friedman; Miyake, 2017; Wiebe; Karch, 2017). Executive functions are generally defined 'as a specific set of attention-regulation skills involved in conscious goal-directed problem solving' (Zelazo; Blair; Willoughby, 2016, p.2).

The EF are composed of three main executive domains: inhibitory control, working memory, and cognitive flexibility (Diamond, 2020). This executive triad enables the development of more complex EF, such as problem resolution, planning, and abstract thought (Collins; Koechlin 2012). According to Siregar and colleagues (2019, p.270) 'storing information that is received in a short time and manipulating that information in mind (working memory), inhibiting unwanted responses through ignoring stimulating attention (inhibition control), and thinking flexibly (shifting)' are the cognitive skills that support mathematical skills which are the same related to other areas such as language.

The WM is the capacity to mentally maintain and manipulate information, allowing one to relate and integrate pieces, to remember sequences, to plan future actions, and to keep more than two pieces of information that come from different types of memories (long & short-term memory) at the same time (Cardoso, 2016). Shokrkon and Nicoladis (2022) define WM as the mental workplace where information is stored and

available for manipulation so that cognitive activities can progress. To Zelazo, Blair, and Willoughby (2016, p.2) it 'involves both keeping information in mind and, usually, manipulating it in some way, such as in passage comprehension when a reader must integrate several pieces of information or ideas into a coherent whole'. People with good WM abilities can show ease in following instructions, connecting one piece of information to another one while reading paragraphs, can solve calculations mentally, can organise information in a timeline, and can keep information in mind to use it later. This executive domain contributes to making sense of a sentence or paragraph (written or spoken), mentally reordering items, putting instructions into action plans, and seeing relations between ideas and reasoning. It is related to creativity since it is necessary to disassemble and recombine elements in new ways (Diamond, 2013).

IC is the capacity to refrain from a behaviour over another (usually an inadequate one), to filter thoughts, to control impulses, to resist temptations, and to think before acting (Diamond, 2013; Cardoso, 2016). A well-developed IC contributes to turn-taking when talking to others so that people find it easy not to interrupt others, they deal well with taking turns to speak, they think before they talk/act, and they can pay attention and control emotions. According to Shokrkon and Nicoladis (2022), the ability to control attention, behaviour, and thoughts is under the responsibility of IC. Choosing consciously what to pay attention to, avoiding temptations, and using different responses instead of automatic ones are what people who developed this EF can do. Zelazo, Blair, and Willoughby (2016, p.2) state that IC 'is the process of deliberately suppressing attention (and subsequent responding) to something, such as ignoring a distraction, stopping an impulsive utterance, or overcoming a highly learned response'. It's also responsible for allowing people to change and choose how they react and behave rather than repeating old habits (Cosenza; Guerra, 2011). Furthermore, IC helps to focus on a task even when a motion or a loud sound is surrounding the environment we are in. Choosing to ignore them and paying or keeping attention to other stimuli related to a goal is the IC function. IC is essential to social-emotional relationships as it is responsible for avoiding saying the first thought that comes to mind, which might hurt others or embarrass us, to analyse facts before jumping to a conclusion and thinking twice before answering a question, producing a better answer (Diamond, 2013).

CF is the capacity to change the focus of attention, to consider new perspectives, priorities, or rules, to adapt to the environment, and to alternate tasks and focus if needed. This executive function is also related to creativity and problem-solving (Diamond, 2013; Cardoso, 2016). People who developed this EF can use different strategies such as use creativity to solve problems, change their strategies when required, deal well with plan changes, can modify their routines (for example, taking a different way to commute to work), and can adapt their behaviour or way of thinking. To Shokrkon and Nicoladis (2022), CF allows one to change one mental set for another, making it possible to see things from a different perspective and adapt to the environment. According to Zelazo, Blair, and Willoughby (2016, p.2), it 'involves thinking about something in multiple ways - for example, considering someone else's perspective on a situation or solving a mathematics problem in multiple ways'. CF is needed to change perspectives, and to do so, people must deactivate previous thoughts and habits and load a different piece of information. Therefore, it is said that CF builds on WM and IC, justifying the fact that these three are considered the core EF (Diamond, 2013).

