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Neuroscience as a Black Swan of Teacher Training: Adding a Topic in Educational Neuroscience to a CELTA Course

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Abstract: *Since little is known about the incorporation of educational neuroscience into foreign language teaching, so many English as a Foreign Language (EFL) teachers heavily rely on the most used teaching methods they learn through Initial Teacher Training programmes (ITT), such as TEFL, CertTESOL, and CELTA. CELTA, which stands for Certificate in English Language Teaching to Adults, is a benchmark of excellence in the field due to its high demand from employers (3/4 English language teaching jobs require a CELTA), its standardised format and practical teaching experience. Even though the CELTA course is widely considered the gold standard for EFL, it fails to equip novice teachers with the neuroscientific evidence to help them improve students' outcomes by explicitly teaching meta-skills: metacognition — "learning how to learn" and meta-motivation — "learning how to motivate oneself". Metacognition and meta-motivation allow learners to evaluate and support their learning, and in turn, encourage autonomy and change the idea of learning as an event purely happening within the four walls of the classroom. This research focused on the overview of the CELTA syllabus through the lens of neuroscience, examination of evidence as to why adding a topic in neuroscience to a CELTA certification course can bring about positive change, a design of the new topic to be potentially added to a CELTA syllabus, as well as an empirical study design to measure its effectiveness. It is hypothesised that adding a topic in meta-skills to the most in-demand course for EFL teachers, will not only improve teaching practice on the course and promote lifelong learning, but also become an accessible, evidence-based, teacher-friendly neuroscience resource. It is assumed that a topic in educational neuroscience will become a black swan of teacher training, — an unprecedented event that can change the whole course of teacher training by shifting the focus from the "know-what" to the "know-how" and the "know-why" of learning, and therefore, have a significant impact on how teachers see learning. A possible positive influence on other certification courses and "dehyping" of neuroscience is also expected, which should lead to more awareness among EFL teachers and minimise the risks of falling into a trap of snake oil salesmen promoting "brain friendly" language learning teacher training courses for EFL teachers.*

Keywords: *educational neuroscience; meta-skills; CELTA; EFL teacher training; metacognition and meta-motivation.*

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1. Introduction

An interdisciplinary field of educational neuroscience emerged in 1985 as a potentially powerful tool to inform educators about the brain's role in learning, and to highlight the importance of good teaching (Feiler & Stabio, 2018). This relatively young field aims to translate empirical neuroscience evidence to educational practice, and thus unlock unique potential for teacher professional development and student learning (Fischer, Immordino-Yang, & Waber, 2010). Translating neuroscience into practice might seem quite daunting, however, research shows that such implications of neuroscience in the classroom as self-regulated learning: cognition, metacognition, and understanding the importance of regulating one's own motivational states, can totally reshape the way teachers see learning, and subsequently teaching (Branigan & Donaldson, 2020). Self-regulated learning allows learners to be aware of their strengths and weaknesses (Zimmerman, 2010). Knowing thyself and one's strengths as a learner, can bolster thinking and engagement in the classroom (Hodges & Clifton, 2012). Self-regulated learning consists of metacognition, cognition, and motivation (Education Endowment Foundation, 2021). Following the Education Endowment Foundation's report on Metacognition and Self-Regulated Learning (2022), teachers are urged to acquire professional understanding and skills to support their learners' metacognitive and meta-motivational development (meta-skills) in the first place, since metacognitive and meta-motivational strategies also enhance cognition. *Meta-skills* are considered the most effective way to improve educational outcomes by developing students' knowledge of themselves as learners and encouraging them to take responsibility for their learning (Education Endowment Foundation, 2021). It is also estimated as a very low-cost intervention, which only requires extra teacher training and a small amount of teacher time to implement the approach in the classroom (Education Endowment Foundation, 2021). Therefore, such a high-tier ITT program for EFL teachers as CELTA, with its longer duration than any other course, its in-person nature, and its in-depth study, has all the potential to add an extra topic in neuroscience to equip early career teachers with the necessary knowledge to foster self-regulation in their classrooms.

Since teaching self-regulated learning, particularly meta-skills, is the most effective and affordable way to translate neuroscience to education, the *main objective* of this study is to develop a topic in metacognition to potentially introduce CELTA course takers to neuroscience in a way it is linked to education: directly— through brain optimisation, and indirectly — through psychology, and meta-motivation to develop new EFL teachers' meta-motivational competencies: growth mindset, attention regulation, and delayed gratification. The *secondary objective* of this study is to examine the structure of the CELTA course through the lens of neuroscience, potentially leading to more effective course design and delivery.

As part of the study, I will conduct a literature review to cover the main components of self-regulated learning *(metacognition* and *meta-motivation*) in relation to English as a foreign language learning and discuss how they can inform teacher training. Then, I will examine the CELTA syllabus through the lens of neuroscience and recommend necessary changes to enhance its effectiveness. After a thorough literature review on metacognition and metacognitive competences that reflect the interaction of neuroscience and education, such as *brain health* and *executive functioning (psychology)* (Thomas, Ansari & Knowland, 2018), as well as a rigorous literature review on meta-motivation, I will design and propose an extra topic to be potentially added to a CELTA certification course. This topic will include one input session on meta-skills: *metacognition* and *meta-motivation* together with a proposed assignment (CELTA Assignment 5) to evaluate trainees' understanding of metacognition and meta-motivation and their implications in the classroom. I will recommend altering the *Teaching Practice Criteria* by adding meta-level teaching competencies. In addition, I will outline an empirical study to measure the effectiveness of the proposed topic.

1.1. Self-Regulated Learning

Self-regulated learning is considered a vital 21st-century skill (Trilling & Fadel, 2009). In the recent past, research findings in the field of education have demonstrated the importance of self-regulation strategies for students' academic achievement (Fauzi & Widjajanti, 2018). Self-regulated learning strategies were also studied in the context of achievements in the field of English as a foreign language and proved to be effective and particularly important for the learners who are not immersed in the language due to the unconducive learning environments of the countries where English is not a native language (Deng, Wang & Xu, 2022). The processes involved in self-regulated learning are *metacognitive* and *meta-motivational* in nature: they reflect how learners plan, evaluate, and monitor their performance, as well as how they can control their motivational states (Deng, Wang & Xu, 2022).

The term *metacognition* was coined by developmental psychologist John H. Flavell after he introduced the world to "metamemory" (Flavell, 1979). It was initially proposed as "knowledge and cognition" about cognitive phenomena. However, with the flow of time, in Flavell's seminal paper, it was introduced, as it is now more often described, as "thinking about thinking". Flavell built it upon preceding research on memory, and this term is still used, as well as "knowledge about knowledge". Flavell's exploration of metacognition started with his study on nursery schoolers, second graders, and fourth graders. All these children were supposed to learn a list of random items by heart until they could recall them flawlessly (Flavell, Friedrichs & Hoyt, 1970). Flavell noticed that older children came up with some strategies, and as a result, managed to recall necessary items. In contrast, the youngest ones could not cope with the assignment because they simply had no idea what to start with, even though they were also eager to do the task. Learners who can regulate their learning act more intentionally. For this, they require awareness and understanding of their own thinking called *metacognition.*

1.2. Metacognitive Components Related to Executive Functioning

Two concepts in psychology research are often characterised as the basis of self-regulated learning: metacognition and executive functions. They are very closely related to each other, consequently, individual variation in one can predict individual variation in the other (Wu & Was, 2023). Neuroscience is indirectly connected to education through psychology (Thomas, Ansari & Knowland, 2018), which studies how learners can manage and direct their behaviour (executive functioning) to achieve better educational outcomes. Thus, it is beneficial to explore how metacognitive components related to executive functioning can impact academic performance.

