

Towards a Cognitive-Linguistic Turn in CLIL: Unfolding Integration

Hacia un cambio cognitivo-lingüístico en AICLE: descripción de la integración

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Para uma mudança cognitivo-linguística na AICL: descrição da integração

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ABSTRACT. The aim of this paper is to unfold the process of integration in CLIL by describing the role of the cognitive processes involved in the construction of knowledge. While there has been extensive research of various aspects of CLIL, the actual process of integration of content and language has largely been neglected. Therefore, this paper argues that the role of language in building knowledge has to be stressed further and made transparent to CLIL practitioners, particularly in “hard” versions of CLIL. Raising teachers’ awareness of the epistemic function of language and drawing their attention to the human cognitive architecture can help them achieve a higher level of understanding of the process of integration of content and language. Using the example of a task taken from a training course for CLIL teachers, this paper describes how a focus on the cognitive architecture of learners can improve the integration of content and language in CLIL.

Keywords: CLIL; integration; knowledge; cognitive load theory; cognitive linguistics.

RESUMEN. Este artículo tiene como objetivo mostrar el proceso de integración en AICLE mediante la descripción del papel de los procesos cognitivos involucrados en la construcción del conocimiento. Aunque existe una extensa investigación de varios aspectos del AICLE, el proceso real de integración del contenido y del lenguaje se ha dejado en gran parte de lado. Por consiguiente, este artículo sostiene que se debe hacer un mayor énfasis en el papel del lenguaje en la construcción de conocimiento y que se debe hacer transparente para los practicantes de AICLE, particularmente en las versiones “duras” de AICLE. Sensibilizar a los profesores sobre la función epistémica del lenguaje y atraer su atención hacia la arquitectura cognitiva humana puede ayudarles a lograr un mayor nivel de comprensión del proceso de integración de contenido y lenguaje. Mediante el ejemplo de una tarea tomada de un curso de capacitación para maestros de AICLE, este artículo describe cómo un enfoque en la arquitectura cognitiva de los estudiantes puede mejorar la integración del contenido y el lenguaje en AICLE.

Palabras clave: AICLE; integración; conocimiento; teoría de la carga cognitiva; lingüística cognitiva.

RESUMO. O objetivo deste artigo é mostrar o processo de integração na AICL, descrevendo o papel dos processos cognitivos envolvidos na construção do conhecimento. Embora exista uma extensa pesquisa sobre vários aspectos da AICL, o processo real de integração de conteúdo e linguagem foi deixado em grande parte para um lado. Portanto, este artigo argumenta que é necessário enfatizar o papel da linguagem na construção do conhecimento e que deve ser transparente para os praticantes de AICL, particularmente nas versões “difíceis” da AICL. Sensibilizar os professores sobre a função epistêmica da linguagem e chamar sua atenção para a arquitetura cognitiva humana pode ajudá-los a alcançar um nível mais alto de compreensão do processo de integração de conteúdo e linguagem. Com o exemplo de uma tarefa extraída de um curso de formação de professores de AICL, este artigo descreve como o foco na arquitetura cognitiva dos alunos pode melhorar a integração do conteúdo e da linguagem na AICL.

Palavras-chave: AICL; integração; conhecimento; teoria da carga cognitiva; linguística cognitiva.

Introduction

Coyle, Hood, and Marsh (2010) defined Content and Language Integrated Learning (CLIL) as a “dual-focused approach in which an additional language is used for the learning and teaching of both content and language” (p. 1). This dual-focus (on language and content) sets CLIL apart from other pedagogical practices that make use of an additional language. While there are similarities between CLIL and English Medium Instruction (EMI) (Somers & Surmont, 2012), English in EMI settings is mainly seen as a vehicle to convey content. In immersion programs, the focus tends to be mainly on the students’ language development. In neither case is the process of integration of content and language foregrounded to the extent it is in CLIL. Hence, CLIL was introduced as a suitable pedagogical approach to foster foreign language development and content knowledge at the same time. Since its introduction, CLIL has experienced some ups and downs—not only in empirical research, but also in classroom practice.