These mental processes are developed from early childhood throughout adult life and are responsible for various aspects of our lives, including academic success. Also, they are strongly related to socio-emotional abilities, social relationships, and professional

performance (Shokrkon; Nicoladis, 2022). They are crucial for building and maintaining friendships, being ready for school, the learning process, emotional and social skills, academic achievement, and also physical health (Shokrkon; Nicoladis, 2022). Students who struggle in school might have a lack in their EF, therefore, they should be stimulated so that they can cope with the content.

EF in the educational context

Stimulating the improvement of EF holds sensitive, responsive caregiving and individualized teaching when situations demand making choices. It is important to create opportunities for children to lead their activities with lesser and lesser adult supervision, effective support to regulate their first emotions, promoting assisted attention, and giving space for the little ones to practice their skills (Center on the Developing Child at Harvard University, 2011, p. 6). EF skills do not suddenly emerge in adulthood, they are built throughout a long period and develop until adulthood (Anderson, 2002; Taylor et al., 2013; Laureys et al., 2021). The Center on the Developing Child at Harvard University (2011) suggests that one strategy to help toddlers enhance their EF skills is scaffolding, breaking activities down into smaller steps, and simplifying them so that students can cope with the whole task. It is a temporary support that is gradually taken away so that learners can eventually work without it.

Throughout students' academic life, they will be required to perform uncountable tasks which will require different competencies and abilities. What is the behaviour expected from students when facing those challenges? They should be able to pay attention, focus, think critically, relate information, express their views, respect their peers' ones, and have the ability to summarise, plan, organise, connect information, and intervene adequately to solve problems.

According to the Center on the Developing Child at Harvard University (2011), two important points are that (a) EF are trainable; as they can be developed throughout life, different approaches should be considered according to age and (b) exercising EF is the way to improve them so repeating strategies is a key part of enhancing EF.

Niebaum and Munakata (2023) consider that EF training should occur in a contextualised environment and not in a lab, as frequently done. They claim that stimuli should include real-world contexts and that people's willingness to engage should be the focus of interventions. Hence, the development of EF would benefit the most following these two approaches.

García-Campos, Canabal Garcia and Alba-Pastor (2018) consider the executive performance of each person, which is utterly important to learning, a result of the ongoing development process that integrates different EF. The authors express the necessity to work on the EF specifically inside classrooms as also proposed by Meltzer (2010).

SECOND LANGUAGE LEARNING APPROACHES

There are more than a handful of approaches to second language learning. For this study, two main approaches were chosen: Task-based Learning (TBL) and Content and Language Integrated Learning (CLIL) for both being used widely and they focus on using language for communication, in real situations and different contexts.

There are various tasks used in teaching English and they can be categorised from different perspectives. In the TBL approach, the pedagogic classification is more well-known by teachers in general, such as listing, ordering and sorting, comparing, problem-

solving, sharing personal experiences, and creative tasks. These are not the only ones, though they will be referred to for this study (Ellis, 2014). Relating to the CLIL approach, the classification that will be used comes from the one mentioned in the Teaching Knowledge Test CLIL Module from Cambridge University: categorisation, cloze test, gap fill, labelling, matching, multiple choice, true/false, ordering words/sentences/paragraphs, jigsaw reading and listening, classification tasks, information transfer, feature identification, pyramid discussion, poster presentations, and domino games.

TBL (Task-based Learning or TBLT)

This approach is based on the solution of a meaningful task as the core of the learning process. According to Nasiba (2022, p.793), 'Task-based language teaching, or TBLT is a method that gives students a genuine context for language use through communicative activities'. Yildiz (2020) agrees, affirming that this approach has commonly been considered important for its main reason is to focus on meaning rather than form. This author (Yildiz, 2020, p. 75) concludes that 'TBLT places emphasis on learning to communicate by means of interaction using the target language, therefore, it is viewed as meaning-focused work. Swan (2005) points to some characteristics of TBL, such as a natural and focused on meaning contexts that should be sought in language learning and tasks performed by students turn lessons into a student-centred environment. Scrivener (2011, p. 32) besides considering TBL as a variant of the Communicative Approach, defines it as 'work cycles around the preparation for, doing of, and reflective analysis of tasks that reflect real-life needs and skills'. A last reason to have chosen TBL is that 'The task's goal is to establish a clear reason for language use and create a natural meaning for language learning' (Sholeh, 2020, p. 123) which is the ultimate objective of learning any language.