There are four components of metacognition that actively correlate with each other: metacognitive knowledge, metacognitive experiences, metacognitive goals (tasks), and metacognitive actions (strategies) (Flavell, 1979). With metacognitive *knowledge*, Flavell describes a person's ability to make judgements about their strengths and weaknesses (self-knowledge), their beliefs about their capacity to learn (self-efficacy), their beliefs about their motivation for learning, the knowledge of various strategies that can be applied to learning, as well as the knowledge of the task, which allows to approach the task in the best possible way (Flavell, 1979). Similarly to *metacognitive knowledge*, *metacognitive experiences* are the demonstration of the monitoring function (Efklides, 2006). They are the reflections on cognitive processes, such as feeling good about one's own performance or worrying about failing an exam, if one feels not good enough (Efklides, 2006). A fear of public speaking or a "revelation" feeling are vivid examples of a metacognitive experience (Mishara & Conrad, 2009). Metacognitive experiences are conscious experiences that are not only influenced by cognitive ability but also by the learner's personality and other factors (Efklides, 2006). Thus, the dual nature of metacognitive experiences allows them to access separate self-regulatory mechanisms that activate different processes which lead to self-regulating their behaviour, and as a result, empowering students to become more independent learners (Efklides, 2006). Metacognitive knowledge and experiences are considered a prompt for the other two aspects of metacognition: metacognitive goals and strategies (Moritz & Lisaker,

2018). *Metacognitive goals (task*s) refer to the intended results or goals and objectives of the task (Flavell,1979). Their successful realisation is largely dependent on metacognitive knowledge and experiences (Flavell,1979). Whereas the aim of *metacognitive strategies (actions)* is to monitor cognitive processes by controlling cognitive activities to ensure that the cognitive goals of the learners are met (Flavell,1979). This includes planning, monitoring, and overseeing one's own learning process (Flavell,1979). Those learners who can successfully apply metacognitive strategies become more autonomous, and consequently, are more likely to become lifelong learners in the future (Moritz & Lisaker, 2018).

1.3. Metacognitive Component Related to Brain Health Optimisation

There is another component of metacognition called *metacognitive states,* and it is beyond the scope of the four components that have typically been examined. The lack of progress has been shown in the ReflectED trial conducted in 2018, which is a metacognition-based programme that investigated the link between metacognition and student attainment in Rosendale Primary School. In their report, the researchers from the University of York, who evaluated the impact of the ReflectED programme on learners' academic achievement, highlighted the importance of redefining metacognition and thinking about it beyond the scope of metacognitive monitoring and control, which are related to executive functioning (Gascoine et al., 2022). Following that, it is suggested to explore metacognitive states that are the product of brain health optimisation, which directly connects neuroscience to education, due to the fact that the brain is a biological organ taking part in learning (Thomas, Ansari & Knowland, 2018). For instance, stress management can be no less important a metacognitive strategy than structured thinking activities because it enables learners to enter a metacognitive state. In turn, metacognitive states that are described as the states of learners in an intellectual situation (Kazemi et al., 2013), are important to peak brain performance for learning. They are characterised by their ability to maximise learners' capacity by bringing their attention back to learning (Kazemi et al., 2013).

1.4. Applications of Metacognition in the Classroom

Teachers' metacognitive abilities are strongly correlated with the metacognitive abilities of the students (Anderson, 2002). Hattie (2008) has drawn a conclusion that teachers practicing metacognition are much more successful at supporting their own and their learners' development through the metacognitive modelling of their own thinking. In addition, one study that explored the role of a teacher in fostering metacognition, investigated how Structured Thinking Activities, such as reflection or planning, can provoke "thinking about thinking"/ "learning to learn" in comparison to teachers modelling metacognitive strategies for their students (Branigan & Donaldson, 2020). The resources that Structured Thinking Activities utilised included planning books, learning journals, and logs. It was concluded that learners were not eager to provide written responses, therefore, reflective practices were not as effective as when teachers were modelling metacognitive strategies for their students (Branigan & Donaldson, 2020). The outcomes of the study highlight the importance of teacher training in educational neuroscience to ensure that educators have a clear understanding of what metacognition is to be able to model it for their students to help them develop their abilities to plan, evaluate, and self-monitor.

1.5. Metacognitive Strategies for English as a Foreign Language Teaching

Many scholars highlight the importance of metacognition to advance language learning (Wenden, 1987; Ellis & Sinclair, 1989; Magaldi, 2010). Even though policymakers keep actively approving metacognition, and a good number of schools all over the world weave it into their curricula, the field of English language teaching and EFL certification courses curricula still have not included metacognition. Since learners' ability to choose and evaluate their learning strategies is no less important than their subject skills, instead of purely focusing on English learning, it is essential to develop students' meta-skills in parallel (Anderson, 2002). Moreover, it is not

recommended to separate metacognition from subject knowledge (Anderson, 2002). Metacognition can be included in English as a foreign language teaching in a two-stage metacognitive process: *Planning* and *Teaching*. Preparation and *Planning* are metacognitive skills that require certain *metacognitive strategies,* which, if applied adequately, can not only improve metacognition but also improve students' language. For instance, the co-creation of materials is a metacognitive strategy that can improve language learning by allowing students to use the English language to negotiate topics of the course, share their perspectives, and personalise their experience (Bovill, 2020). Formation of rituals and building good language learning habits in the classroom is both a metacognitive skill and an important element of successful language learning (Boyer & Liénard, 2006). Therefore, including such rituals as reflection activities in the lesson plans can help to improve metacognition and maximise language practice at the same time. *Metacognitive goals* can also serve as a valuable tool for language improvement, for example, setting SMART goals. Setting sustainable, measurable, attainable, relevant, and timely goals for English language learning together with the students will not only improve their planning skills but also help to break down the process of learning into smaller, more achievable chunks (Bjerke & Renger, 2017). The process of *Teaching* can elicit necessary *metacognitive experiences*, such as a feeling that a learner does not understand something discussed in the lesson (Flavell, 1976). Since metacognitive experiences usually arise in intellectual situations that encourage conscious thinking (Flavell, 1979), the use of such teaching strategies as knowledge leveraging and knowledge integration can help to identify the knowledge gaps that learners might have, or why their particular language learning strategies are not working (Wenden, 1998). Knowledge leveraging is characterised by the use of prerequisite knowledge on a certain topic to one's advantage: for instance, vocabulary learning leverages the existing knowledge of the vocabulary. Prior word knowledge leveraging is thought to positively affect language learning (Webb & Chang, 2015). Knowledge integration is described as a translation of raw knowledge into applicable knowledge. It is also about how prior and new knowledge interact (Said & Jabar, 2023). Since foreign language learning is a process that requires active engagement in the classroom, it is necessary to practically apply what is learned to become proficient (Kim & Sul, 2023).

Learners' *metacognitive knowledge and states* can also be improved during *Teaching* with the help of visualisation, social connectedness building, and stress management techniques. Since *Metacognitive knowledge* also includes students' beliefs about themselves as learners (Wenden, 1999), Wenden (1999) recommends using surveys and interviews to build a profile of students' metacognitive knowledge. Using visualisation (guided imagery) as an intervention tool can also help learners to explore themselves (Arnold, 1999), moreover, it can help them to build an image of their future selves with perfect English (Dörnyei, 2009). *Metacognitive states* of learners play an important role in language learning due to their ability to regulate thoughts and emotions, reduce mind wandering, and maintain focus. Utilising stress management techniques in the classroom, such as mindfulness meditation, will enable students to get into proper metacognitive states (Teasdale, 1999). In addition, social relatedness is characterised by the feeling of being connected to others in the classroom and is positively correlated with EFL students' engagement (Hosseini et al., 2022), and learner engagement, in turn, can foster a metacognitive insight mode or metacognitive state (Teasdale, 1999).