Initially, it was hoped that the educational landscape in Europe was ready to turn bi- and multilingual, and CLIL was therefore recommended at different educational levels (i.e., primary, secondary, and tertiary) as a new pedagogical discourse where the benefits were clearly visible (Marsh, 2002). Thanks in part to a number of high-profile advocates (Coyle et al., 2010; Marsh, 2002; Mehisto, Marsh, & Frigols, 2008), CLIL has since then not only produced numerous grassroot projects (see, for example, de Zarobe, 2013; Frigols & Marsh, 2007), but also promising empirical research (Dalton-Puffer, 2008; Dalton-Puffer & Smit, 2007, 2013; Hüttner & Smit, 2014).

These studies mentioned above have been informed by various linguistic theories, most notably Second Language Acquisition (SLA), Systemic Functional Linguistics (SFL), discourse analysis, and sociolinguistics (Nikula, Dalton-Puffer, Llinares, & Lorenzo, 2016b). Currently, it seems that one theme in particular is gaining prominence in CLIL research—that of integration (see Dalton-Puffer, Nikula, & Smit, 2010; Nikula et al., 2016b). It could be argued that the / in CLIL has long been given the Cinderella treatment, since the main focus was usually on language and its impact on classroom discourse (see Dalton-Puffer,

2007; Dalton-Puffer et al., 2010; Nikula, Dalton-Puffer, & García, 2013). For insights into the process of integration, an understanding of cognitive load theory and the cognitive architecture of the learner seems like a useful avenue to explore. From our point of view, insights into cognitive theories may be a valuable asset for content teachers and to eventually improve learning outcomes for both content and language.

Content and language: focus on the process of integration

It is a positive development that the interplay of content and language is receiving more attention now. In the past, content and language were often conceived of as two separate domains that coexisted in the CLIL classroom, disregarding their “inherent interdependency” (Nikula et al., 2016b, p. 2). This is supported by Meyer, Coyle, Halbach, Schuck, and Ting (2015), who claimed that

in traditional classrooms, content teachers do not usually focus on the quality of learners’ disciplinary literacy and discourse. In language classrooms, subject-specific literacies are considered irrelevant. [...] if “literacy” were at the center of the learning agenda, regardless of subject disciplines, a fundamental shift towards deeper learning would occur. (pp. 41–42)

Meyer et al. (2015) further pointed out that “unravelling the integrated approach and the inherent interrelationship of using language for progressing knowledge construction and meaning-making needs to be addressed, drawing together linguistic and pedagogic theoretical underpinnings” (p. 41).

In line with Nikula, Dafouz, Moore, and Smit (2016a), we argue that integration is the key to a successful implementation of CLIL. Although content teachers in higher education very often stress content knowledge as the major aim of their classroom discourse, they are very likely to miss the pivotal role that language plays in this context since they often lack linguistic and didactic competence due to their professional background. Many CLIL teachers have not been trained to be language teachers per se. However, teaching in CLIL classrooms needs methods and practices to be able to explain the interplay of content and language.

The idea that every teacher is a language teacher (see Skinnari & Nikula, 2017, p. 224) is a mind-set that has hardly found its way into

tertiary education. This correlates with Carloni (2015), who argued that “[for teaching] subject content in English effectively, instructors need to use a wide array of strategies to foster high levels of knowledge both in domain-specific and language areas” (p. 28). To achieve this in the CLIL classroom, we have to focus on the use of these strategies, since language creates knowledge and is thus not merely a means to an end. According to Moate (2010), it is necessary to emphasize

firstly language as the primary tool mediating the construction of knowledge and understanding, and secondly the recognition of the fundamentally social nature of learning [...] as language is required to access, construct and demonstrate learning [...] [making] language the primary tool in both pedagogic and learning repertoires. Language is the tool of engagement between learner and teacher, learner with subject, learner with learner. (pp. 39–41)

