Cognitive control functions in language learning

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What are cognitive control functions?

Learning another language is a complex process that requires more than just language skills. In order to learn a new language successfully our learners need to be in control of their own learning and of themselves. In order to do that, they need to set goals, organise their learning over time and focus their attention so that they manage to stay on task rather than getting distracted. When faced with the occasional challenge they need the ability to adapt their behaviour in order to overcome the difficulties and reach their goals.

> Learning another language is a complex process that requires more than just language skills. In order to learn a new language successfully our learners need to be in control of their own learning and of themselves.

A set of cognitive[1] skills – often referred to as *executive functions* (EFs) – is required to manage such behaviours successfully. Located mainly in the frontal and pre-frontal parts of the cortex,[2] these cognitive skills 'are to the brain what a conductor is to an orchestra. […] They coordinate and lead other neural structures in concerted actions. The frontal lobes are the brain's command post' (Goldberg, 2001, p. 2).

It is important to stress that these cognitive skill sets determine success in learning at all stages of development, from toddler years to university age and beyond. They have a significant influence, too, on how successful and efficient we are at the workplace as adults throughout our lives, and in advancing our careers. Moreover, these executive functions have a strong bearing on our self-image and how satisfied we feel with our lives. A study has shown, for example, that adults with good executive skills enjoy a better quality of life (Moffitt, 2012). So it is not surprising, given all the evidence of the importance of these executive functions, that in recent years a lot of effort has been made to improve their development at all stages of learning. Likewise, there has been increasing interest in research into the efficacy of various methods of developing these cognitive functions.

In conversations with language teachers we have noticed that the term executive functions often evokes connotations with business English rather than the cognitive development of young learners, adolescents and young adults. Hence, in this paper, rather than using the term *executive functions we use cognitive control functions* (CCFs), as it expresses more clearly what those cognitive functions are all about (when the term executive function is used in quotations from original sources, we understand it to be equivalent to our term *cognitive control functions*).

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1 relating to mental processes or activities
2 the outer layer of the brain

Core cognitive control functions

The research into cognitive control functions has specified three core areas: **working memory**, **inhibitory control** and **cognitive flexibility**.

Working memory is about the ability to hold information in mind so that certain tasks can be completed. Imagine a student reading a narrative text; if that student has difficulties holding in mind the gist of the story as it develops while they are reading, they will not be able to read it successfully and will not enjoy their reading process. They will have to go back to the beginning of a sentence, paragraph or page quite frequently, and might well lose the thread of the story altogether. In order to read successfully, they need to develop reading fluency, and for that process a well-functioning working memory is essential. The same is true of taking part in a conversation. Having asked a question but then being unable to remember what it was because of the effort needed to understand the interlocutor's[3] answer will most probably lead to confusion on both sides or even a complete breakdown in communication.

Inhibitory control describes the 'suppression of goal-irrelevant stimuli[4] and behavioural responses' (Tiego et al., 2018). It refers to the abilities to focus attention, especially when confronted with distractions, and to control one's emotional and behavioural responses to various stimuli in favour of starting or continuing a task, or accomplishing a goal. Imagine a student engaged in a writing task when they get interrupted in their workflow by another student, or a noise or some other disturbance from their surroundings. In order to deal with the irritation successfully, the student needs inhibitory control skills. Rather than losing track of their work they need to be able to ignore the disturbances, so they can quickly continue with their task.

Cognitive flexibility is needed for solving problems. It enables students to look at issues from different viewpoints, to think 'outside the box' and adapt to changing conditions. Without cognitive flexibility, students cannot think creatively. Taking part successfully in conversations, for example, requires more than the mere exchange of prefabricated sentences. Students need to learn to use language creatively to express what they want to communicate. They might need to create sentences they have never heard or seen before. They will need to react flexibly, creatively and spontaneously to whatever another person is saying. They need to use repair strategies so that the process of communication can unfold properly if there is a misunderstanding, or if they or their interlocutor(s) have comprehension problems. They need to be able, for example, to ask their interlocutor to repeat what they have said, or to paraphrase it. In other words, they need to flexibly change the course of interaction, so they have choices that help them overcome any problems when they occur, rather than getting stuck.

Where do cognitive control functions come from?

Dawson and Guare (2018, p. 7) compare the development of cognitive control functions to the development of language in the child's brain. Neurologically speaking, the basis for both language and cognitive control skills is inbuilt. But both language and cognitive control functions need to be developed over time – and their development is influenced by genetics on the one hand, and by environmental influences on the other. This means that the development of those capabilities is not just determined by what children have inherited from their parents, but that parents, teachers and other significant people have an important influence on a child's language and their cognitive control functions through the ways they interact with the child. Parents and other people who are important to them can make a significant contribution to the development of their child's cognition. There are many ways how they can do that: for example, making time to play with the child and looking at picture books together,

3 conversation partner
4 things that cause us to respond or react

and later reading stories to them, asking them questions and giving them time to think before coming up with answers – and then taking their child's answers seriously.

Cognitive control functions are unlikely to be used in isolation, but appear to be interrelated. It seems that working memory is often twinned with inhibitory control (teachers often observe that students who are good at focusing their attention and are not distracted easily often have a better working memory, too). Furthermore, students often find shifting and planning (important skills in the areas of cognitive flexibility) easier to handle if their working memory skills and capacity to control their inhibitions are well developed (see Best and Miller, 2010, p. 16).