1.6. Meta-Motivation

Another meta-level skill that is closely related to metacognition is *meta-motivation.* The responsibility learners take for their performance, including hard work, discipline, and self-control, is a metacognitive process that is directly related to motivation (Valenzuela, Nieto Carracedo & Muñoz, 2014). Motivation is crucial for learners to maintain their effort to study, and it impacts their decisions about how to study until they finish the task (Kornell & Bjork, 2007). However, the role of the learner in motivation regulation is often neglected (Norouzi et al., 2023), as well as the strategies that teachers can use to help learners manage their motivational states. *Meta-motivation*

arises when the psychological and/or physiological needs of the learners are met, and English as a foreign language learning becomes self-actualisation. The meta-motivational approach suggests that individuals can regulate their motivational states, which makes it more effective than intrinsic and/or extrinsic motivation (Fujita et al., 2024).

1.7. Meta-Motivational Strategies for English as a Foreign Language Teaching

Such *meta-motivational strategies* as growth mindset, attention regulation, and delayed gratification can be implemented to enable ESL learners to achieve their learning goals. To support learners in developing a genuine interest in new things, a *growth mindset* should be cultivated (Dweck, 2006). The growth mindset allows learners to look positively at their learning journey, helping them to bounce back from setbacks and failures, and experience more positive emotions while learning because of having control over their abilities (Dweck, 2006). According to Seligman and Csikszentmihalyi (2000), positive emotions are among the most important factors for people's flourishing. Emotions affect our cognition substantially by modulating the selectivity of attention, and therefore, play a pivotal role in motivation (Tyng et al., 2017). Basic emotions like joy and happiness are motivational factors independently and therefore play a big role in reaching better educational outcomes (Seligman & Csikszentmihalyi, 2000). Foreign language anxiety or FLA is one of the demotivating factors in learning English as a foreign language. The main reason for FLA is that foreign language learning is associated with risk-taking (Horwitz, Horwitz & Cope, 1986). Consequently, encouraging a growth mindset in the classroom by giving students praise for their efforts, and when they challenge themselves, can help to establish a safe space required for foreign language learning.

Motivation is defined as a mental *attention allocation* mechanism necessary for memorising information (Cook & Artino, 2016). One learns what one attends to (Cook & Artino, 2016). Based on Hebbian Law: neurons that fire together, wire together. The stimuli play a big role in encoding, storage, and recall of information. Since emotions modulate the selectivity of attention, they also have an impact on motivation. Emotional influences must be taken into consideration when designing English as a foreign language course or planning English as a foreign language lesson (Kralová, Kamenická & Tirpáková, 2022). In addition, emotional stimuli require more attention than non-emotional ones (Schupp et al., 2007), which explains the necessity to plan EFL lessons in a way that they are emotion-provoking and fancied by students to capture and retain their attention.

Since autonomous learners are more proactive in pursuing their goals and intrinsically motivated, managing one's own motivation is important for self-guided learning and autonomy (Schunk & Zimmerman, 1997). This enables learners to process information at a deeper level and have better educational outcomes. For EFL learners to be able to self-regulate, maintain motivation and effort, as well as prioritise their learning, the importance of *delayed gratification* should be brought to light. Delayed gratification is described as an ability to continue through till the end until the task is completed, to overcome difficulties, fatigue, and boredom (Bembenutty & Karabenick, 2004). According to Bembenutty & Karabenick (2004), students who are better at their ability to delay gratification in favour of studying tend to be also better at self-regulation, and self-regulation is associated with academic achievement. Thus, explicitly teaching learners to choose activities that will enable them to reap considerable long-term benefits by tapping into their inner motivation should be one of the meta-motivational strategies that EFL teachers utilise.

2. CELTA Syllabus Overview Through the Lens of Neuroscience

Certificate in English Language Teaching to Adults (CELTA), or as it is now known, Certificate in Teaching English to Speakers of Other Languages, was initially introduced to train English language speakers to teach their language to speakers of other languages interactively and communicatively (Watkins, Thornbury & Millin, 2023). The CELTA course syllabus is designed in a way that it caters to the needs of both inexperienced and experienced EFL teachers willing to learn how to teach communicatively and gain an internationally recognised qualification. Tens of

thousands of teachers take CELTA every year, which makes it a relevant teaching qualification. CELTA encompasses subject matter, teaching techniques, and practical experience, which resembles the majority of ITT programmes (Cambridge University Press & Assessment, 2022). As with any other ITT, it trains teachers to effectively use methodology, practice teaching and reflection and equips them with the knowledge of the mechanics of the English language (Musset, 2010). However, it is becoming increasingly apparent that teachers require training in learning to learn (L2L) to develop rigorous teaching practices (Brick et al., 2021), whereas the CELTA course mostly focuses on the "what" rather than the "how" and the "why" of foreign language learning. Moreover, it is evident that meta-skills increase learners' inner motivation and result in deeper and more efficient learning (Wang, Haertel & Walberg, 1990).

In CELTA topic one entitled "Learners and Teachers and the Teaching and Learning Context", among all the content points of the syllabus, together with input on cultural, linguistic, and educational backgrounds, contexts for learning and teaching varieties of English and multilingualism, there is a take on motivation, learning and teaching preferences. Both content points are suggested for revision. Motivation, for instance, is presented as learners' reasoning for learning English (CELTA Syllabus, 2022). Whereas a reason for doing something is a motive, motivation is more of a force that drives individuals to do things (Peters, 1956). Even though the motives are emotionally charged; for example, learners enjoy learning foreign languages, motivation is tied to the notion of a "drive" and an ongoing stimulus that deliberates energy for doing something (Peters, 1956). Thus, exploring the motives of the learners is not the same as motivating them to persevere and delay gratification, as well as directing their behaviour towards a goal by cultivating a growth mindset. Even though, it is useful to find out why learners need to learn English to be ready with the activities on topics that they are particularly interested in, motivating the students to learn is more about creating a safe space for them to speak out, maintaining their attention, and explicitly teaching them to motivate themselves when they are not in the classroom. Learning styles (or preferences, as it is used in the syllabus updated in 2018) present in the course syllabus Topic one, are considered a neuromyth. The idea that students learn better when they are exposed to information presented in their preferred style has been rejected because of numerous trials carried out to test this assumption and showing no result (Pashler et al., 2008; Rogowsky, Calhoun & Tallal, 2020). From a neuroscience standpoint, the brain works as an integrated whole and parts of the brain do not function separately from each other, which completely precludes the possibility of isolated neural networks for different learning styles (Waterhouse, 2006).

The second topic of the course is called "Language Analysis and Awareness" (Cambridge University Press & Assessment, 2022). The focus here is on the development of teachers' understanding of English grammar, vocabulary, and pronunciation. This component of the course delves into the mechanics of the English language and explores approaches and strategies required for developing learners' language knowledge. This topic is a good opportunity to start introducing novice teachers to L2L strategies to enable them to model these strategies to their learners based on the evidence that metacognition is specific to the task that the learners are working on. So, it is recommended to weave metacognitive knowledge into the subject knowledge. The reason for that is that some strategies might be ineffective if the learners lack subject knowledge (Willingham & Lovette, 2014). Here, teachers can think out loud about the strategies that they have used when they were learning English (for non-native speakers) or any other foreign language (for native speakers) by constantly comparing English language grammar, vocabulary, and phonology to the learners' L1.

CELTA syllabus area three is devoted to language skills, such as reading, writing, listening, and speaking (Cambridge University Press & Assessment, 2022). Simultaneously learning metacognitive strategies and language skills by practicing reading, writing, listening, and speaking in the target language can improve educational outcomes (Volet, 1991). Teaching learners to ask powerful questions and actively listen is a complementary practice while working with spoken or written discourse (Tennant, Long & Toney-Butler, 2023); (Tofade, Elsner & Haines, 2013). Thus, it

is beneficial to select a specific metacognitive strategy in the "early reading/writing/speaking/listening" phase and model this strategy in the "during reading/writing/speaking/listening" phase. Stopping occasionally and adding "think-aloud" to the work on the written or spoken discourse can help to develop powerful reading/writing/speaking/listening habits, and improve academic achievement.