However, convincing content experts of the centrality of language in teaching and learning takes more than simply stressing its benefits (Mehisto et al., 2008). Content teachers need to understand that they may well benefit from an understanding of relevant areas of linguistics, such as sociolinguistics, discourse analysis, Systemic Functional Linguistics, and Second Language Acquisition. Furthermore, the centrality of the process of integration means that teachers would also do well to develop a familiarity with some basic concepts of cognitive linguistics. Zwiers (2007) pointed out that “the development of academic language in mainstream content area classrooms is not well understood” (p. 94), due to a lack of research conducted on the interplay of content and language in learners of English as a Foreign Language and the paucity of approaches to conceptualize academic language among content teachers, who primarily focus on technical vocabulary rather than on other dimensions to make meaning of “complex and abstract concepts” (Zwiers, 2007, p. 94). This shows that teaching content in a foreign language takes more than just being equipped with some key terms and expressions, which is a common misconception that training courses for content teachers need to address.

Foregrounding the role of language is all the more relevant, as this is an unfamiliar terrain for content teachers who are, as a rule, rather unwilling to see themselves as language teachers, even though it has been argued that every non-language subject teacher is in some way

also a language teacher (e.g., Van der Walt & Ruiters, 2011). However, content teachers very often feel that language development is outside their expertise and responsibility, and thus “their pupils’ own responsibility, or the responsibility of language teacher colleagues” (de Graaff, 2016, p. xiii).

Persuading content teachers that language is “a powerful tool and [...] a system of manageable signs and symbols to relate content, thinking and communication to one another” (Becker-Mrotzek, Schramm, Thürmann, & Vollmer, 2013, p. 35) needs a re-conceptualization of CLIL per se. Nikula et al. (2016b) called for “well-developed, research-based conceptualizations and models as tools for practitioners to make better sense of content and language integration” (p. 12). According to Meyer et al. (2015), “the role of language and its relation to conceptual development, knowledge construction and meaning-making” (p. 45) makes a better and more convincing explanation of the interplay of content and language necessary. As Nikula et al. (2016b) pointed out, “even when integration does appear in official curricula, language matters in content courses have often been programmed on instinct, against no linguistic backdrop and without a proper language theory supporting them” (p. 11).

If “the existence and stability of content separate from language is an illusion” (Byrnes, 2005, p. 280) and “an understanding of CLIL as fusion implies a multi-perspectival view on both language and content [...]” (Dalton-Puffer et al., 2010, p. 289), it follows that unfolding integration may be the key to enhancing the original concept of CLIL further and thus may help unravel the complexity of integration. As will be outlined in the following section, a cognitive-linguistic perspective on the process of integration is particularly valuable here.

The cognitive linguistic dimension in CLIL

In CLIL contexts, learners are confronted with cognitive-linguistic challenges and want to advance their knowledge structures and operational skills. The role of language awareness and knowledge about the language (KAL) have often been discussed in this context ever since the first publications of Bolitho and Tomlinson (1980). However, language awareness was mainly seen as awareness of forms and functions relating to grammar, phonology and vocabulary. While multilingual aware-

ness (MLA) is also at the core of many teacher training programs, information store principles and the cognitive architecture of the learner have been largely ignored.

Subsequently, we will outline some of the mental-linguistic processes that are required for the comprehension and production of knowledge, and point out why cognitive discourse functions play a central role in this construction of knowledge. Furthermore, we claim that CLIL teachers should possess knowledge about the human cognitive architecture and the cognitive load theory in order to facilitate the simultaneous learning of content and language, which will be discussed in more detail below.

Building and transferring knowledge through language

Not only do content specialists expect language learning to happen automatically whenever an L2 is used as the medium of instruction, they also often underestimate the role of language in teaching. They have to be familiarized with the fact that language is the space where knowledge is created, and that language learning is an active, dynamic and continuous process that helps learners to find orientation and to build knowledge. This paper argues that we have to make this linguistic dimension of knowledge building explicit and transparent to teachers by drawing their attention to the human cognitive architecture.