Developmental aspects of the formation of cognitive control functions

Cognitive control functions begin to show in pre-primary years and develop further during primary education. Best and Miller (2010, p. 15) point out that inhibitory control improves dramatically with preschoolers, while it is less strong and more linear[5] in the primary school years, until students reach adolescence. The same authors stress that working memory, on the other hand, develops in a more linear way from preschool through adolescent years, while shifting and planning (important subskills in the area of cognitive flexibility) are less developed in early years because they require more complex thinking capabilities, which seem to depend on the previous development of inhibitory control and working memory. It is the middle adolescent years when students often demonstrate the same level of complexity in their cognitive flexibility as many adults.

However, the development of cognitive control functions is not complete in adolescence, and often takes until early adulthood. In fact, many adolescents or young adults still show a lack of cognitive control skills, especially when it comes to the use of the more sophisticated combinations of them needed, for example, to successfully manage time or apply study strategies and meta-cognitive strategies.[6]

This is why during adolescent and teenage years, students still need support from their teachers in developing their cognitive control functions. Research has shown that when a student at pre-primary or primary level shows a lack of a certain cognitive control skill, teachers are far more prepared to give the student support in developing that skill. However, in secondary classrooms, teachers tend to be less ready to offer such help. According to research carried out by Dawson and Peg (2018, p. 40) the reason lies in a different perception of the problem. Secondary teachers tend to perceive a problem (for example, when a student fails to remember new words that have been taught and which they have been supposed to revise as homework) not so much as a lack of a skill or a strategy that still needs to be, and can be, developed. Many teachers tend to see the reasons for a specific student's failure as a lack of motivation or an unwillingness to do the task, whereas it may actually be caused by the student not having the right study strategy; the student may have spent hours reading and rereading long lists of vocabulary and think they've done everything they possibly could, unaware that a different strategy could have been a lot more efficient (see the suggestions on developing study strategies and metacognition on p. 8).

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5 step by step
6 these involve learners planning, monitoring and evaluating their own learning

Can cognitive control functions be improved?

In a very recent review of the research of the last 25 years on the efficacy of cognitive control functions training, Diamond and Ling (2020, location 3967–4243) clearly state that 'EFs can be improved. Moreover, it appears that improving EFs is possible across the lifespan and by different methods'. However, they stress that 'transfer of training is narrow', in other words while students become better at skills they have practised, this practice does not generally improve cognitive control functions in all contexts. An example would be that research has not been able to demonstrate that activities designed to develop non-verbal working memory skills have a positive effect on the development of verbal working memory also.

The influence of language learning on cognitive control functions

Morales et al. (2013, p. 199) compared how monolingual children achieve in working memory tests compared to bilingual children. They found that 'bilingual children do perform better than monolinguals on working memory tasks'. They argue that the advantage bilingual children have in doing these tasks can be traced back to the fact that they are better able to deal with 'other executive function demands of the task'. If bilingual children are better equipped with cognitive control functions than monolingual children, this does not of course automatically mean that language learning in the classroom generally improves students' control functions in the same way as it has been shown with bilingual children. However, as we will see, it is likely that language learning has the potential to help develop their cognitive control functions efficiently while they are exploring the new language.

The influence of stress and anxiety on cognitive control functions

Eyler says that students who suffer from fear of failure, making mistakes and taking tests might actually achieve significantly poorer results because of the stress they are under: 'Regardless of its source, stress may be one of the most powerful deterrents to learning for our students' (2018, p. 183). He explains that the reasons for achieving less have to do with the fact that the students' self-talk[7] while carrying out a task is often taken up with worries (How am I doing? Am I making mistakes?) – a process that reduces the capacity of the working memory and reduces the problem-solving capabilities needed to be successful (Eyler, 2018, p. 182). The occupation of the working memory with self-worry has also been shown to limit students' information-processing capabilities (see Gregersen and Horwitz, 2002), in a way similar to what happens when students have unrealistically high expectations of themselves and aim to be perfect. In those cases, their working memory is either occupied with negative self-talk or worries about possibly not being able to reach their high personal standards and hence they cannot fully focus on the task they are supposed to be doing.

> It is likely that language learning has the potential to help develop students' cognitive control functions efficiently while they are exploring the new language.

7 inner voice

The influence of emotional engagement in developing cognitive control functions

Diamond and Ling point out that emotional engagement is a key driving factor in whether or not training in cognitive control functions will be successful. They express their strong beliefs that personal engagement, feelings of joy, a sense of challenge and achievement and the sensation that an activity matters to students are all essential qualities in that process: 'Emotional investment matters because, if someone is deeply committed to an activity, that person will devote great time and effort to it. When doing something you thoroughly enjoy, 'work' feels like 'play.' If that activity happens to train and challenge EFs, then sizeable EF improvements should be seen, because it is the time spent practicing, pushing oneself to improve that drives the benefit' (2020, location 9683). The authors stress too that the teacher's attitude plays an important role and that activities will work better if teachers see them as meaningful while believing in their students' abilities to improve. 'The way an activity is done will prove, we predict, to be more critical than what the activity is' (Diamond and Ling, 2020, location 9917).

Ways of improving cognitive control functions in ELT

Based on the findings briefly summarised above I am suggesting below various categories of activities and strategies aimed at developing cognitive control functions in the ELT classroom, depending on students' age and the kind of cognitive control functions, or combinations of them, that the teacher wants to use. You will then find examples of activities suitable for pre-primary, primary, lower secondary and (young) adult students. The advantage of these activities, as you will see, lies in the fact that they have a dual focus: they are designed in such a way that they develop language skills at the same time as fostering cognitive control functions.