There are various designs that can be used for a TBL lesson. However, there are three basic stages they all share (Ellis, 2014: (A) pre-task, (B) during the task, and (C) post-task. Phases A and C are not required, though they ensure performance effectiveness.

Phase A has the purpose of preparing students for phase B so that the performance promotes acquisition. Introducing the topic, teaching vocabulary, performing a similar task, providing a model, and promoting strategic planning are examples of activities for this stage. Though not necessary, this stage helps frame the task, motivating students to complete it, besides presenting its purpose and utility.

There are two basic kinds of during-task phase: (1) task performance options, which relate to how the task is to be undertaken and therefore can be planned in advance, and (2) process options, which involve the decision making about how to perform while the task is being completed. According to Ellis (2014), the three most mentioned strategies of task-performing options found in his research are whether to set a time limit for the task to be completed, whether to allow access to data while the task is being performed, and introducing some surprise element into the task. As for process options, teachers' and students' previous experience affects the way they conduct a task. Since the decision must be taken in flight as the performance of the task, it is difficult to mention examples.

In contrast, for the post-task stage, there are various options to address three main pedagogical objectives: (1) to offer an opportunity to repeat the task performance; (2) to invite the students to reflect on how they performed the task; and (3) to motivate students to pay attention to form, especially those which proved to be a problem while performing the task. Teachers may offer students a second try to perform their task under

the same conditions as the first one, ask students to present a report about how they felt, what they decided and/or discovered, and ask them to evaluate their performance. Encouraging attention to form may be proposed through reviewing students' errors, promoting consciousness-raising tasks, providing productions-practice activities, and developing noticing activities.

While in some approaches students are still very passive and the teacher continues to be the centre of the lesson, TBL proposes a student centred focus and allows students to engage in the topic and make decisions, resolving social problems. In contrast with traditional pedagogy, TBL presents a loose discourse structure, the use of referential questions, the control of the development of the topic by the students, scaffolding, a variety of functions used by learners, turn-taking is equal to the one used by everyday speakers, opportunities to negotiate meaning, feedback is focused on content, and repetition used to establish intersubjectivity not drilling (Ellis, 2014).

CLIL (Content and Language Integrated Learning)

The CLIL approach integrates content and language and is based on what is known as the 4 C's: content, communication, cognition, and culture. This means that language is the means and not the aim. A critical factor of this approach is that planning must consider that students are learning new concepts through a second language. Therefore, teachers must provide the necessary input to help students to perform the tasks. Bentley, who wrote a preparation course for teachers who want to get a CLIL certificate offered by the University of Cambridge, states that CLIL is important in the current borderless world as it 'helps students to develop skills in their first or home language and also helps them develop skills to communicate ideas about science, arts, and technology to people around the world'.

Neto Moreno de Diezmas (2016) declares that besides providing more exposure to foreign languages, CLIL also promotes a higher quality of this exposure because the learning environment is more naturalistic than in traditional ESL lessons. Gabillon (2020) states that 'CLIL builds and reinforces learners' knowledge of other disciplines while using the language creatively to solve problems and develop critical thinking'. Aldim and Aribaş (2021) conducted a study showing how English is taught in Finland, Poland, and Turkey, the previous ones through CLIL and the last one, through the Grammar Translation Method and they suggested that CLIL is very important and has benefits and, therefore, it should be implemented in Turkey.

It is common to refer to the '4Cs' of CLIL, listed by Coyle (2007), as content, communication, cognition, and culture. These topics are the base to define teaching aims and learning outcomes. Content relates to the subjects that are part of the curriculum taught in English. Communication relates to the language students must produce in both oral and written. As in the previous approach, engagement in the topic is paramount, therefore, one aim is to increase the time students speak (student talking time) and reduce the teacher time (teacher talking time). Self-evaluation and peer and group feedback are also encouraged. Cognition relates to the thinking and reflection proposed by the tasks including reasoning, creative thinking, and evaluating. Culture relates to understanding and accepting different habits, and having an open mind to the variety of communities. According to Coyle (2007), the core of CLIL is culture as it provides opportunities to deal with a wide range of cultural backgrounds. This 'C' also allows us to develop positive attitudes and responsibility as local and global citizens. The '4Cs' are integrated into the lesson planning and co-occur while the lesson advances.