In the fourth topic of the course, teachers are introduced to the planning and resources for different teaching contexts (Cambridge University Press & Assessment, 2022). In this part of the course, participants learn to write lesson plans, set goals (clear and achievable, as stated in the guidelines), plan activities and procedures, as well as select and/or create materials that are fit for purpose. Since one of the ways to improve teaching and learning is a collaboration between a teacher and a student, it is advisable to involve learners in the planning and selection of the resources to ensure more inclusive, and therefore, more effective learning (Lubicz-Nawrocka & Bovill, 2021). Another metacognitive skill required for preparation and planning is goal setting. It is important to add "setting SMART goals" competence with an emphasis on measurable, relevant, and time-based goals, since they do not appear in the guidelines. Goal setting taps into planning and self-efficacy, which are powerful metacognitive strategies. Locke and Latham (2002) introduced a goal-setting theory of motivation, which draws attention to the goal-setting/performance interface, particularly the correlation between the learners' performance and the difficulty and specificity of their goals; namely, the more challenging and specific the goal is, the higher is the motivation to accomplish it. Measurable goals help learners get regular feedback on their performance and therefore track their progress (Lawlor & Hornyak, 2012). Relevant and time-based goals help in developing the focus and using time efficiently, as well as maintaining attention (Ogbeiwi, 2021).

The last topic of the course is devoted to developing teaching skills and professionalism (Cambridge University Press & Assessment, 2022). This topic aims to develop such professional skills as classroom presence and control, organisation of the classroom, teacher and learner language, the use of teaching materials and resources, practical skills for a range of levels, monitoring and evaluation of learning, evaluation of teaching/learning process, professional development responsibilities and professional development support systems. This part of the course seeks to summarise everything learned previously and covers more practice than theory. At this stage, participants observe lessons conducted by experienced teachers and the tutors of the course observe the trainees' teaching. Teaching practice (TP) is assessed against the criteria of proper lesson structuring: from setting-up to feedback. At the very beginning of the lesson, it is important to engage prior knowledge in addition to the listed criteria procedures, like establishing a pleasant atmosphere, informing the learners about the lesson goals, and setting the theme of the lesson. Prior knowledge influences students' ability to learn (Simonsmeier et al., 2018). To make sense of new information presented, one refers back to what they already know (Simonsmeier et al., 2018). This ability to recall previous knowledge fosters the acquisition of new knowledge (Simonsmeier et al., 2018). Thus, it is recommended to add prior knowledge activation to the setting up stage. One of the ways to boost students' motivation is to appeal to their need for autonomy and competence (Beymer & Thomson, 2015). Providing English language learners with several task options of how they can reach their end goal, will give some agency over their own learning. In the monitoring phase, it is advisable not to just monitor learners' progress and check if they are on task and keep them focused, as prescribed in the course, but also to ensure that each of them learns by teaching others. The process of explaining new grammar rules to peers or retelling texts not only enhances autonomy, but also solidifies new knowledge and the memories of new skills that they practice during the on-task stage. The significance of the "Learning by Teaching" effect is not only in the identification of knowledge gaps and enhanced memory retention, but most importantly in the long-lasting impact that it has, in contrast to passive learning (Wagner & Gansemer-Topf, 2005). So, it is highly recommended to include this procedure into the on-task stage of the TP specified in the CELTA syllabus.

As neuroscience influences education by shaping psychological theory (Thomas, Ansari, & Knowland, 2018), translating neuroscientific findings to EFL classrooms by weaving them into teacher training syllabi is predicted to improve learning outcomes and act in the interest of time to meet the needs of busy modern English language learners. The leverage points identified and recommended for intervention in this CELTA syllabus overview are projected to improve the reliability and validity of the training content, and as a result, educational outcomes. Due to the importance of the teachers' clear understanding of the concepts of metacognition and meta-motivation, as well as their implications in the classroom, in addition to suggested improvements to be made to existing topics of the course, an extra topic in neuroscience is recommended for inclusion in the syllabus.

3. Adding a Topic in Neuroscience

Educational psychology has been influencing educational practice and policy by informing teachers about how learners learn, measuring learning outcomes, and improving learners' participation (Hadi, Alfia Nursyamsi, & Adelia, 2024). Nevertheless, many psychological theories are shaped by neuroscience and directly address neural processes and correlates (Beste, 2021). For instance, VAK learning styles and Multiple Intelligences (MI) theories, which have been prevalent in education for decades, are debunked neuromyths because of the lack of evidence from neuroscience. And for this reason, educational neuroscience plays a big role in informing educators. Current evidence and practical applications allow the translation of the most important psychological principles and brain optimisation techniques to educational practice (Thomas, Ansari, & Knowland, 2018). Additionally, an interdisciplinary field of educational neuroscience not only studies the malleability of the brain during learning, but also how these implications can lead to rethinking education to promote lifelong learning. These potential changes might come as a black swan event with a major effect on current narratives that exist in education and present learning as an institutional framework following a certain curriculum; instead, the paradigm should shift from the importance of "what" we learn to the prioritising of "how" we learn and "why" we learn. Moreover, in the new era of lifelong learning, which began due to the need to master new skills more often than in the past, individuals require more of the "know-how" to learn and the "know-why" to learn because the "know-what" is uncertain, changeable and information itself is not scarce anymore. According to the reports produced by the Royal Society, current evidence of how we learn should be given more importance and teacher training should contain this evidence (Royal Society, 2011). That being so, educational neuroscience is placed in the centre of attention in current educational practices, as a viable field that links neuroscience to education. There are two links between neuroscience and education: direct and indirect. The direct link originates from the fact that the brain is a biological organ directly involved in learning (Thomas, Ansari, & Knowland, 2018). Optimising the brain for learning to enhance the brain's overall efficiency and functionality is a necessary practice for classroom use. Knowing what brain optimisation is and how to optimise the brain for learning, is a competence that English as a foreign language teachers need to develop. Among other factors that impact learning are social connectedness and stress management. Stress management may include mindfulness meditation, exercise, nutrition, sleep, and naps. Indirectly, neuroscience is linked to education through psychology, where psychology informs education based on the neuroscience underpinnings (Thomas, Ansari, & Knowland, 2018). Thus, the knowledge of psychological principles and their neural underpinnings pertaining to learning should be one of the priorities of the teacher training programs for EFL teachers. Also, according to Brick et al. (2021), the knowledge of learning how to learn enables educators to create more student-centred classrooms. Learner-centeredness as a teaching principle runs through the CELTA syllabus like a red thread (Watkins, Thornbury, & Millin, 2023). All in all, adding a topic in neuroscience to a CELTA course syllabus to cover *metacognition* and *meta-motivation,* which teachers find the most difficult (e.g. Abdelrahman, 2020), will inform teachers how to support their learners through engagement and help them to construct their knowledge.

3.1. Metacognition

Metacognitive practices have become a requirement to succeed in a changing world (Stanton et al., 2021). Metacognition has already gone far beyond the scope of "thinking about thinking" and even far beyond "learning how to learn" (Veenman, Van Hout-Wolters & Afflerbach, 2006). Hence, to translate metacognition to the classroom, it is crucial to identify what metacognition is. Even though it usually refers to processes like planning, monitoring, and adapting to new tasks and contexts, control of one's *thinking* and *behaviour* to achieve the best possible learning outcomes is the most precise definition of metacognition (Cross & Paris, 1988). This taps very well into the two remits of educational neuroscience: *brain health optimisation* and *psychology*. Such metacognitive skills as *stress management*, *social connectedness,* and *visualisation* fall under the umbrella of brain optimisation and directly link neuroscience to education. Whereas such metacognitive strategies as *knowledge leveraging*, *knowledge integration, rituals, habit formation, setting SMART goals, and co-creation of materials* lie in the domain of psychology and refer to executive functioning. These metacognitive strategies indirectly connect neuroscience to education. Following that, to translate neuroscience to education, it is crucial to include these metacognitive strategies as teachers' professional competences for Teaching and Planning on a CELTA course to prepare EFL teachers for work in a new era of lifelong learning, and to ensure the best possible outcomes for today's busy modern learners.