Activities enhancing cognitive control functions

These are activities for students from preschool to adolescence. You can find examples of these activities below, grouped according to students' ages. Occasionally, you will also find suggestions as how an activity could be adapted for a younger or older age group. It is important to underline – in accordance with what was said about the influence of stress and positive emotional engagement on the development of cognitive control functions – that none of the activities should be done in a test-like atmosphere.

Also, it is recommended that the activities are done regularly, and that the level of challenge is raised gradually over time. It's important too to signal to your learners that making mistakes is natural and you are not grading them on how they achieve these tasks. Point out to them that they will be doing these activities repeatedly, and that they should notice that the more they focus and start enjoying the activities the better they will become at them.

NB: for space reasons we cannot cover in this paper questions about working with students who have specific clinical learning challenges such as ADHD and autism. If you want to find out more about this kind of work, see e.g. Dawson and Guare's suggestions for 'intervention strategies to enhance the development of executive skills in children with autism' (2018, p. 142–156) and their thoughts on 'motivating students with ADHD to use and practice executive skills' (2018, p. 138–141). Another area that we cannot cover in this paper is helping students with developmental dyslexia. If you are interested in finding out more about how to best deal with this disorder in your classrooms so that you can organise an effective foreign language teaching process for students with dyslexia, you might find interesting theoretical insights and useful practical suggestions in Nijakowska (2010).

Using self-talk to enhance cognitive control skills

We can help students with goal setting, planning and carrying out their plans, as well as thinking about how well a process works for them if we actively teach it to them, rather than expecting them to have that skill already. Scripts with model questions, templates and checklists can be used to support that process. If repeated over time, the language routines the students are taught to use will gradually be internalised and become part of their self-talk. Depending on the level of the class, this process can have great pay-offs for the development of the target language too, and it can be taught to the whole class or to individual students.

Whole class motivational interventions aimed at developing self-control strategies to create a can-do classroom culture

Most teachers have experienced stages in their students' learning process when they seem to have reached a plateau and are stuck in their development, unable to take the next step. Often, it seems that a collective 'we can't' – a negative belief on the students' part that causes them to doubt their own capabilities to take the next step – hinders them from developing further. This can become a tricky phase in the development of a positive classroom culture. The students' negative beliefs, once set, might not only influence the students negatively, but might even in a similar way influence the teacher's beliefs about their students' capabilities too. An example would be a monolingual class – where students and the teacher share the same mother tongue – when the teacher desperately tries to get them to stop speaking their L1[8] and use English as a means of communication instead. If the teacher then simply gives up and develops a belief that 'nothing can be done to get them to speak English' or 'they are simply not able to speak English in class', then that belief might turn into what psychologists call a 'self-fulfilling prophecy'. You will find an example of a motivational intervention aimed at resolving the L1–L1 challenge in primary and lower secondary classrooms on p. 15.

Developing study strategies and metacognition

When you work with older teenagers and (young) adults you should notice that any problems they have concerning cognitive control functions may not be so much about the core skills themselves as the more sophisticated combinations of them. The problems are usually to do with, for instance, time management, procrastination, or using effective study skills, and with meta-cognitive strategies as a 'general management mechanism for cognitive strategies' (Gregersen & MacIntyre, 2014, p. 150; see also Oxford, 2012, p.19).

8 first language

Working with pre-primary children (age 3–5)

When working with very young learners, it is the teacher's task to act – metaphorically speaking – as the children's prefrontal cortex so they can gradually learn to develop their own self-control – as part of learning inhibitory control functions. For example, the teacher will help the children to develop socially acceptable behaviour and help to lay the foundations for their learning by showing the children what they can, should and should not do. The teacher also teaches the children alternative ways of behaviour when what they do is not socially acceptable.

Another area that needs to be developed is the students' working memory. As you can see from the examples below, the two areas – developing inhibitory control and working memory – are often interrelated and can be trained simultaneously.

Activities to enhance cognitive control functions

Example 1: Remember, remember

> **Cognitive control functions**: working memory, inhibitory control
>
> **Language learning objective**: revise lexical sets[9]
>
> **Materials needed**: picture cards
>
> **Time**: 5–10 minutes

Procedure:

1. Show your students two picture cards illustrating words they have already learnt, and put them up next to one another (sticking them on the board or using a whiteboard). Ask them to remember the words. Give them five seconds to do that, then tell them to close their eyes. Cover up the picture cards (or blank the screen).

2. Ask them to open their eyes. Encourage the children to say the words in their correct order, left to right. If necessary, help by pointing at the places where the word cards were.

3. Encourage the children to say the words again and remember them in the same order. Then show the two pictures again so they can check.

4. Carry on like this for some time with different picture cards. Gradually increase the number of cards.

Note:

When children close their eyes, some of the distractions that come from the environment get blanked out; thus their inhibitory control has to work less hard and they can focus better on trying to remember the sequence of pictures they have seen.

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9 a group of words that have something in common, e.g. meaning or form

Using the activity with older learners

Start with three or four picture cards rather than just two. Ask the students to work in pairs. After showing a row of picture cards, and asking them to remember them in order, conceal them and tell the students to say them to their partner. Then show the picture cards again so they can check. Then ask them to close their eyes. Make a slight change in the order of the picture cards. Ask them to remember the new order, conceal the cards again and ask the other child in each pair to tell the order to their partner.

Gradually increase the number to five or six. Do not go beyond six.

