

Implicit Learning as a Neglected Key Concept in CLIL Learning

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ABSTRACT

This contribution develops the idea that implicit learning and its influence on the brain constitute a key concept for understanding the underlying mechanisms of subject-language integration (CLIL). It thus aims to contribute to the reflection on a comprehensive theory underlying the success of the CLIL approach. It will show (i) that the way in which CLIL perceives learning has profound, even hidden, consequences on its results and (ii) which language teaching techniques should be developed to exploit this knowledge. Learning will first be briefly discussed. The concepts of explicit and implicit learning, and specifically CLIL learning, will then be examined. Its importance for brain development will then be highlighted. CLIL outcomes and their side effects will be examined with regard to the brain, aging, and dyslexia. The final sections will address the pedagogical implications of implicit learning for classroom activities, teacher training, and parent contact. This theoretical contribution draws on the findings of more than twenty years of research and experience, primarily in Belgian CLIL schools.

Keywords: CLIL, explicit and implicit learning, multilingual learning and the brain, dyslexia

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1 INTRODUCTION

Recent decades saw an increase in the number of primary and secondary schools applying the content and language integrated learning approach (CLIL). At the same time, numerous studies have been published mainly describing CLIL experiences ranging from pupils' acquisition of the target language to teachers' attitudes, classroom discourse and/or various other aspects, such as curriculum and school organisation (see for instance Jäppinen, 2005; Dalton Puffer & Smit, 2007; Van de Craen et al., 2007; Lorenzo et al., 2010; Linnares et al., 2012 for studies on language related factors and Lasagabaster & Sierra, 2009; Katarzyna, 2012; De Smet et al., 2018 for examples of studies of CLIL and non-language related factors). However, little attention has been paid to questions such as: where does this success come from and what are the underlying factors that make the approach so attractive?

A seemingly logical candidate for studying its impact is of course the brain, since learning is primarily a very high-level brain activity. There are different forms of learning, but when it comes to academic or school learning, the distinction between explicit and implicit learning is quite sufficient. The first part of this contribution will address these two forms of learning in general and its implications for the brain. Next, the characteristics of explicit/implicit learning in a CLIL context will be examined as well as their influence on the brain.

2 WHAT IS LEARNING?

Since the mid-1990s, interest in the learning brain has grown considerably, mainly due to the development of scanning techniques that have given researchers the opportunity to observe the brain at work, so to speak. Therefore, what actually happens in the brain during learning can be visualized as in Figure 1.

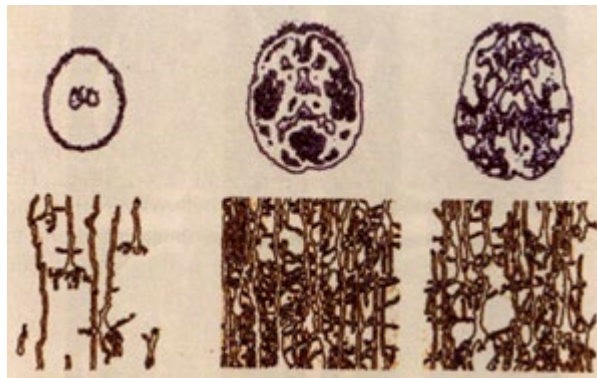


Figure 1: A look at the brain and its neural connections at different ages. On the left, a newly born, in the middle a six-year-old child, on the right a 25 year-old adult. The density of the connections decreases with age as unwanted connections disappear (see Carter, 1998:18)

Learning means creating neural connections through any activity, whether movements, language, or play. Maximum density is reached by age six, after which useless connections disappear and are replaced by more useful ones as shown in Figure 1, right. It's easy to see that the more intense the activity, the more connections there are. It's also clear that every brain is different, as experiences vary. All this happens, of course, spontaneously: the brain is equipped to do it from birth and delights

in establishing an unlimited number of connections. Currently, the number of brain connections is estimated at 86 billion (Goriely, 2025). The flexibility of the brain, its neuroplasticity, stems from this figure and, for the moment, surpasses any computer.

It is quite surprising that, in many cases, the study of learning is not integrated into the study of teacher training programmes. Yet, as we shall see, a basic understanding of what learning is could be of great help to classroom teachers. In a school context, two forms of learning can be distinguished: explicit learning and implicit learning. Explicit learning is the typical form of learning associated with school activities: students enter the classroom and, upon leaving, have learned how to subtract, write a letter, learn about their country's history, or whatever else the curriculum prescribes.