Teacher Competences to optimise students' brain health

According to Shulman (1987), the physiological aspects cannot be viewed separately from learning and are important for educators to know. Therefore, how learning occurs and how to optimise the brain for learning is relevant to share on a teacher training course. Metacognitive competences pertaining to brain health optimisation, such as stress management (deep breathing, exercise, healthy diet, sleep/naps, relaxation techniques, mindfulness meditation, energy management), social connectedness, and visualisation play an important role in learning enhancement. One of the goals of a topic in educational neuroscience is to inform EFL teachers about how to optimise the brain to maximise students' ability to perform.

Multiple evidence point to the detrimental effect of stress on memory (Schwabe & Wolf, 2010). For instance, learning under stress demonstrates significant memory weakening and impaired processing of information; stress before testing is considered mainly harmful (Schwabe & Wolf, 2010). Additionally, EFL learners are usually stressed and anxious for multiple reasons: self-related thinking, a cognitive bias in relation to being a non-native speaker, and language learning difficulties (Hashemi, 2011). Foreign language anxiety (FLA) is impacted by the way EFL learners acquire the four language skills (reading, listening, speaking, and writing), where learners might avoid certain activities aimed at training the skills they do not feel confident about (Tasan, Mede & Sadeghi, 2021). Thus, stress management strategies should be introduced to a CELTA course in the form of an input session on metacognition under a subtopic of "Metacognitive Competences for Brain Health Optimisation" and listed as professional competences in Teaching Practice guidelines, as well as included in the assessment as a Classroom-Related Written Assignment. As per strategies, the results of the studies demonstrate that students ought to be presented with viable techniques by their teachers to help them cope with stress (Kassymova et al., 2018).

One of the stress reduction techniques is deep *breathing* or *pranayama* in Sanskrit. This diaphragmatic breathing improves learning by reducing stress and is time and cost-effective, which makes it easily applicable in any classroom. The study conducted by Tasan, Mede, & Sadeghi (2021) investigated the impact of pranayama breathing on stress reduction among EFL learners and concluded the reduction of anxiety levels among the students. Nadi Shodhana Pranayama and Bhramari Pranayama were the two breathing techniques applied in the study. Nadi Shodhana or Alternate Nostril Breathing is characterised by breathing from one nostril to the next, where one should hold the breath for some time on the inhale. Research evidence suggests that alternate nostril

breathing improves focus and concentration, and reduces stress (Ma et al., 2017). Bhramari Pranayama, which is usually referred to as "Humming Bee Breath" and is about controlled inhalation and exhalation along with a buzzing sound that resembles the sound of the bee, has been proven to have positive effects on stress reduction and cognitive function (Bhawani & Tribhuwan, 2023). Following this, it is highly recommended to make deep breathing techniques an area of EFL teachers' professional competences.

Research on *physical exercises* has shown a positive correlation between physical exercises (PE), executive functioning, and well-being (Mandolesi et al., 2018). Viewing physical exercises as a tool to enhance learning can change EFL teachers' perspective on how active the lessons in the classroom should be. One of the main benefits of physical exercise is lower stress and anxiety. PE also facilitates learners' engagement in the classroom. In addition, explicitly teaching the importance of being physically active has a positive effect on students' academic performance (Abdul Rahman et al., 2024). Hence, adding input on PE to a CELTA course can benefit students' learning.

Various studies point to the powerful effect that learners' *diet* has on learning (Mahoney, Lieberman & Kanarek, 2005). For instance, glucose consumption is associated with enhanced memory. The foods that protect the heart and brain vessels, like foods rich in omega-3 fatty acids, are associated with brain power (Gonzalez & Miranda-Massari, 2014). Diets containing too much saturated fats result in a reduction of molecular substrates that support learning (Gomez-Pinilla, 2008). Maintaining a healthy diet can help to cope with stress, whereas unhealthy eating patterns are associated with an increased level of stress (Gonzalez & Miranda-Massari, 2014). Therefore, it is advisable to inform EFL learners about the importance of nutrition for better educational performance.

Time out of studying has been considered no less important than the time spent on studying because short breaks (*naps*) and long breaks (*night sleep*) benefit long-term memory (Mander et al., 2011). Slow brain waves during a deep sleep stage facilitate the transportation of memories from the temporary storage (a region called the hippocampus) to permanent storage (cerebral cortex) (Mander et al., 2011). As little as one hour of nap while learning can enhance memory in the same way as if it were spent on cramming. In one of the experiments, the group that did not take a nap showed a significant decline in cognitive ability compared to the one that did (Cousins et al., 2019). Moreover, healthy sleep has been shown to improve stress (Lo Martire et al., 2024). Informing teachers on the CELTA course about the benefits of sleep for foreign language learning is essential for improving their students' achievement.

Utilising *relaxation techniques* in the classroom to help reduce students' anxiety has proved to be an effective way to cope with the stresses and the stresses of testing in particular. Such relaxation techniques as PMR (progressive muscle relaxation) demonstrated a significant reduction of the levels of anxiety and usability in the classroom environment (O'Donnell & Dunlap, 2019). Since muscle tension is related to anxiety, anxiety lowers when it is relieved. During the PMR session, the muscles are tensed and then released; firstly, the students are asked to release the tension, and then they are told to focus on the relaxation of different body parts (Varvogli & Darviri, 2011). Adding this technique to EFL teachers' toolkit to facilitate learners' brain health optimisation for learning is highly recommended.

Mindfulness meditation has *been* shown to sufficiently impact the facilitation of English language learning. This includes boosting motivation, confidence, and enjoyment (Zhao, 2024). Mindfulness is characterised by a state of being present at the moment, as well as an ability to self-regulate (Reina & Kudesia, 2020). Being a crucial metacognitive competence for brain health optimisation, mindfulness meditation can help EFL learners to cope with stress, language anxiety, and negative emotions. Teachers' professional competence to practice mindfulness meditation not only promotes students' relaxation, but also improves classroom management (Zhao, 2024). There are plenty of mindfulness exercises that can be introduced to teachers during the input session on

brain health optimisation, such as body scan, mindful colouring or drawing, mindful listening to music, etc.

For the process of learning to be equally enjoyable and fruitful*, energy management s*hould be in place. A lot of people are familiar with time management; however, energy management is more efficient, and ultimately, we all have time, but during specific hours and specific mental states our energy levels are higher (Loehr & Schwartz, 2006). The physical energy of the learners comes from proper nutrition, physical exercises, sleep, and overall well-being, whereas their ability to manage their emotions, motivation, and metacognitive knowledge about themselves as learners comes from mental energy. Only by tapping into physical and mental sources of energy learners can enhance their learning (Loehr & Schwartz, 2006). This includes the development of healthy habits and awareness of students' energy levels. Among the strategies for effective energy management is a prosocial strategy, which is about showing gratitude, making others happy, and showing compassion to enhance satisfaction from the learning process (Fritz, Lam, & Spreitzer, 2011). This can be employed by EFL teachers to boost their learners' energy levels. Teachers can lead by example, as well as explicitly teach prosocial competence.