Example 2: I can do it too

> **Cognitive control functions**: working memory, inhibitory control
>
> **Language learning objective**: verb phrases
>
> **Materials needed**: picture cards
>
> **Time**: 5–10 minutes

Procedure:

1. Show your students a picture card of e.g. an ice cream.

2. Mime eating an ice cream while saying *Look what I can do.*

3. Encourage them to say *I can do it too*, and imitate the action. When they do it successfully, comment, *Ah, you're eating an ice cream*.

4. Repeat this several times with the whole class, then with individual children.

5. Once this has become a routine, use a different picture card, e.g. of a car. Mime driving the car while saying *Look what I can do* etc. (as with 3 and 4 above)

6. Use the same picture cards in the next lesson, and add another two. Change the order in which you use them.

Using the activity with older learners

When children are at ease with doing the activity as described above without any help from you, get them to say the verb phrase themselves, e.g. T: *Look what I can do.* - Ss: *I know what you can do, and I can do it too. I'm driving a car* (miming the action).

Note:

Again, in this activity there is a close link between inhibitory control and working memory. Students first have to remember the action, then do it. This requires both skills areas. A few children might be confused and do any movement, or imitate the teacher at first but then do other movements. Working successfully on getting the children to only imitate the action the teacher has shown them will gradually help to enhance their inhibitory control. Finally, when they carry out the action as shown by the teacher and the teacher comments, e.g. *Ah, you're eating an ice-cream* and this is done repeatedly, they will gradually develop their working memory and remember the language (first in their recognition, and later also actively).

Using self-talk to enhance cognitive control skills

Example 1: Getting ready for a transition

> **Cognitive control functions**: inhibitory control, cognitive flexibility, working memory
>
> **Language learning objective**: internalising a chant, getting ready for listening
>
> **Materials needed**: none
>
> **Time**: 2 or 3 minutes

The new language is an important means of helping children develop self-regulation[10]. Present a few words, using gestures and mime to help the children understand

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10 control of one's own behaviour

its meaning. The learners imitate both the language and the movements and, with repetition over time, gradually internalise the language so that eventually they can use it in their 'private talk' as pointed out by Vygotsky and Piaget. An example would be that the mother says to her two and a half year old 'Always eat your veggies first. Then you can have a sweet'. Later, the mother overhears the child telling her doll exactly what the mother has said – so the child uses the instruction in her 'private talk' and it later becomes part of her inner monologue, her self-talk (see e.g. Bodrova and Leong (2007) for an in-depth discussion of this process). Short rhymes or chants are ideal for that, because rhythm and rhyme help the children remember the language more easily. Puchta and Elliott (2017, p. 47) demonstrate with the help of the following chant how a teacher can prepare the learners for storytelling:

It's story time,
It's story time.
Oh, what fun!
Look and listen,
Three, two, one!

Procedure:

1. Use gestures and mime to introduce the chant. When you come to the last line of the chant, slowly count down to one, whispering the words. End the chant by putting your index finger on your lips.

2. Repeat this several times and gradually encourage the learners to join in with the gestures, and later with the chant as well.

Note:

When the children repeat the chant over and over again, they will easily remember it, and in time it will become a ritual that helps to activate the learners' inhibitory control, and creates the right state of attention, expectation and curiosity in their minds – an important prerequisite for a successful storytelling phase.

Example 2: Help them deal with negative emotions

Cognitive control functions: inhibitory control
Language learning objective: listening and understanding the teacher's intervention
Materials needed: none
Time: 3 minutes (whenever appropriate)

As indicated above, very young children need to learn to control their emotions. When a child gets angry very easily, for example, and grabs other children's toys, or throws a temper tantrum if they don't immediately get what they want, the teacher needs to help them calm down and offer them a more constructive behavioural strategy.

Procedure:

1. If there is a student who can't control their negative emotions, show them how they can get rid of their anger or frustration: exhaling and inhaling deeply a few times. Tell them to let go of their emotions every time they exhale and take up new, fresh energy when they inhale.

2. Ask them to close their eyes and count down with you slowly from six to one, while breathing calmly and thinking of something beautiful. Give them an example – it could be a kitten playing with a ball, a person with a friendly smile etc.

3. When you see the child has calmed down you may want to suggest to them that they apologise to their classmate (if appropriate), and/ or, for example, ask the classmate politely if they can borrow the toy they had wanted.

4. Remind the child to use the breathing ritual again when they get angry, by doing the activity with them, and praising the child as their mood changes.

5. Gradually, the child will remember and use the ritual themselves, and with the help of your support and praise will internalise the desired behaviour .

Working with primary children (age 6–10)

Depending on how much language the children have learnt before primary school, this phase is important primarily because it lays the foundations for developing children's basic literacy skills and developing them further so that the children over time learn to read and write independently. Working memory and inhibitory control are essential in this process. The same is true of further developing children's listening and speaking competencies – again, cognitive control functions are needed to help them become more focused listeners and refine their speaking capabilities in the new language.

Activities enhancing cognitive control functions

Example 1: Who says...?

> **Cognitive control functions**: cognitive flexibility, inhibitory control
>
> **Language learning objective**: active listening
>
> **Materials needed**: none
>
> **Time**: 10 minutes

Note:

This activity is based on the popular and classic game *Simon says*. It helps develop the students' cognitive flexibility, as they have to adapt to frequent rule changes.