According to Genesee and Hamayan (2016), CLIL lesson encompasses three phases: preview, focused-learning, and extension. The preview phase seeks to check what knowledge students already have about the topic by asking them questions, developing a concrete activity (e.g. going on a field trip), checking vocabulary, and watching a video, all connected to the concepts to be taught. The focused-learning phase concentrates explicitly on the new concept. The more students are involved and share the responsibility of their learning with the teacher the better they will understand the topic. Under the teacher's guidance, who should lead them to discoveries, students become more active and build their knowledge. General learning skills will help them to retain or search for new information and to deal with new concepts. The extension phase provides opportunities to interact with the real world; its core is to apply what has been learned in the classroom to a real-life situation. Besides engaging students with the community they live in, it also reinforces knowledge just built.

Genesee and Hamayan (2016) mention five different types of objectives for each lesson. They suggest dividing them into two groups: primary and secondary. Content and language objectives are considered primary objectives due to their importance, and cross-linguistic, cultural, and general learning skills are considered secondary ones, though still relevant. The authors bring an example of a lesson plan in which they list the objectives starting with these verbs: describe, list, explain, give reasons (content); write, use appropriately, demonstrate, define, and use (language); look for and compare (cross-linguistic); compare and analyse (cross-cultural); take notes, make diagrams, search for information, ask, link, create, read, collaborate, organise (general-learning skills).

BASE NACIONAL COMUM CURRICULAR (BNCC)

This is a normative document that defines the essential organic and progressive learning setting that all students must develop during their education in school at different levels: primary, secondary, and high school in Brazil. BNCC (Brasil, 2018) establishes knowledge, skills, and subskills that all students must develop during their school years. It also aims for the full human formation and the construction of a fair, democratic, and inclusive society.

BNCC defines ten general skills as the students' learning rights related and breaks them down into specific skills according to the level: Kindergarten, described in Experiences Fields, Primary, Secondary, and High School, described in knowledge areas and curricular subjects with skills for each of them. English is one of the subjects related to Languages along with Portuguese, Arts, and Physical Education which starts in the sixth year and goes up to High School. For the Language area, BNCC (Brasil, 2018, p. 63) lists six general competencies:

1. To understand languages as a human, historical, social, and cultural construction, of a dynamic nature, recognizing and valuing them as forms of meaning of reality and expression of subjectivities and social and cultural identities.

2. To know and explore different language practices (artistic, bodily, and linguistic) in different fields of human activity to continue learning, expand your possibilities of participation in social life, and collaborate for the construction of a more fair, democratic, and inclusive society.

3. To use different languages – verbal (oral or visual-motor, such as Brazilian Sign Languages, named Libras, and writing), corporal, visual, sonorous, and digital –, to express oneself and share information, experiences, ideas, and feelings in different

contexts and produce meanings that lead to dialogue, resolution of conflicts and cooperation.

4. To use different languages to defend points of view that respect each other and promote human rights, socio-environmental awareness, and responsible consumption at the local, regional, and global levels, acting critically and facing world contemporary issues.

5. To develop the aesthetic sense to recognize, enjoy, and respect the various artistic and cultural manifestations, from local to global, including those belonging to the cultural heritage of humanity, as well as participating in diversified, individual and collective practices, artistic-cultural production, concerning the diversity of knowledge, identities, and cultures.

6. To understand and use digital information and communication technologies critically, meaningfully, reflectively, and ethically in various social practices (including school practices), to communicate through different languages and media, produce knowledge, solve problems, and develop authorial and collective projects.