Explicit learning is a conscious way of learning and has tremendous prestige. It is for most teachers the only way to acquire knowledge, it is well-structured and has thousand years of history behind it. Moreover, since knowledge is structured, it is easy to test via standardized procedures. Also, the results are clear: either you pass or you fail – and the career path is mapped accordingly. We know this approach can be problematic for some students, but in most cases, their circumstances are not addressed. The western school system has generally operated this way for centuries.

Ericsson and his colleagues proposed a particular type of explicit learning, namely *deliberate practice* or expert learning (Ericsson et al., 1993; Ericsson & Pool, 2016). If someone wants to become a concert pianist or violinist, a chess grandmaster or even a professional football player, they must invest hours and hours of practice from a young age to achieve the level of expertise required for this activity. In general, the occupation is very specialized, needs the support of a coach, himself or herself an expert, and it is generally a very codified and traditional undertaking. Even if deliberate practice shows what humans are capable of, the goal of school education is certainly not to produce experts in any field.

Implicit learning is completely different. It happens, when according to Seger, “complex information is learned without complete verbalisable knowledge of what is learned” (Seger, 1994:164) It is an unconscious way of learning, it has no prestige, it is unstructured, it is more of a learning-by-doing process, there are no standardized tests, and the results are unpredictable. It is therefore unsuitable for school application. At least, this is the opinion of many teachers and educational authorities. Interestingly, in preschool implicit learning is widely accepted and even appreciated. Furthermore, we forget that children learn many things implicitly, perhaps the most striking example being their mother tongue(s). Let us discuss some aspects of implicit learning.

Interest in implicit learning is fairly recent, dating back only to the studies of American cognitive psychologist Arthur Reber (see Reber, 1967, Reber, 1993). According to him, compared to explicit learning, implicit learning is (i) *more robust*, implying that what is learned is retained for a longer time, (ii) *less subject to variation*, implying that learning is distributed more evenly within a group, (iii) *more suitable for group learning*, implying that it is suitable for traditional classrooms as well as cooperative learning (iv) *IQ-independent*, implying that it is suitable for any young learner, and (v) *age-independent*, implying that it is also suitable for adults.

In the field of language learning research has been particularly productive (see for example DeKeyser, 2003; Rebuschat, 2015 and Isbell & Rogers. 2021). Unfortunately, artificial languages are often used to test Reber's hypotheses. These distort reality, because these non-words have no meaning and are therefore far removed from the reality of the language learning process (see Wang, 2020). With regard to brain function and language processing, studies of the interplay between implicit and explicit learning conclude that explicit learners show more rule-governed behavior, while implicit learners show more spontaneous language behavior and at the same time retain more vocabulary (see Ellis 2005 for a good overview). Let us return now to CLIL.

3 BASIC COMPONENTS AND RESULTS OF THE CLIL APPROACH

Note that the expression CLIL approach is used and not CLIL theory as is often done. CLIL is not yet a unified scientific body of knowledge as a theory should be, although it has characteristics of a paradigm (cf. Kuhn 1970) in the sense that the approach is currently widely used and accepted by its advocates and practitioners. For some it is “the most important educational innovation of the past fifty years” (Koster & Van Putten 2014, 74). However, because research is conducted from different angles, such as linguistics, discourse analysts, pedagogues, sociologists, social psychologists and neuroscientists, a uniform approach is still a long way off.

However, the basic components of the teaching approach are clear: a target language is taught by teaching the subject matter or content in that language, without paying attention to its formal aspects. It is advisable to start at an early age, for example in nursery school, and continue until the end of secondary education. The approach works best under a number of conditions: schools must embrace the approach wholeheartedly and teachers must (i) be fluent in the target language, (ii) preferably be able to speak or understand the school's main language and be willing and able to collaborate with their colleagues.

It is clear that this is primarily an implicit approach to learning. The best possible comparison of this approach is with the Suzuki method used in music pedagogy, in which students first learn how to play the instrument and only later learn to read music. Just as a student learns to play an instrument without having to read sheet music, a CLIL student learns to speak before learning the rules of language. And just as the postponement of sheet music reading is criticized because reading sheet music is postponed, the CLIL approach is also criticized because knowledge of grammar rules is neglected in the early years of study (see for this discussion for instance Bruton 2011, 2013, Hüttner & Smit 2014). However, the CLIL results show that the pessimists are wrong on this point.