Procedure:

1. Give an instruction, e.g. *Simon says touch your right ear*, or just *Touch your right ear*. If the instruction starts with Simon says, students carry it out. If it doesn't, they mustn't move. Give several instructions, gradually upping the speed and frequently varying between *Simon says …* and instructions without that phrase.

2. After some time, tell them that you're now playing *Jennifer says* with them. Give an instruction, e.g. *Simon says stand up!* But this time the students should remain seated, as you had started your sentence with *Simon says*, not *Jennifer says*. Carry on playing the game at a fairly fast pace, varying the instructions.

3. Continue playing the game, using different names (*Michael says*, *Anne says* etc.)

Example 2: Multi-sensory vocabulary introduction

> **Cognitive control functions:** working memory, inhibitory control
>
> **Language learning objective:** introduction of new (one- or multi-word) lexical items from a lexical set
>
> **Materials needed:** picture and word cards, board (or a whiteboard)
>
> **Time:** 10 minutes

Procedure:

This activity is ideal for teaching lexical sets (of up to 10 or 12 words).

1. Present a picture card showing one of the words from the lexical set, say the word and make a gesture symbolising that word. Ask students to repeat the gesture while saying the word. Stick each picture card on the board. Carry on with all the words. Repeat this twice, keeping to the same order.

2. Say one word after the other (still in the same order). Ask the students to listen silently and make the gesture for each word.

3. Say the words again, asking the students to listen to the words with their eyes closed.

4. Ask students to keep their eyes closed and repeat the words exactly as you are about to say them. Say one word after another, but this time in jumbled order, and in different ways (shout one word, whisper the next, say another using a happy/sad/angry/high-pitched/low-pitched etc. voice).

5. To introduce the spelling of the words in the picture cards, use word cards. Flash these cards to them one by one so they can perceive the words in a holistic way, but don't have enough time to read it letter by letter (students with reading problems will often sound words out letter by letter and may then have problems with pronouncing the word correctly). When they have said the word correctly, say, *Yes, it's …* (say the word) and fix the word card underneath its picture card.

6. Tell them to read your lips and guess the words. Mouth the words in jumbled order, moving your lips only, but not using your voice.

7. Write a number next to each word. Ask them to remember each word with its number. Tell them that they should 'switch on their computer' to memorise the words with their numbers.

8. Ask them to close their eyes. Say a number and get them to call out the word that goes with it, or say a word and get them to call out the number.

Note:

This activity is a powerful way of helping students to remember words, and gradually – when repeated over time – store them in their long-term memory. Please note that insisting on the students keeping to your instructions carefully (e.g. when you ask them to imitate your mime, or when you say the words using different auditory sub-modalities) is very important for developing the student's inhibitory control, and thus helps their working memory too.

Example 3: Backward chaining

Learners sometimes need to remember longer sentences, for example when practising dialogues, and can find this quite tricky. This activity helps with that, and supports the working memory in an ideal way. Although this technique has been around for a while, even the omniscient World Wide Web doesn't seem to have an answer as to who came up with it first. I have noticed, however, that many teachers have never heard of it, and very few actually use it. So here it is:

> **Cognitive control functions:** working memory
>
> **Language learning objective:** memorising longer sentences, for example before acting out a dialogue.
>
> **Materials needed:** none
>
> **Time:** 2–3 minutes

Procedure:

1. Imagine you want to help your students prepare for acting out a funny play or skit. In it, there's the sentence *If you put water on the blue pill, you get spinach with potatoes.* – a sentence so long that many students will have problems repeating it after you by using their working memory. So proceed like this:

2. Say the last word of the sentence and get students to repeat it.

    T: potatoes

    Ss: potatoes

    T: with potatoes

    Ss: with potatoes

    T: spinach with potatoes

    etc.

3. Carry on like this with the rest of the sentence, and repeat the activity two or three times with a bit of time in-between. You will notice that the students will soon be much more at ease remembering the sentence than if you had asked them to study it without giving them any specific support.

Note:

You could try the reverse process – forward chaining, rather than backward chaining too, e.g. say the first word and get students to repeat it, then the first and the second etc. You may want to use this as a variation and then ask students which of the two they find more helpful.

Example 4: Creative visualisation activities

> **Cognitive control functions**: inhibitory control (to practise mindfulness)
>
> **Language learning objective**: listening, speaking, creative writing
>
> **Materials needed**: none
>
> **Time**: 8–10 minutes

Many children get easily distracted because of the sensory overload they often find themselves in: fast-moving pictures on TV and other screens, loud music

and so on. Getting them to close their eyes and listen to language while focusing on their own imagination is a very good way of getting them to learn inhibitory control. This example is from Super Minds, SB1, 2nd edition.

Procedure:

1. Ask children to get into a relaxed position, close their eyes and listen. Then either play the audio or slowly read out the script below to them, making sure you pause between the sentences to give students time to develop their imagination.

Audioscript:
Close your eyes and listen.
Imagine you're on a holiday. It's a beautiful day.
Where are you? Are you at the beach? Are you at a campsite?
Are you in a big city, in the countryside or at a lake? Or are you in the mountains?
What do you do? Do you go swimming? Do you catch a fish? Do you climb mountains? Do you play with friends? Do you like your holiday?

2. When they've opened their eyes, ask them to take 3 minutes to draw what they have imagined. Then get them to compare their drawings. If necessary you can help them with language for comparing their pictures, e.g.