Summing up, it is possible to affirm that BNCC recognises language as a means of communication expressing one's ideas, feelings, identity, and culture. Therefore, BNCC (Brasil, 2018, p. 239) suggests English to be taught from the perspective of lingua franca: a language in use that allows people to understand each other' 'context, and reality and making people more empathic to different cultures. TBL and CLIL approaches view the main aim of the language learning process similarly. So, it seems appropriate to use them as the basis for this study.

For each area, BNCC establishes skills students are supposed to develop over the school years. Table 1 shows the six skills related to English that are linked to the ten general competencies and to the six for languages just mentioned.

Table 1 – Specific English skills

SPECIFIC ENGLISH LANGUAGE SKILLS FOR THE ELEMENTARY SCHOOL
1. To identify the place of oneself and the other in a plurilingual and multicultural world, critically reflecting on how English language learning contributes to the insertion of subjects in the globalized world, including concerning the world of work.
2. To communicate in English, through the varied use of languages in printed or digital media , recognizing it as a tool to access knowledge, broaden perspectives, and possibilities for understanding the values and interests of other cultures and for the exercise of social protagonism.
3. To identify similarities and differences between the English language and the mother tongue/other languages, linking them to social, cultural, and identity aspects, in an intrinsic relationship between language, culture, and identity.

4. **To elaborate** linguistic-discursive repertoires of the English language, used in different countries and by different social groups within the same country, to **recognise** linguistic diversity as a right, and to value the heterogeneous, hybrid, and multimodal uses emerging in contemporary societies.

5. **To use** new technologies, with new languages and modes of interaction, **to search, select, share, position** yourself, and **produce** meanings in English literacy practices in an ethical, critical, and responsible manner.

6. **To know** different cultural heritage, material and immaterial, widespread in the English language, with a view to the exercise of fruition and expansion of perspectives in contact with different artistic and cultural manifestations.

Table 1 – General English skills of BNCC. Version and highlighting by the authors.
(Source: the author)

The content of the table proves how complex and challenging is the process of learning. The highlighted skills start from low-order cognitive skills (e.g. identify) to high-order cognitive skills (e. g. use and produce). This means that students will have to deal with basic to complex actions while performing tasks. All these skills are directly related to EF development; it is hard to separate them though these examples are just to clarify that by sharing, inhibitory control is needed when collaborating with peers; working memory is needed to identify different similarities and differences; to communicate in English means sometimes taking decisions on the spot, relying in cognitive flexibility.

CONNECTING THE DOTS

The previous sections stated a broad view of each focus of the article. However, how are they interconnected? At school, students are expected to be able to organise ideas, their own and the ones from another source (a text, a lecture, a podcast, a TV programme, for example), to think critically and ethically, and to deal with problems and sort them out. Both TBL and CLIL aim to develop these skills through language teaching so that pupils can communicate with ease. To achieve this academic success, EF are essential. If facing tasks causes struggling, EF weakness may be the underlying problem. Teachers are sometimes so worried about teaching content and sticking to the curriculum, they do not realise that teaching strategies to strengthen students' EF help them to deal with school tasks that address the competencies needed in the 21st century.

To make their connection more visual, Tables 2, 3, and 4 summarize the information on the EF, TBL, and CLIL approaches as well as BNCC. It is important to mention that there are more skills listed in the BNCC that can be used to fill its column. However, the goal is not to exhaust the issue but to give examples to clarify connections.

Table 2 – Working memory

Executive Functions ⁵	TBL ⁶ & (2) CLIL ⁷	BNCC ⁸
- Connecting information between paragraphs	(1) Ordering and sorting; comparing. (2) Labelling; matching; multiple choice; true/false; ordering; jigsaw reading/listening; feature identification	(EF07LI08) Relate the parts of a text (paragraphs) to build its overall meaning.
- Being able to follow instructions that have stages / more stages.	(1) Listing; ordering and sorting; comparing; problem-solving; sharing personal experiences; creative tasks. (2) Categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; jigsaw reading/listening; ordering; feature identification.	(EF07LI07) Identify key information from parts of an English language text (paragraphs).