These are the most important results of CLIL learning. As if by magic, fear of speaking disappears completely for all students at all levels. In terms of linguistic aspects, the mastery of spoken language, i.e. fluency and accuracy, including accent, CLIL students outperform traditional language learners. In terms of content knowledge, CLIL students score as well or better than traditional language learners. In terms of cognitive aspects (the term is from Jäppinen 2005) CLIL students outperform traditional language learners in mathematics and science. In terms of social-psychological aspects, students show a positive attitude towards language learning compared to traditional language learners

and, finally, the brain of CLIL students responds differently to simple arithmetic tests than that of traditional language learners (see for all this for instance Jäppinen 2005; Mondt 2005, Mondt et al. 2011; Lorenzo et al. 2010; Murray 2010; Perez-Canado 2012; Van de Craen et al. 2007b, 2007c, 2012, 2019; Ouazizi 2016; Surmont et al. 2016; Woumans et al. 2016; Hilligsmann et al. 2017; Fleckenstein et al. 2019).

4 CLIL RESULTS EXPLAINED AND BEYOND

Young CLIL students quickly learn to function in the target language in the classroom. This will form the basis of their explicit knowledge later, i.e. grammar, reading, and writing. How quickly? This of course depends on a number of factors, such as the nature of the target language, the language of the outside world, parental support, extracurricular activities, among others, but in general, it can be said that, in European schools, if the school year starts in September, by Easter of the following year, young children can fully function in target language classes (see Van de Craen et al. 2018).

The stark contrast between these results and those of traditional learners does not mean that the student has already mastered the target language or, contrary to what many parents believe, that they are able to translate everything asked of them. It simply means that a solid foundation has been laid for their future development, allowing them to develop their target language. The true nature of their bilingualism only becomes apparent at puberty. It is only then that the true value of the CLIL approach becomes fully evident. The question is : where does this learning success come from?

In his seminal work, "How We Learn," Dehaene distinguishes four pillars of learning: (i) attention, (ii) active engagement, (iii) error and feedback, and (iv) consolidation (Dehaene 2021). Although he makes no mention of CLIL nor any other form of bilingual education, neither mentions explicit or implicit learning, these pillars align perfectly with CLIL learning. Let me elaborate the pillars from a CLIL perspective.

Attention. First of all, a striking aspect of CLIL courses is that learners are more attentive to what is happening than in traditional classes. The use of the target language arouses interest, and it is necessary to listen more attentively to grasp its meaning. In addition, the activities focus on various uses of the language. It can therefore be said that the CLIL approach improves students' attention (cf Serra 2007; Van de Craen et al. 2018).

Active engagement. Second, active engagement is also an integral part of the CLIL philosophy. Students are constantly asked to engage in certain tasks, and since a great deal of attention is paid to group activities and cooperative learning, it can be said that the CLIL approach inherently elicits and requires active engagement (cf. Coyle et al 2010).

Errors and feedback. Third, errors and feedback are cornerstones of CLIL learning, as errors are a fundamental aspect of all learning. Therefore, errors are accepted and feedback is given as long as it is constructive and consistent with the interaction taking place at that particular moment. This implies that feedback can be deferred to a later time (cf Evniskaya 2018).

Consolidation. Fourth, consolidation is closely related to repetition. As is well known, repetition is the basis of all successful learning, and CLIL forms of learning are no exception. In a CLIL context, consolidation means the repetition of content, not only in the target language but also in the school's vehicular language (cf. Van de Craen et al. 2018).

The four pillars of learning as identified by Dehaene fit perfectly with the CLIL approach and largely explain its success with primary and secondary school students. Now that we have established CLIL and implicit learning as a good learning example, at least three other side effects should be highlighted.

5 THREE SIDE EFFECTS RELATED TO IMPLICIT LEARNING

Three side effects will be highlighted; (i) on the brain, (ii) on aging and (iii) on dyslexia.

(i) *The brain.* There are striking differences between the brain function of explicit and implicit learning. In general, it can be said that implicit learning involves more subcortical areas, such as the basal ganglia and cerebellum, than explicit learning, which involves more of the hippocampus, responsible for memory, as well as the cerebral cortex (Yang and Li, 2012). See also Figure 2.

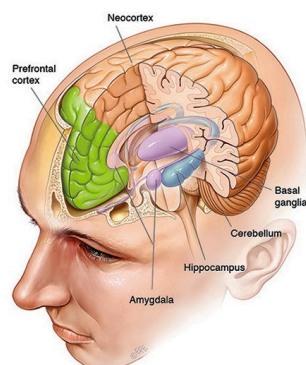


Figure 2 Implicit learning involves subcortical areas such as the basal ganglia and cerebellum. Explicit learning involves more cortical areas as well as the hippocampus. Picture source: Queensland Brain Institute (n.d.).

Research findings suggest that implicit learning engages the brain differently than explicit learning. For one thing, memory plays a different role. While explicit learning directly engages memory, implicit learning, or learning by doing, affects memory by creating unconscious representations that result in more fluent and automatic language processing. For example, learners will first use models, such as “She works hard” or “I saw it” without knowing how the verbs are conjugated.