On my holidays, I go to…   You go to…
I am…   You are…
I like…   You like…

Note:

Initially, a few students may start giggling when you ask them to close their eyes and listen. Culture permitting, you could just gently place your hand on their shoulder, saying something like 'That's OK. Please listen now', or simply ignoring the giggling. Usually, such behaviour doesn't last very long as children tend to enjoy this activity a lot.

Whole class motivational interventions aimed at developing self-control strategies by creating a can-do classroom culture

Example: Our world record in speaking English

Looking into a classroom:

A teacher of a monolingual primary class (A2 level) has problems getting the learners to use English as the medium of communication in class.

The learners are very motivated to speak English when acting out little dialogues, answering the teacher's questions, for example about stories she has told them, and when they are told to ask and answer each other's questions, using language that has been practised before. But they frequently fall back into their mother tongue when they want to ask the teacher a 'real' question (about something they want to ask – not because they have been taught and told to do it), or when they want to say something to one another and the teacher.

We asked the teacher for her thoughts on this. She said that she was about to give up because she thought it was perfectly natural that the children were not trying to use English as the main means of communication – after all, she and the students shared the same first language. She also said that she thought the students didn't really believe it would be possible for them to actually use English instead of their own language for any amount of time in the lesson, and she thought this was why students didn't even try it, or want to try it.

We suggested the teacher use the stopwatch on her mobile, and challenge the students to see how long they could speak English. She tried that; the first time it was only about 35 seconds until a student used their mother tongue, but gradually the class managed to speak English longer, the students quite often saying 'Speak English!' when somebody raised their hand. Overall it was a big success, supported by the teacher's praise and a sign on the wall of the classroom saying 'Our world record in speaking English: <time>.'

Cognitive control functions: inhibitory control (mindfulness)

Language learning objective: listening, speaking, creative writing

Materials needed: a stopwatch (e.g. on your phone)

Time: 8–10 minutes

Procedure:

1. Challenge your students and ask them how long they think they can speak English without using their mother tongue. Take out a stopwatch, or better, use the stopwatch on your phone. On *three, two, one, go*, start the watch. As soon as somebody uses their mother tongue, stop the watch.

2. Say e.g. 'Not bad – (25) seconds. Let's write it down.' Use a sign saying *Our world record in speaking English*, then write the time taken on a sticky label that you fix on the sign. Stick the sign, with its label, up on the wall.

3. Carry on using the stopwatch to measure how long the children manage to speak English only. Make a little ritual out of it; whenever a new record has been achieved, praise them and update the label.

4. From time to time, when the students have achieved a particularly good record, celebrate with them and tell them how they have amazed you!

Using the activity with older learners

I have very successfully used the activity above with lower secondary students too.

As an alternative, use a glass jar and a box of pebbles. Whenever a student says something spontaneously in English and makes a great contribution to the class conversation, ask them to take a pebble out of a box and add it to the jar. Once the jar is full, surprise them – e.g. tell them a story, organise a games lesson or show them a video (and don't forget the popcorn!).

Working with adolescent students (age 10–14)

Activities enhancing cognitive control functions

Example 1: Reversed instructions

> **Cognitive control functions:** cognitive flexibility, working memory, inhibitory control
>
> **Language learning objective:** active listening
>
> **Materials needed:** none
>
> **Time:** 3–4 minutes

This is an activity I first saw demonstrated on YouTube by an Australian colleague, Mark Collard (https://www.youtube.com/watch?v=JmcmffiXgFY). It's great for warm-up phases, and good fun because it requires students to react as fast as possible to the changing rules of the game.

Procedure:

1. Tell your students you will give them a pair of instructions, *jump* and *stop*, and ask them to carry them out. Vary the order of the instructions, e.g. *jump – stop – stop – jump – stop – jump – jump – stop – stop – stop*. Challenge them by creating different intervals between the instructions, and occasionally changing the instructions rapidly.

2. Next, tell them to reverse their reactions – to jump when you say *stop*, and stop when you say *jump*. Again, vary the order of the instructions.

3. Introduce the next two instructions, *sport* and *stretch*. Tell them they are to call out their favourite sport when you call *sport*, and stretch up high when you say *stretch*. Finally get them to reverse their reactions to the two new instructions, and to the first pair of instructions.

4. Finally, introduce another two instructions, e.g. *walk* and *dance*. Carry on as above until in the last round you are using all six instructions in random order and students are reverse-reacting to all of them.

Using the activity with younger learners

Use one pair of instructions, and when the children are at ease with carrying them out in reverse order, introduce another pair of instructions and practise those until they are at ease with reversing them too. With good classes, you may want to try to use all four instructions together. If so, use them in the correct sense in jumbled order for some time before you ask the children to reverse their responses to them.

Example 2: Collocations and chunks generator

Cognitive control functions: working memory, inhibitory control

Language learning objective: completing and remembering collocations and chunks of language

Materials needed: none

Time: 3–4 minutes

Note:

This is an activity that I first learnt from Scott Thornbury. It helps create awareness of collocations and chunks of language, and aids the students' working memory in a very engaging way. If done repeatedly, it will help to transfer language into their long-term memory. The activity should be used after you have introduced a song, or your students have read or listened to a story or a factual text, and you have already worked on the comprehension with them, so they have a good receptive command of the language.