Modulated by the activity of the subcortical reward system, *social connectedness* positively impacts well-being, whereas social isolation is associated with poor mental health (Kim & Sul, 2023). The same prosocial behaviours, as mentioned in the energy regulation part, can be applied to brain health optimisation. In addition, it is vital to avoid learners' social exclusion in the classroom in order not to compromise learners' well-being (DeWall & Bushman, 2011). It should be one of the main teachers' professional teaching competences to ensure relatedness in the classroom, which implies students feeling that a teacher and peers genuinely like them, and are interested in their success and flourishing.

One of the unconventional metacognitive strategies affecting brain optimisation is *visualisation*. Such visualisation techniques as guided imagery can change individuals' moods and enable learners to influence their emotions and behaviours more powerfully (Blackwell, 2019). After behaviourism constraints have lifted, more sophisticated research techniques have led to ground-breaking findings about the role of visualisation in cognition and wellbeing (Pearson et al., 2015). In addition, mental imagery techniques have been widely used to treat anxiety disorders by utilising "imaginal exposure" to have the patients imagine what they are afraid of until their level of anxiety decreases (Pearson et al., 2015). The implications of this research can be translated to the classroom by asking EFL learners to visualise their FLA until its level reduces. The opposite direction would be to visualise themselves being already fluent in the target language to lower their levels of FLA. Moreover, mental imagery can be used to help students achieve their language learning goals, such as improving pronunciation, vocabulary, listening, writing, or speaking by allowing them to think metacognitively about the process and imagine the sequence of actions to be taken to reach their goals, as well as potential obstacles. According to Wenger (1998), imagination is one of the most powerful ways to create new metacognitive knowledge about us and the world around us. During the process of visualisation, individuals can deeply reflect on themselves as learners and generate new ideas on how to approach English as a foreign language learning. Even though visualisation is a scarce topic in teacher training, it is a powerful tool to create one's heuristics and strategies for foreign language learning.

Teacher Competences to Support Students' Executive Functioning

Psychological theories that can inform education are grounded in neuroscientific findings and thereby link neuroscience to education. The metacognitive competences that emerge from psychology, particularly executive functioning, are suggested for inclusion to ensure successful planning and teaching of ESL. These professional competences include co-creation of materials competence, ritual and habit formation competence, knowledge leveraging competence, knowledge integration competence, as well as a competence in setting SMART goals.

Co-creation in learning and teaching has proved to be one of the ways to amplify students' engagement and encourage empowerment (Bron, Bovill & Veugelers, 2018). Active collaboration between an EFL teacher and learners, where they negotiate the learning process, is an important metacognitive strategy to be utilised at the stage of Planning. The shared responsibility between a teacher and learners encourages learner autonomy, and learner autonomy, in turn, promotes lifelong learning - a sustainable development goal number 4 (Bron, Bovill & Veugelers, 2018). Since all EFL students have different learning needs and motives for learning the English language, they might prioritise different topics from the teacher. Students' life dynamics should directly influence the classroom dynamics, but not contrariwise. Moreover, reflections during the process of co-creation will help to strengthen students' metacognitive skills, such as planning, goal setting, directing their learning, and monitoring their progress.

Ritual and habit formation play a critical role in the development of *students*' metacognitive skills, like self-regulation and organisation of the learning process. Consistently repeating certain actions leads to rewiring of the brain, and subsequently, a change in the behaviour. From a neuroscience standpoint, habit formation goes far beyond just repetitive actions, it is also influenced by the environment and cognitive mechanisms (Wyatt, 2024). For this reason, classroom habits and rituals should be aligned with personal learning to be more likely to persist. Therefore, if teachers are informed about the importance of helping their learners form healthy learning habits outside of the classroom, and the need to introduce healthy rituals in the classroom, they are more likely to establish a predictable and safe environment for their learners to practice. Rituals and habits in relation to reflection/affirmation — meditation, intention setting, keeping the diary; community building — games, negotiations, topic selection; recharging — visualisation, physical exercises; material consolidation — Q&A, games, teaching others; and retrieval practice are recommended for inclusion into the Planning stage.

One of the metacognitive goals is to use one's already existing knowledge for planning and approaching learning. *Knowledge leveraging is* about making good use of what you already know about the topic to generate more knowledge. According to the theory of constructivism, prior knowledge plays a great role in the whole learning process, even despite inaccuracies in the initial stages of learning (Smith, diSessa & Roschelle, 1994). Additionally, activated existing knowledge weaves into new pieces of information and transforms learners' understanding of the topic or concept while pre-existing knowledge does not get eliminated, and there is no replacement of it with better knowledge (diSessa, 2014). Background knowledge activation not only gives teachers the data to extend and build on but also makes learning more meaningful and personal (Minshew et al., 2017). Therefore, EFL teachers are advised to leverage their students' knowledge by activating their prior knowledge before introducing a new topic. This might include referring to the learners' mother tongue if it is of Germanic-Romance origin, or finding out which related vocabulary or grammar learners already know.

Knowledge integration metacognitive strategy is one of the most important ones in English as a foreign language learning. And the reason is that foreign language learning is a complex and dynamic process (De Bot & Larsen-Freeman, 2011). Non-linearity of language acquisition has been outlined owing to developmental cognitive neuroscience (Hohenberger & Peltzer-Kapf, 2009). And since a foreign language cannot be acquired by learning separate words or grammatical rules, integration of its parts into meaningful written or spoken discourse should be an ultimate goal. Students follow the knowledge integration process as they build up their knowledge of lexis, syntax, phonology, pragmatics, and morphology. They might come to class with little phonological, morphological, pragmatic, lexical, or syntactic awareness. For them to succeed in foreign language learning, they need to integrate new knowledge to recognise language situations, figurative meanings, registers, and colloquialisms. An EFL teacher should consider knowledge integration when giving a lesson, particularly at the higher levels.

Setting SMART goals is a vital metacognitive skill to increase EFL learners' self-efficacy and motivation (Muñoz & Jojoa, 2014). Based on students' current level of proficiency, setting

specific, *measurable, attainable, relevant, and timely* goals is highly recommended for better educational outcomes (Muñoz & Jojoa, 2014). By specific goals, it is inferred that the end goal should be specified, for instance, to be B2 level in English. The progress of reaching the B2 level needs to be measured — this can be done by referring to the Common European Framework Level Reference. Additionally, language goals need to be attainable and students should be able to achieve a certain level within a certain period. It is important to be realistic and plan one level up at a time. Also, all goals set to improve English language proficiency need to be relevant to learners' lives and motives for learning English, thus, it is recommended to set the learning goals in collaboration with the learners. Learning goals also need to be time-bound to ensure learners prioritise their learning and have a deadline to focus on.

3.2. Meta-motivation

If metacognition is known as the "know-how" of learning, meta-motivation is considered the "know-why" of learning. It can be flexibly regulated and is aimed at enhancing learners' cognitive processes. Both ingredients are essential for effective teaching, therefore, both ingredients are recommended for inclusion in the CELTA course.

A significant positive correlation between motivation and educational outcomes has been found in a meta-analysis conducted by Kriegbaum, Becker & Spinath (2018). However, it is important to define what motivation is to understand how motivational states can be regulated. Motivation has neither been a property of the student's character nor the teacher's professional ability. Learners get motivated by certain relevant intrinsic goals, which makes motivation an attribution of the situation, not the character or competence (Daniel & Esser, 1980). There is also a *meta-motivational* approach, which is built on metacognition. The psychological processes that operate at the meta-level monitor and make alterations to motivational states, similar to metacognition, which regulates the processes of cognitive control (Fujita et al., 2024). Some scholars even consider meta-motivation a part of research on metacognition because motivational processes involve cognition (Bürgler, Hoyle & Hennecke, 2021). Meta-motivation has been established as a more novel line of research that advances evidence on motivation, highlighting strategies learners can use to facilitate and improve motivation (Sansone & Thoman, 2005). The idea that one can learn how to motivate oneself gives extra hope to EFL learners that they can persist in times of challenges. In addition, the meta-motivational approach provides a framework that implies the possibility to regulate motivational states (Fujita et al., 2024). Specific meta-motivational strategies can be utilised to regulate such motivational states as beliefs, attention, and gratification.