We build knowledge by reacting to input. Bakhtin (1986) pointed to the seminal role of language as a responsive tool by saying, “I live in a world of others’ words [...] my entire life is an orientation in this world, a reaction to others’ words” (p. 143). However, language is not only responsive but also a powerful tool to relate content, thinking and communication to one another. Thus, it plays a central role in the discovery, identification and storage of new knowledge, since it allows knowledge to be transmitted.

In the building and transferring of knowledge, language takes over an epistemic function. Language stays important even when it is not the primary means of expression, that is, when types of knowledge are expressed in semiotic systems that make little use of language per se, such as in mathematical writing, where symbols, formulae, statistics and diagrams are used. Even when codes are self-contained, they need to be verbalized for purposes of discussion, commentary or teaching.

Through this verbalization, we add a heuristic and epistemic function to the communication process. Beacco, Coste, van de Ven, and Vollmer (2010) pointed out that the mental-linguistic processes which are involved in knowledge comprehension and production, such as naming what is already understood, searching for new information, inferencing the unknown, integrating the new into existing knowledge, restructuring a whole area or field of knowledge and linking new knowledge to other contexts, are vital:

In addition to communicative uses of language, the heuristic or epistemic function comes into play when the individual seeks to find out about the world and to construct knowledge. This epistemic function can be visualized as an “on-line” procedure underlying the searching and thinking processes involved in identifying or developing knowledge, which leads to the type of provisional formulations that are part of this process. Accordingly, the term ‘epistemic modality’ is used to refer to the expression of differing degrees of certainty as to one’s thoughts or findings. The epistemic function of language is central for acquiring new knowledge and linking it to existing knowledge or for restructuring a whole knowledge domain. (Beacco, Fleming, Goullier, Thürmann, Vollmer, & Sheils, 2016, p. 20)

We build, restructure and transfer knowledge in interaction by allowing exchanges in the form of discussions, debates, or even disputes between the producers of knowledge and between users of knowledge. In the CLIL context, the active use of cognitive discourse functions (CDFs), which structure and drive educational discourse and which form the interface between thinking and language (Bonnet, Breidbach, & Hallet, 2009; Dalton-Puffer, 2013), has become an important objective for CLIL learning environments. Dalton-Puffer (2013) defined CDFs as:

[...] patterns which have arisen from the demand that participants within the institution school orient towards explicit or implicit learning goals and the fact that they have the repeated need for communicating about ways of handling and acting upon curricular content, concepts, and facts. It is in their very nature that they provide speakers with schemata (discoursal, lexical and grammatical) for coping with standard situations in dealing with the task of building knowledge and making it intersubjectively accessible. (p. 231)

Dalton-Puffer (2013) described seven types of cognitive discourse functions that create a “zone of convergence between content and lan-

guage pedagogies” (p. 216). She proposed the following categories for her classification: classify, define, describe, evaluate, explain, explore, report. These categories can be viewed as “prototypical communicative intentions about cognitive steps that are necessary for dealing with knowledge” (Dalton-Puffer, 2013, p. 233).

The interface between thinking and language has already been introduced in the context of Systemic Functional Linguistics—a linguistic approach in which knowledge is viewed as meaning and resource for understanding and acting on the world (Mohan, Leung, & Slater, 2010, p. 221). The call for the development of a kind of pluriliteracy in CLIL programs has led to discussions about how to best enhance the ability to participate in the socio-scientific world by also focusing on expounding and disseminating knowledge by increasing the mastery of cognitive-discourse functions.

Even when CLIL teachers provide their learners with the appropriate schemata for communicative situations, they very often lack deeper metalinguistic awareness and knowledge about cognitive processes involved in comprehension and conceptualization. This is why we argue that there is a need for CLIL approaches that help teachers to map learner progressions in knowledge and enable them to gain a deeper understanding of how the process of integration of content and language unfolds. CLIL teachers need to be informed about how language and thinking are intertwined. The introduction of the concept of *language* is one step in this direction, since it points to the constructive power of language in forming conceptualizations:

When one languages, one uses language, among other purposes, to focus attention, solve problems and create affect. What is crucial to understand here is that language is not merely a means of communicating what is in one person’s head to another person. Rather, language serves to construct the very idea that one is hoping to convey. It is a means by which one comes to know what one does not know. (Swain & Lapkin, 2013, p. 105)