Procedure:

1. Select 8–10 sentences from the story or song that contain important collocations or chunks of language. Write them on the board, leaving out one word from each chunk/collocation, but do not leave a gap, so students do not get a hint where in the sentence the word might fit. Write each missing word, in capital letters, in the margin. Here is an example of such an activity based on a text used successfully with adolescent B1 students:

We're used to hearing really expensive Hollywood films.	ABOUT
Spider Man 3, for example, had a budget more than $250 million.	OF
To be successful, however, a film doesn't have to be expensive.	THAT
An example this is the 2010 movie Monsters.	OF
It cost less than half million dollars to make.	A
Amazingly, the film only seven weeks to film.	TOOK
The film crew was seven people in a van.	JUST
The director decided make the film with digital video.	TO
There is the fact that they used real locations, not a studio.	ALSO

2. Do one example with the class. Then ask the students to work on the other sentences in pairs.

3. Ask them to read out their solutions and compare their findings. Give them feedback.

4. Over the next few lessons, repeat the activity several times. Make sure you present the sentences in jumbled order. Read out the incomplete sentences slowly, without the students seeing them. You should notice that most of your students will be able to complete them from memory.

Example 3: The n-back challenge

Cognitive control functions: working memory, inhibitory control

Language learning objective: revision of lexical items: e.g. words/ chunks of language/phrasal verbs

Materials needed: write a list of lexical items you want to revise, or create a presentation – see below for how to do this

Time: 5–6 minutes

Students usually find this activity quite challenging, but they enjoy it at the same time because of that. Needless to say, you will need to ensure that it is done in a good spirit, and not as a test, or with the intention of putting anybody down for making mistakes or not remembering well.

In the n-back challenge, students see or hear one item after another. For each item, they need to decide if the item they're seeing or hearing is the same as the one that they saw/heard 1, 2 or 3 items before; if so, they need to e.g. clap their hands. Depending on the number, the challenges are called n-1, n-2 or n-3, hence the name 'n-back challenge'. The difficulty of the task can be increased with a higher number, a faster pace, longer items, and items that are more challenging to remember.

Here is an example list for an n-2 challenge. The words that students need to react to are marked with an x.

pen	
ruler	
pen	X
glue stick	
pen	X
ruler	
schoolbag	
ruler	X
schoolbag	X
etc.	

Procedure:

1. Write a list of the lexical items you want to revise. Or create a presentation with one lexical item per slide, so students do not see the previous one. This introductory exercise will be n-1, so tell your students they are to clap when an item is the same as the previous one. Start reading out the words from the list or show your presentation. After the students have clapped correctly, ask each of them to make a sentence with the word. Ask 3–5 students for their suggestions. If a sentence is not correct, elicit the correct sentence from the other students.

2. Here is an example list for a B2 class which is revising phrasal verbs:
   take after
   get rid of
   get rid of
   back down
   get along with

get along with
double down
advise against
advise against
etc.

3. You should find that your students are at ease with this task, as it is only an n-1 challenge. So the next time, write up an n-2 challenge list. Continue as described above, and repeat the activity several times before going on to an n-3 challenge.

Using the activity with younger or lower level students

If you want to use the n-back challenge with younger or lower-level students, use single-word items only. Read out or present the words slowly, so students have time to focus their attention, and do not go up as far as an n-3 challenge.

Example 4: Be careful making judgements

> **Cognitive control functions:** cognitive flexibility (looking at things from different viewpoints)
>
> **Language learning objective:** viewing comprehension
>
> **Materials needed:** video to present vlog, activities as below (examples taken from Think 2nd edition, SB 1, Unit 5, p. 55)
>
> **Time:** 20–30 minutes

Note:

The following example from Think 2nd ed. shows a very contemporary way of reaching out to young people, a vlog. Students watch the video (see video script below) and do the activities aimed at raising awareness about important aspects of making judgements about other people without prejudice. The vlog helps students develop cognitive flexibility by inspiring them to look at people from different viewpoints, rather than judging them by their appearance or first impressions.

Vlog video script:

Making judgements

Oh it's you again. Hi. Guess what I'm doing? Busy studying, you say. Wrong. Look again. Got you!

There's an expression in English that says: 'never judge a book by its cover'. It basically means that things aren't always what you think they might be. And that was the perfect example. Actually, it's a trick I use to fool Dad. He thinks I'm studying. I get a bit of peace and the chance to do some serious reading. But it's also the perfect example. Thank you very much!

So, there's that man on the street corner playing guitar badly. He's poor and probably just a bit lonely you think. Or maybe… he's just a normal man who just loves playing his guitar to anyone and everyone.

And there's that new kid at school. Doesn't talk to anyone. Unfriendly, you think. Or maybe… he's just very shy and finding it difficult to make friends.

What about that annoying kid who spends all the time telling you how great he is and how many things he's got and how he's better than everyone else. Well, just maybe that's not entirely true. Maybe his life's not so great. Maybe that's the way he deals with it.

So all these people aren't what they seem to be at first. Don't be too quick to make a judgement. Maybe get to know them first before you make up your mind.

Oh. Let's not forget Kate, my big sister Kate. Annoying you think. Unfriendly, you think. Mean, you think. Or maybe… she's just had a bad day.

Anyway, I need to get back to my studies.

Till next time.

Whole class motivational interventions aimed at developing self-control strategies by creating a can-do classroom culture

Example: Problems with homework

Dawson and Guere (2018) stress the importance of occasionally using incentives when it comes to motivational strategies aimed at the whole class rather than at individuals. An example they offer is about problems with students' reliability (or otherwise) when it comes to getting their homework done. The teacher's reaction to this problem can be a very tricky issue, especially if individual students get singled out and told off in front of their classmates. So here is an excellent suggestion for a strategy you could use instead (p. 71), aimed at uniting the class in working towards a common goal:

'Class, for the last 3 weeks you have been handing in, on average, 75% of the homework assignments. If we can raise that percentage to 90% for the first 3 days this week, then Thursday will be a no-homework night.'