Table 2 – Shows the relation between working memory, TBL/CLIL and BNCC (Source: the author)

Looking at Table 2, it is possible to notice that the common tasks proposed by TBL and CLIL aim to develop the skills BNCC establishes for the 6th to 9th grades: ordering, comparing, categorising are meant to build meaning, organise ideas, plan, and identify information. To do this successfully, students need to remember vocabulary, store information from one paragraph to link to another one or between two different texts, or even between one text and a listening or video; they need to understand syntax structures such as comparisons and conditionals; they need to be able to organise not only ideas but also their presentations when manipulating concepts and expressing their understanding; they need to follow steps, stages, instructions to build and produce content.

Table 3 – Inhibitory control

Executive Functions ⁹	TBL ¹⁰ & (2) CLIL ¹¹	BNCC ¹²
- Thinking before speaking	(1) Ordering and sorting; comparing; problem-solving; sharing personal experiences; creative tasks. (2) Categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; ordering; jigsaw reading/listening; feature identification; domino; pyramid discussions.	(EF08LI03) Build global meaning of oral texts, relating their parts, the main subject, and relevant information.

⁵ According to the Center on the Developing Child at Harvard University (2011).

⁶ According to Ellis (2014, p. 211-212).

⁷ According to Ellis (2014, p. 211-212).

⁸ According to Bentley (2010, p. 57).

⁹ According to the Center on the Developing Child at Harvard University (2011).

¹⁰ According to Ellis (2014, p. 211-212).

¹¹ According to Ellis (2014, p. 211-212).

¹² According to Bentley (2010, p. 57).

- Focus on a task ignoring internal and external distractions	(1) Listing; ordering and sorting; comparing; problem-solving; sharing personal experiences; creative tasks. (2) Categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; ordering; jigsaw reading/listening; feature identification; domino; pyramid discussions.	(EF07LI01) Interact in oral exchange situations to carry out activities in the classroom, respectfully and collaboratively, exchanging ideas and engaging themselves in role-plays and games.
- Control our emotions,	(1) Listing; ordering and sorting; comparing; problem-solving; sharing personal experiences; creative tasks. (2) Categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; ordering; jigsaw reading/listening; feature identification; domino; pyramid discussions.	(EF06LI01) Interact in oral exchange situations, showing initiative to use the English language.
- Waiting for our turn to speak and stop talking, respecting turn-taking	(1) Listing; ordering and sorting; comparing; problem-solving; sharing personal experiences; creative tasks. (2) Categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; ordering; jigsaw reading/listening; feature identification; domino; pyramid discussions.	(EF09LI01) Use the English language to expose points of view, arguments, and counterarguments, considering context and linguistic resources aimed at the effectiveness of communication.

Table 3 – Shows the relation between inhibitory control, TBL/CLIL and BNCC (Source: the autor)

Table 3 summarises the typical work proposed by TBL and CLIL, such as sharing personal experiences, jigsaw reading, labelling, pyramid discussions, focusing on relating parts to get overall meaning, interacting with peers and groups, exposing arguments and counterarguments as well as listening to the others and promote turn-taking. These skills are driven by the executive function inhibitory control. This EF helps students to think before they speak, to focus on the tasks and avoid distractions, to manage feelings, especially when displeased, and to wait for their turn patiently.

Table 4 – Cognitive flexibility

Executive function ¹³	TBL ¹⁴ & (2) CLIL ¹⁵	BNCC ¹⁶
- Expressing our opinion without hurting others according to social conventions	(1) comparing; sharing personal experiences; problem-solving. (2) categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; ordering; domino; pyramid discussions.	(EF08LI19) Investigate how expressions, gestures, and behaviours are interpreted due to cultural aspects. (EF09LI09) Share, with colleagues, the reading of the texts written by the group, valuing the different points of view defended, with ethics and

¹³ According to the Center on the Developing Child at Harvard University (2011).

¹⁴ According to Ellis (2014, p. 211-212).

¹⁵ According to Ellis (2014, p. 211-212).