The cognitive architecture of the learner

The use of a foreign language as a working language obviously influences language-specific mental activities and the processing of content. Heine (2010) conducted one of the first studies taking the cog-

nitive architecture of the learner into account. Her approach aims at facilitating knowledge transfer and promotes a cognitive linguistic perspective on CLIL. Heine (2010) provides insights into what CLIL learners actually do when they solve content-focused tasks while using an L2. By using methods such as spontaneous verbalization of thought and detailed verbal protocols, she demonstrates that language and conceptual thought interact closely and that the use of an L2 as working language can even enhance this effect.

CLIL teachers should, therefore, be familiarized with the human cognitive architecture and the cognitive load theory in particular. This theory suggests that there are three types of cognitive load: intrinsic cognitive load, extraneous cognitive load, and germane cognitive load. Intrinsic cognitive load refers to the “natural complexity of information” (Sweller, 2010, p. 124), while extraneous cognitive load is related to instructional procedures. While these two types of cognitive load are mainly concerned with material and how material is presented, the third type, germane cognitive load, is concerned with learner characteristics, such as the capacity of the working memory and how many of his/her resources the learner uses (Sweller, 2010). It is assumed that the use of cognitive discourse functions and *translanguaging*, which refers to “the act performed by bilinguals of accessing different linguistic features or various modes of what are described as autonomous languages, in order to maximize communicative potential” (García, 2009, p. 140), can lessen the cognitive load of learners and therefore facilitate and improve their language learning process.

Further, the human cognitive architecture is built upon by five basic principles (Sweller & Sweller, 2006; Sweller, Ayres, & Kalyuga, 2011; Sweller, 2015) that can be traced back to our biological evolution and form a natural information processing system:

1. The *information store principle*, which assumes that humans have evolved to acquire an immeasurably large amount of information that is stored in long-term memory;
2. The *borrowing and reorganizing principle*, which states that we constantly borrow and reorganize input when we acquire information from others although we do not need to be taught how to acquire that information. However, in connection with language, we need to be explicitly taught the secondary skills of reading and writing;

3. The *randomness as genesis principle*, which describes our ability to resort to problem solution activities when we do not have information from other people, but want to retrieve it. These attempts at information retrieval are based on random problem solving moves which are constantly tested to ascertain their effectiveness;
4. The *narrow limits of change principle*, which refers to the fact that our cognitive system is designed in a way that it restricts the capacity and duration limits available to process novel information. As is commonly known, we can process no more than 3–7 elements of novel information in working memory (Cowan, 2001; Miller, 1956) and hold that information for no more than about 20 seconds without rehearsal (Peterson & Peterson, 1959). These working memory limits affect the learning and processing of a second language; and
5. The *environmental organizing and linking principle*, which makes working memory limits disappear when dealing with organized information stored in long-term memory.

This is, incidentally, a very strong argument for explicit language instruction in CLIL contexts. Roussel, Joulia, Tricot, and Sweller (2017) claimed that:

Once linguistic information, either associated with a biologically primary native language or a biologically secondary foreign language has been stored in long-term memory via the information store principle, elements of that information appropriate to the context can be transferred into working memory using the environmental organizing and linking principle, organized as required and used to both understand what is being said and to generate appropriate speech. Until that information has been stored in long-term memory, neither listening nor speaking can be used effectively. (p. 73)

For this reason, the foreign language instructional component of CLIL, which is often missing in higher education and which aims to support second language learning while learning content, is crucial.

Facilitating the integration of content and language in CLIL

In this section we will outline how a language instructional approach can help reduce learners' cognitive load and thus facilitate integration.

Cognitive load in CLIL

In higher education, the intrinsic cognitive load that learners have to deal with is already high because of the complexity of the subject matter, and when the content is delivered in a foreign language, the cognitive load increases even further. Still, lecture-type courses, in which the instructor presents the material with very little interaction with the learners, are common and, in some fields, maybe, even the most common teaching method. However, as we have seen, the capacity of students' working memory is limited. When they are presented with large amounts of new information in a lecture in an L2, they have to deal with new content points and new language elements at the same time, which means that they can process less content information than they would be able to process in their L1.