(ii) *Aging.* In a study that generated widespread reaction in the international press, Canadian researchers demonstrated that the cognitive reserve accumulated by bilinguals is responsible for the delay in the onset of dementia in adult learners (Bialystok et al. 2006; Bialystock & Sullivan 2017).

In a follow up study Woumans et al., (2016) that this was also true for learners from an immersion context.

(iii) *Dyslexia*. Another side effect of the CLIL approach, more important for schools, is its impact on dyslexic children. Nicholson et al. (2001) showed that dyslexia is not so much a cortical problem as a cerebellar problem and therefore developed the cerebellar deficit hypothesis to explain the cause of dyslexia. The cerebellum is, among other things, also involved in balance. Therefore, children with dyslexia could greatly benefit from balance exercises, as these stimulate the cerebellum, thus improving brain connections and, in doing so, improving reading ability in many, if not all, dyslexics (see also Alvarez and Fiez 2018 for more information on this hypothesis).

This is where the connection with CLIL learning lies. Implicit learning, a key feature of CLIL learning, has also a significant impact on the cerebellum, i.e., it stimulates it (see Matsumura et al., 2004). Therefore, the problems of dyslexic children are alleviated by this type of learning, as their brain connections are strengthened. To date, no large-scale research has been conducted to confirm or refute the cerebellar deficit hypothesis. We must be content with the numerous testimonies of parents and teachers on the Internet, attesting that dyslexic children succeed well in CLIL contexts. The study by Parmentier et al. (2024) is an exception. They conclude, based on a sample of more than 800 participants, 28 of whom were diagnosed with dyslexia, that "our results suggest that there is no measurable disadvantage for dyslexic students in following CLIL programs, either for language learning or for the acquisition of academic content" (Parmentier et al. 2024: 1). Implicit learning is undoubtedly the basis for this result. This important side effect should be better known because many parents are advised to avoid CLIL programmes if their child is diagnosed with dyslexia.

6 DIDACTIC AND OTHER IMPLICATIONS DERIVED FROM CLIL LEARNING

The CLIL experience has taught the world of education a lot. This includes effects on (i) actual teaching approaches, (ii) teacher training and school involvement and (iii) effects on contact with parents. These point will be briefly addressed.

(i) *Actual teaching approaches*. As mentioned, implicit learning is extremely well suited to group learning and, therefore, to cooperative learning, defined as "the instructional use of small groups that allows students to work together to maximize their own and others' learning" (Johnson et al., 1994: 3). Group learning skills promote interaction and communication among students, which is an additional social asset to the CLIL approach. Practice shows that in CLIL classes where cooperative learning is used, social interactions are encouraged, but also that teachers are sometimes reluctant to apply group work, for fear of losing control of the learning process (Pistorio 2010; Castell-Rodríguez and Prat Fernández, 2022).

(ii) *Teacher training and school involvement*. First, CLIL teacher training, whether for languages or subjects, should be strengthened in most European countries. CLIL teachers often lack CLIL training and miss several important aspects, such as the development of bilingual children and the role of implicit learning. Second, it is worth emphasizing that more technical and vocational schools should

become involved in CLIL programs. Too often, teachers and school authorities refuse to use them, claiming and wrongly assuming that doing so would exceed learners' abilities (cf. Van Mensel et al., 2020)

(iii) *Parental contact*. In an ideal world, parents are involved in their children's school activities. This is not superfluous in the CLIL context, as it is a relatively new approach and false expectations can arise within different groups of parents. Parents should be aware that although bilingualism is the ultimate goal, children will not become bilingual overnight and that the child needs support to overcome any problems related to the cognitive load that this approach entails. Schools should also explain why the mother tongue will not suffer from the CLIL approach and that in most cases, true bilingualism is a goal that is not achieved until puberty. Research shows that parental evaluations of CLIL programs are closely related to parents' education level in that highly educated parents have more realistic expectations than others (cf. Barrios 2019). Teachers and school authorities should be aware of this.

7 CONCLUSION

Content and language integrated learning is a recent pedagogical approach. While its practical success is undeniable, the underlying theoretical premises are still being developed. This contribution argues that implicit learning is a key overlooked factor in understanding CLIL success in young learners. Further research is needed to develop this aspect. The same applies to the relationship between implicit learning and the brain, involving subcortical rather than cortical areas, and its consequences for dyslexia and aging. Finally, regarding the actual functioning of the classroom, the impact of cooperative learning needs to be examined more closely, as well as teachers' and parents' attitudes towards it. CLIL as we know it today in Europe is only 30 years old. We are still a long way from a comprehensive CLIL theory, but whatever form it takes, implicit learning will be a major component.

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