Working with older teens and (young) adults

Developing study strategies and metacognition

Example: Going meta on study strategies

There is solid research (see in particular Weinstein et al., 2019) into what study strategies are effective and what strategies are basically a waste of time. After reviewing over 700 studies on the efficacy of various study strategies that (young) adults use in their preparation for tests, Dunlosky et al. (2013, p. 46) say that even students who have achieved good results in lower grades sometimes have problems later, when there is much less supervision by the teacher and they have to be in control of their own learning. After winnowing the retrieval strategies down to the most effective ones, they conclude: 'Teaching students to use these techniques would not take much time away from teaching content and would likely be most beneficial.'

So how can we teach students to use more effective retrieval strategies? A good approach would be to help them become aware of what strategies they are currently using, and what scientific evidence there is concerning the efficacy of those strategies. When students fail, or achieve lower results than expected, in spite of often having spent a considerable amount of time to prepare for a test, they often blame factors other than their study strategies for their results.

There is clear evidence that the following strategies, which are very common among high school and university students, are not very effective: re-reading, highlighting, underlining and copying verbatim. 'Although these strategies are commonly used, they are not very effective as they are fairly passive, and can cause what learning scientists call a 'fluency illusion': the impression that, because something is self-evident in the moment, it will remain that way in a day, or a week. Not necessarily so. Just because you have marked something or rewritten it, digitally or on paper, does not mean your brain has engaged the material more deeply.' (Carey, 2015, p. 226).

The three main strategies we should teach our students are that they should (a) regularly review information from each class – but not immediately after the lesson; rather, a day or so later; (b) when preparing for a test, space their learning rather than cram it, and keep this timing in mind when they plan their retrieval practice; and (c) use practice testing or quizzing themselves or each other on the content, as that has been shown to cognitively engage students much more deeply. It is important to stress too that when it comes to practice testing – one of the most powerful retrieval strategies – students should do the same practice tests repeatedly. Dunlosky et al. (2013, p. 31) observed 'significantly greater final-test performance when students engaged in cued-recall practice until target items were recalled four to five times versus only once'. The researchers also conclude that the type of self-testing or practice testing plays an important role: tasks that simply require recognition or filling in gaps have been shown to be less effective than practice tests that require more generative responses (e.g. recall, or short answers).

Dr Herbert Puchta is a professional teacher trainer as well as a writer of course books and resource books. He has been a plenary speaker at numerous international conferences and has conducted workshops and given seminars in more than 50 countries. For almost three decades, he has carried out research into the practical application of findings from cognitive psychology and brain research to the teaching of English as a foreign language. His latest course books, co-written with other colleagues, are Empower, Super Safari, Super Minds 2nd edition and Think! 2nd edition, all published by Cambridge University Press.

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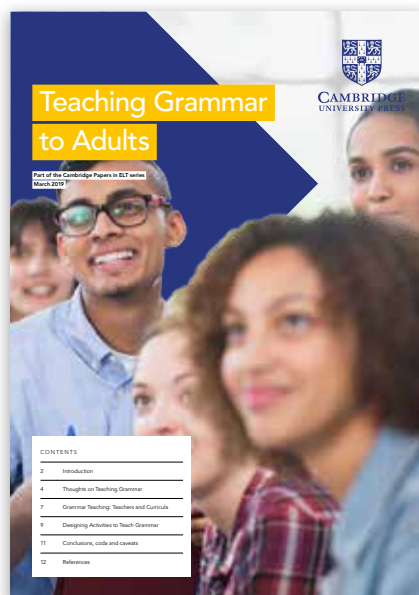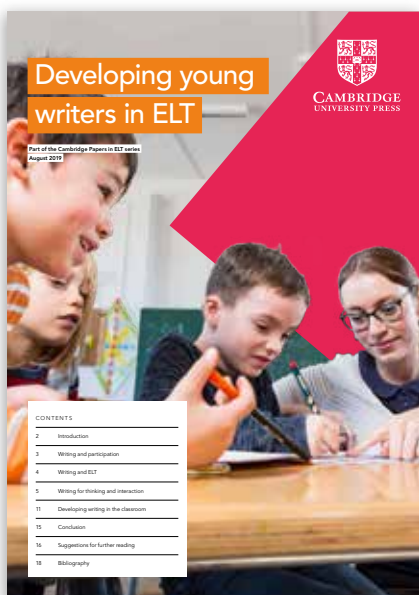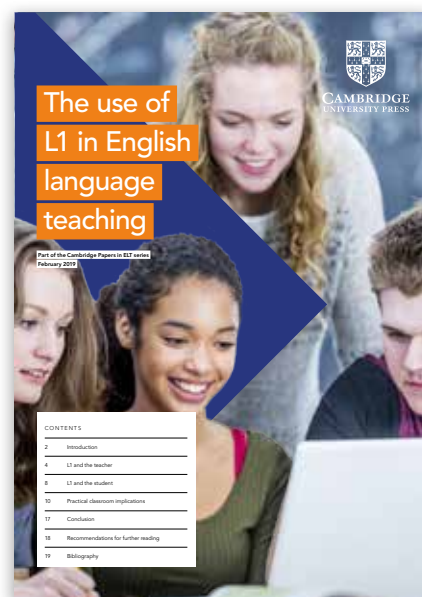
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