3.3. Growth Mindset

The pivotal role of beliefs in learners' motivation has been widely explored; moreover, beliefs about whether intelligence is plastic or not are described as mediators of self-regulated learning (Dweck, 2006). Self-regulated learning improves learning outcomes because of the goal-directed control of learning and cognition (Tirri & Kujala, 2016). A growth mindset is a belief that one's intelligence and skills can be developed through hard work, training, and effort (Dweck, 2006). It is considered a motivational strategy that is beyond the scope of the typical meta-motivational research (Fujita et al., 2024). In one study that explored the neural correlates of learners' reactions to mistakes by utilising event-related potentials (ERPs), it was found that a growth mindset is associated with attention allocation to mistakes and viewing errors in a positive light. Moreover, individuals with a prevalent growth mindset showed better accuracy after mistakes than their counterparts with a fixed mindset (Tirri & Kujala, 2016). Since mindsets are flexible, and they can be altered through educational interventions, like explicitly teaching about neuroplasticity and the brain's potential to change while learning, and practicing new ways of thinking (Blackwell, Trzesniewski & Dweck, 2007), it is recommended to add information on a growth mindset to an input session on *meta-motivation*. Even short, purposeful conversations on the malleability of the

brain have been proven effective and enduring (Blackwell, Trzesniewski & Dweck, 2007), therefore, EFL professionals should be familiarised with their importance in the CELTA course.

3.4. Attention Regulation

Motivation is well described as a mental mechanism that helps to direct learners' attention to specific information, and thus, attention plays a key role in memory and successful retention. In addition, motivation directly influences attention orientation by introducing rewards that drive curiosity. Attentional mechanisms filter and select information that is relevant to the context, as well as information that provokes the basic element of human cognition — *curiosity* (di Nocera et al., 2014). Curiosity is essential for effective foreign language acquisition (Pluck & Johnson, 2011). Since attention can indirectly influence action selection toward novel stimuli, actions that are not directly related to the current behaviour can be executed (Baldassarre & Mirolli, 2013). Therefore, introducing activities that stimulate learners' curiosity is essential to maintain learners' motivation that directs their attention to learning. That being so, it is advisable to introduce attention regulation on a CELTA course as a meta-motivational strategy.

3.5. Delayed Gratification

Learners' ability to postpone an instant reward in favour of a better reward later is called delayed gratification (Carducci, 2009). This non-cognitive behavioural factor positively affects educational outcomes; on the contrary, putting more value on immediate gains can often lead to procrastination, which is associated with poor academic performance, worse mental health, and well-being (Reuben, Sapienza & Zingales, 2015). Learning a foreign language requires ongoing practice outside the classroom, and managing one's motivation enables learners to stick to the task even when the teacher is not nearby. This meta-motivational strategy allows EFL learners to prefer their long-term goals to immediately rewarding activities, and consequently, improve their foreign language skills. Notwithstanding, EFL learners do not necessarily develop a delayed gratification strategy without being taught, so it is recommended to teach it explicitly and/or model it in the classroom.

To sum up, teaching EFL students to monitor and regulate their motivational states through a growth mindset, attention regulation, and delayed gratification is crucial to sustain and improve their motivation. Autonomous motivation, which implies a sense of control and volition of an individual, is considered the most effective form of motivation (Deci & Ryan, 2008). For that reason, it is necessary to equip teacher trainees on a CELTA course with the meta-level motivational strategies which they can either model or teach directly to their learners.

4. Conclusions

A course in English as a foreign language is not merely a language course, but a gateway to the world. Due to its heightened importance and lack of time, learners tend to be extremely stressed and anxious, and therefore, it is recommended to teach the object-level and meta-level skills in parallel. Metacognition and meta-motivation not only extend the scope of useful information that can be included in the teacher training course, but also have a powerful influence on teachers' perception of intelligence as a malleable construct; and this, will help to shape their pedagogies in a way that can benefit their learners more. Moreover, metacognitive instruction should be placed at the heart of teaching to foster creativity and flexibility in learning (Borkowski & Muthukrishna, 1992).

All in all, it is recommended to add Topic 6 entitled *"Meta-Skills: Metacognition and Meta-motivation"* to the CELTA syllabus, and to assess the progress in Topic 6 by adding Assignment *5* to the Component 2 — Classroom-Related Written Assignments, as well as altering Teaching and Planning Section by adding professional teacher competences pertaining to meta-skills development that reflect the indirect connection between neuroscience and education through *psychology*. These are the competences that are predicted to strengthen teaching practice:

6a — co-creation of materials competence, **6b** — ritual and habit formation competence, **6c** —a competence of setting SMART goals, **6d** — knowledge leveraging competence, **6e** — knowledge integration competence, **6f** —competence to foster growth mindset in the classroom, **6g** — competence to sustain students' attention, **6h** — competence to explicitly teach motivational aspects of delayed gratification. Adding to the Planning and Teaching Section, teacher competences that directly connect neuroscience to education by teaching EFL learners to *optimise their brain health* for learning are also recommended. These competences are: **6i** — stress management competence, **6j** — social connectedness building competence, **6k** — competence to do (guided) visualisation.

5. Neuroscience Topic Proposal

5.1. Empirical Study Outline

The purpose of the proposed study is to bring out how neuroscience is linked to education through brain health optimisation and executive functioning (psychology) by designing an extra topic in educational neuroscience to be added to a CELTA course and inform teacher trainees about the importance of meta-skills and their applications in the classroom. In particular, the study focuses on developing an input session on a new CELTA topic entitled "Meta-Skills: Metacognition and Meta-motivation". This input session is to be given to 50 teacher trainees since this is the average intake of the participants on this course and because a good sample size for educational research is more than 30. The input session will enable the respondents to acquire essential familiarity with meta-skills and their applications to *optimise learners' brain health* and develop their *executive function skills* in the classroom. The guidelines for the input session development are provided in Appendix 1. There are two components of internal assessment based on the CELTA Assessment Framework that are to be utilised in the study to assess the topic's impact on the quality of teaching. They refer to the Planning and Teaching component and the Classroom-Related Written Assignments component. The 6 hours of Teaching Practice already included in the course syllabus will enable candidates to acquire a range of practical skills. Teaching Practice will provide novice teachers with an opportunity to apply their knowledge in a real teaching context. The impact of the topic in neuroscience on the participant's teaching performance is to be assessed against newly added teaching practice criteria presented in Appendix 3. Moreover, to assess teachers' understanding and knowledge of metacognitive and meta-motivational teaching strategies, a Classroom-Related Written Assignment on a new topic is to be conducted. The outline of the assignment design and the grading rubric are provided in Appendix 2, and the center, where the study will be conducted, is responsible for the design of the written assignment based on the guidelines provided in Appendix 2. For instance, the assignment should be between 750-1000 words, or two 500-word assignments can be submitted instead of a larger one. The assignment(s) are graded on a pass/fail basis, and they can be resubmitted once if any changes are required to pass.

The impact of the new topic on respondents' performance on the course will also be externally moderated by a Cambridge English-approved assessor who samples participants' portfolios that consist of written assignments and lesson plans, as well as teaching practice, to ensure that all the coursework is up to the standard.