¹⁶ According to Bentley (2010, p. 57).

		respect.
- Inner and outer voices and when to use them	-	(EF08LI20) Examine factors that may impede understanding between people of different cultures who speak English.
- Finding mistakes and correcting them	(1) listing; ordering and sorting; comparing. (2) categorisation; labelling; matching.	(EF08LI09) Evaluate one's written production and that of colleagues, based on the context of communication (purpose and adequacy to the public, content to be communicated, text organization, readability, and sentence structure).
- Noticing that the same word has different meanings according to the context	(1) comparing. (2) categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; feature identification; domino.	(EF07LI17) Explore the polysemous character of words according to the context of use.
- Review habits of doing things according to new information	(1) creative tasks. (2) pyramid discussions.	-
- 'Thinking outside the box'	(1) creative tasks. (2) pyramid discussions.	(EF09LI12) Produce texts (infographics, online discussion forums, photo reports, advertising campaigns, memes, among others) on topics of local collective interest or global, which reveal critical thinking.
- Learning exceptions to grammar rules	(1) ordering and sorting (2) categorisation; cloze; gap fill; labelling; matching; multiple choice; true/false; ordering.	(EF06LI19) Use the present tense to identify people (verb to be) and describe daily routines.
- Repeating an experiment changing what is necessary until it works	(1) problem solving. (2) pyramid discussions.	EF08LI10) Reconstruct a text, with cuts, additions, reformulations, and corrections, to improvement, editing, and final publication.
- Trying new strategies to solve a conflict	(1) creative tasks, sharing personal experiences. (2) pyramid discussions.	(EF08LI01) Use the English language to solve misunderstandings, state opinions and clarify information through paraphrases or justifications.

Table 4 – Shows the relation between cognitive flexibility, TBL/CLIL and BNCC
(Source: the autor)

Table 4 presents BNCC skills related to reformulating, rephrasing, reconstructing, expressing different opinions, developing critical thinking, self-evaluation, and solving misunderstandings and problems are addressed by both TBL and CLIL frequent assignments such as pyramid discussions, problem-solving, categorizing, comparing, and proposing creative tasks. To achieve this, pupils need to access the EF related to cognitive flexibility, responsible for 'thinking outside the box', viewing different perspectives, and finding new strategies to deal with conflicts. Aiming to make the relation clearer, Figure 1 groups TBL/CLIL everyday tasks linking them to each EF.

As Tables 2, 3, and 4 show, connections between EF, TBL & CLIL, and BNCC can be drawn, and Figure 1 summarizes these interconnections.