5.2. Research Methods and Questions

The purpose of the study is to evaluate the topic in neuroscience added to a CELTA course, and its application in the classroom through the 6 hours of Teaching Practice and Topic 6 Classroom-Related Written Assignment on 50 CELTA teacher trainees (N=50) taking the course together, without a control group to eliminate the risk of systematic differences in the course curriculum at this early-stage exploratory research. This approach will allow to gather only preliminary evidence on the utility of Topic 6, with the need to undertake further study in the future to explore the impact of the added topic in neuroscience directly on the students. It is *hypothesised* that a topic on meta-skills added to the CELTA course will improve teaching practice on the course

and model lifelong learning. It is predicted that adding an extra topic on meta-skills will enable teacher trainees to understand and employ information on metacognition and meta-motivation to plan their lessons for the Planning component of the CELTA course accordingly, and to make practical use of this knowledge during Teaching Practice of the course by developing and maintaining teacher competencies listed in the Key Teaching Practice Criteria in Appendix 3. It is also assumed that the introduction of Topic 6 will enable teachers in training to demonstrate awareness of the need for learners to regulate their motivation and help their learners to develop motivational regulation strategies at the Teaching Practice stage of the course.

To facilitate the learning of the proposed Topic 6 through an input session on meta-skills, *pedagogy* is to be utilised as a methodology in order to inform teacher trainees on a theory and provide room for them to practice.

To determine the results of the learning, the data is to be collected through *assessment* — Key Topic Classroom-Related Written Assignment 5 and a *demonstration* of Teacher Competences referring to Topic 6 during the Planning and Teaching stage of the course. The Key Topic Classroom-Related assignment will allow progress tracking and will help to identify teacher trainees' understanding of the theory. The demonstration of Teacher Competences during Planning and Teaching on the course will help to pinpoint specific areas where teachers are struggling, enabling teacher trainers to provide targeted support in their feedback.

6. Implications and Future Directions

Educational neuroscience embraces the notion that by changing the closest factors to educational outcomes, such as motivation, ability, attention, health, and nutrition, learners can improve their educational outcomes (Thomas, Ansari, & Knowland, 2018). For that reason, the purpose of this study was to explore the role of the topic in educational neuroscience for the CELTA course. Training teachers on a CELTA course on how their learners can flexibly regulate their proximal factors to learning outcomes with the help of meta-skills is projected to improve their teaching on the course, and potentially, the academic performance of their students. Moreover, this study aimed to make an original contribution to knowledge on metacognitive and meta-motivational approaches that extend beyond metacognition as "thinking about thinking" or "knowledge about knowledge" and motivation as intrinsic and extrinsic, which have typically been examined. In addition to presenting metacognition as learners' awareness of their process of learning, this research introduces metacognitive strategies through the lens of neuroscience by linking them directly to *brain health optimisation* and indirectly to *executive functioning (psychology)*. Notwithstanding, this study aims to collect only preliminary evidence, so further research on the impact of the added topic on the learners' educational outcomes is required. The literature review includes quite a lot of seminal papers due to either a lack of high-quality, current publications on certain topics, or different research perspectives presented in the current publications. In some cases, I needed to refer to the papers that initially presented a certain concept to be able to draw novel conclusions.

Adding an extra topic in neuroscience to a CELTA course is cost and time-effective. With many EFL teachers showing so much interest in "brain-friendly" teacher training courses, a topic in neuroscience is expected to spark even more interest in the CELTA certification. Unfortunately, many teachers fall for a scam of snake oil salesmen offering pseudoscientific applications of neuroscience to education. And such a reputable certification course as CELTA has all the potential to meet their needs for professional development in educational neuroscience by offering a science-backed programme.

I hope that this research will inspire educational researchers and teacher trainers to think about the broad implications of shifting the focus of teacher training from the "know-what" to the "know-how" and the "know-why" to improve learning outcomes by changing the most proximal factors to them, as well as to cater for the needs of the modern learners. The "know-how" and "know-why" questions that this approach illuminates should be explored further.

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Appendices

Appendix 1

Adding Topic 6 "Meta-Skills: Metacognition and Meta-motivation" to the CELTA Course

Topic Descriptors
Topic 6 — Meta-Skills: Metacognition and Meta-motivation

Ref	Syllabus Content	Learning Outcomes Successful candidates are able to:	Assessment
6.1	The Importance of Meta-Skills: Metacognition and Meta-motivation in ELT	Understand and employ information on metacognition and meta-motivation; design curriculum and learning environments accordingly	*Teaching practice:* Meta-Skills: Metacognition and Meta-motivation *Assignment:* Techniques to foster metacognition and meta-motivation
6.2	Metacognitive competences reflecting an interface between neuroscience and education	a. understand an interface between neuroscience and education b. identify ways in which neuroscience is linked to education c. make practical use of this knowledge and understanding to plan and teach accordingly.	
6.3	Components of metacognition related to Executive Functioning	a. understand, develop and maintain *metacognitive experiences* and teacher competences associated with them b. understand, develop and maintain *metacognitive goals* and teacher competences associated with them c. understand, develop and maintain *metacognitive strategies* and teacher competences associated with this component d. make practical use of this knowledge and understanding to plan and use appropriate teaching strategies.	
6.4	Components of metacognition related to Brain Health	a. understand, develop and maintain *metacognitive knowledge* and teacher competences associated with it b. understand, develop and maintain metacognitive *states* and teacher competences associated with them c. make practical use of this knowledge and understanding in teaching.	
6.5	Components of meta-motivation	a. demonstrate awareness of the need for learners to regulate their motivation b. understand and develop students' motivational regulation strategies such as growth mindset, attention regulation and delayed gratification c. make practical use of this knowledge and awareness in teaching.	

Appendix 2

Topic 6 Assessment

Key Assignment

To assess teachers' progress in Topic 6, it is recommended to include *Assignment 5* to Component 2: Classroom-Related Written Assignments.

Assignment 5.1 Techniques to foster metacognition

The design of assignment to include:	Candidates can demonstrate their learning by:
Length 750-1000 words ● investigation of components of metacognition and evaluation of their role in EFL learning ● identification of teacher competences required to foster metacognition in the classroom ● suggestions for specific teaching strategies for embedding metacognitive strategies	a. demonstrating awareness of how learners' metacognitive skills affect their learning and performance b. demonstrating ability to evaluate different learning strategies and select appropriate strategies for a particular task c. providing a rationale for using specific metacognitive strategies with learners.

Assignment 5.2 Techniques to foster meta-motivation

The design of assignment to include:	Candidates can demonstrate their learning by:
Length 750-1000 words ● evaluation of importance of motivation regulation for students ● identification of motivational regulation strategies and investigation of their use in EFL learning ● identification of teacher competences required to regulate students' motivation.	a. displaying awareness of how motivation regulation increases and maintains learners' effort b. justifying the importance of fostering growth mindset in ELT c. explaining the importance of sustaining students' attention d. providing a rationale for explicitly teaching motivational aspects of delayed gratification.

Appendix 3

Key Teaching Practice Criteria

Supervised and assessed teaching practice (6 hours) is an integral part of the CELTA course. It provides candidates with opportunities to apply theory to practice, thus, candidates are required to exemplify their ability by achieving the assessment criteria which are presented in the CELTA syllabus. If adding Topic 6 entitled "Meta-Skills: Metacognition and Meta-motivation" to the course syllabus, the assessment criteria ought to be updated to reflect teacher competences related to meta-skills. The assessment criteria are linked to the syllabus; therefore, each newly added criterion will be introduced by number 6, which refers to a corresponding topic 6 that is recommended to be added to the syllabus.

Planning and Teaching

Successful candidates are expected to demonstrate that they can:

prepare and plan for the effective teaching to adult ESOL learners by:

6a co-creating materials with the learners
6b choosing learning rituals and habits and introducing them to the students
6c setting SMART goals for students.

demonstrate professional competence as teachers by:

6d leveraging students' knowledge
6e helping students retain, organise and integrate knowledge
6f fostering growth mindset in the classroom
6g sustaining students' attention
6h explicitly teaching motivational aspects of delayed gratification
6i helping students to manage their stress
6j building social connectedness in the classroom
6k doing (guided) visualisation to help students increase their motivation, focus, and reduce stress.