Figure 1 – Tasks interconnected to EF

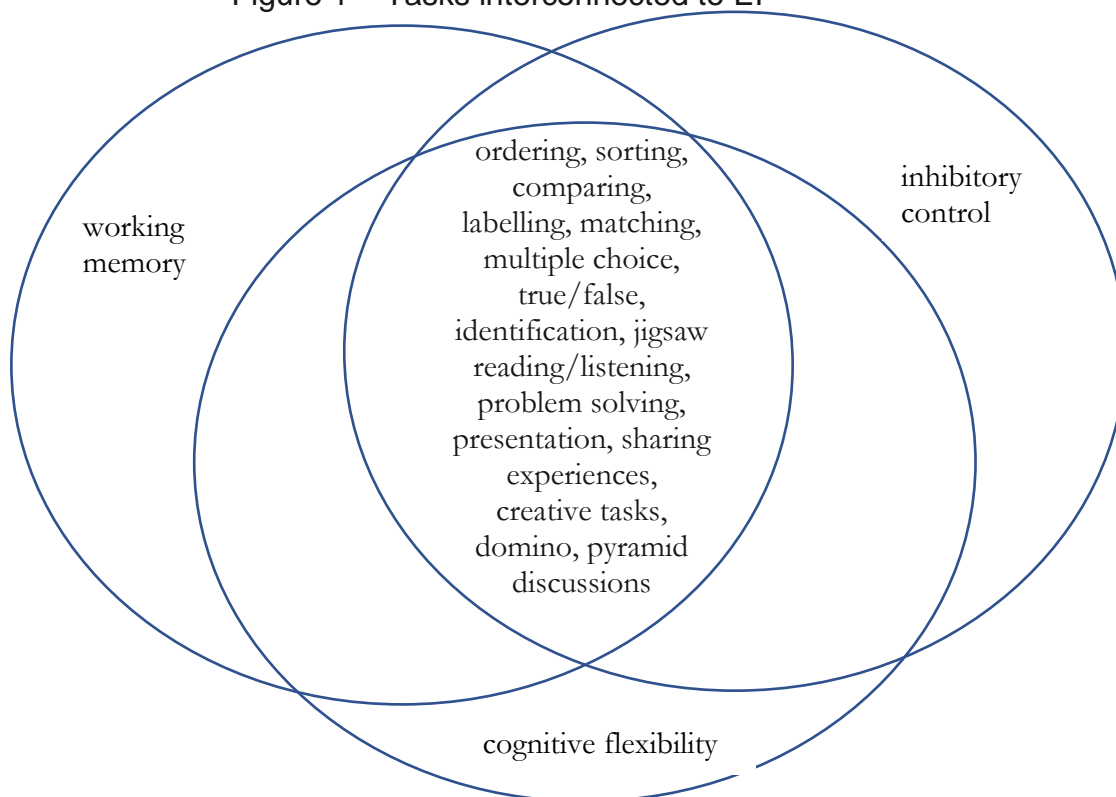


Figure 1 – presents the intersection of TBL/CLIL tasks and EF (source: the author)

Figure 1 shows that the classical tasks proposed by the ESL approaches are related to the three main EF. Although it is possible to separate them for pedagogical purposes and according to the task one of them plays a main role, in everyday life, the EF overlap one another and work together. For example, when pupils are performing a discussion to solve a challenge, working memory accesses previous information to organise connections, inhibitory control helps to coordinate turn-taking so that everyone in the group has the chance to express their opinions, and cognitive flexibility is requested to find out an adequate solution.

To sum up, it is possible to link the three core EF to several tasks common in ESL approaches, in this research, TBL and CLIL, and their connection to the abilities listed in the BNCC. In other words, the type of tasks students are supposed to perform in English lessons dealing with content that aims to develop the skills listed for each school year demands the use of the WM, IC, and CF. The three core EF need to be established so that students can solve the tasks English teachers propose. Students with difficulties in dealing with tasks may not develop the listed abilities and this raises a question: is the content or the difficulty to access certain EF abilities the problem? If the EF are well developed will the students deal with content differently? If students can't pay attention to instructions or focus on a task while someone is mowing the grass in the schoolyard, is the task or the difficulty in accessing IC the issue?

Sometimes, teachers complain a lot about students not being able to deal with content. However, did teachers consider the fact that their students might not have been exposed to several experiences that stimulated the development of the EF? Looking at Table 2, it seems plausible that students' difficulties can be a product of an underlying lack of EF.

FINAL CONSIDERATIONS

The purpose of this article was to seek links between EF, ESL approaches, and the BNCC. TBL and CLIL aim to facilitate the learning process, developing the skills established in the BNCC, especially the communicative ones. According to the links shown in this study, these skills are dependent on the stimulation and improvement of the EF.

In both approaches, vocabulary use goes far beyond plain memorization: one's working memory has to filter the suitable usage in a meaningful syntax structure. Communication is also crucial in TBL and CLIL approaches, hence, turn-taking, respect for the other's opinion, and focus on what is being discussed are necessary skills related to inhibitory control. Cognitive flexibility is necessary to solve tasks in TBL and the maker culture in CLIL. EF are the core structures students need to access when dealing with English language tasks: they trigger knowledge manipulation to make sense and understand/communicate meaning, interact with others, and develop interpersonal skills. Therefore, promoting strategies that stimulate the EF when planning English lessons is essential to achieve a successful performance from the students.

However, a question that may be asked is how aware teachers are to incorporate stimuli to the EF into their planning or do they incorporate them unconsciously? If teachers do not know about EF, their importance, and how to stimulate them, they miss a huge opportunity to help their students become proficient and be able to communicate in the second language, which is the core of learning a second language.

Understanding how to consider strategies for stimulating working memory, inhibitory control, and cognitive flexibility that can reduce student difficulties is necessary. The concern with content is important. However, if the students' EF are not developed, they will have difficulties in the learning process. On the contrary, if EF are well developed, students will be able to deal with most tasks related to any content using different strategies to solve challenging situations. In this sense, lesson planning that promotes the RF in teaching English as a second language has a lot to contribute.

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