In the light of what has been discussed in this paper so far, it is clear that, under these circumstances, no integration of content and language can take place. If the students do not get the opportunity to engage with the new content in the L2, there is limited language development and conceptualization of the new factual content. The two domains, language and content, simply run parallel in lecture-style teaching.

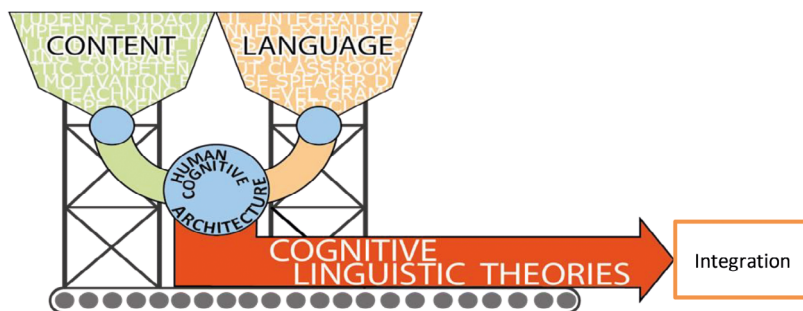
We argue that in this form of teaching, students do not reach their full potential in either domain. Not only are they not supported in their language development, they also cannot process the content adequately (Swain & Lapkin, 2013). Lecturers in higher education should be made aware of this so that they can take the process of integration into consideration in their teaching.

In order to make content experts aware of the centrality of language, teacher training in CLIL has to explain the interplay of content and language that makes integration possible. An introduction to cognitive-linguistic principles may be a step towards more successful CLIL teaching in higher education (Figure 1).

Integration informed by cognitive-linguistic principles

CLIL practitioners who are guided by cognitive-linguistic principles should take the cognitive load theory into consideration to make integration happen. Based on the different types of cognitive load, a framework can be developed that unfolds the process of integration.

Figure 1. Towards the integration of content and language in CLIL



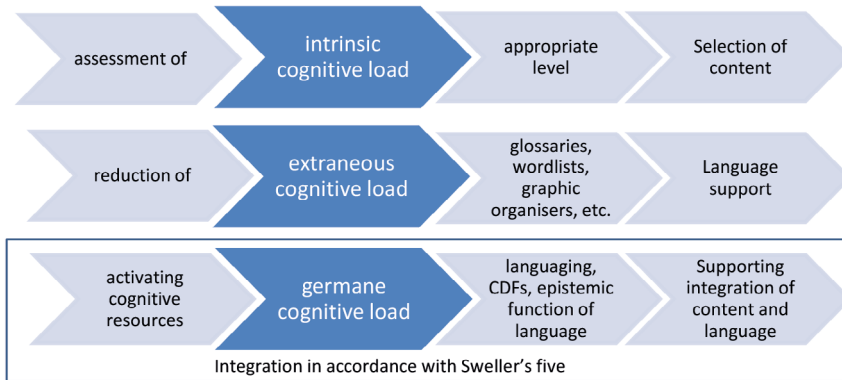
Source: Own elaboration.

Assessment of intrinsic cognitive load. Lecturers' first consideration should be if the intrinsic cognitive load of the content they have chosen is appropriate for the level of their learners or if adjustments are necessary.

Reduction of extraneous cognitive load. Once the content has been chosen, lecturers should reduce the extraneous cognitive load where possible. In terms of the L2, they can provide, for example, graphic organizers or other types of language support. Content can be made more accessible in terms of how it is presented visually.

Activating cognitive resources: germane cognitive load. In addition to these types of support, lecturers need to choose methods that support the integration of content and language. They need to be aware of the basic cognitive architecture of the learner as it relates to the interplay of content and language (CDFs, languaging, epistemic function of language). Figure 2 illustrates how integration is informed by cognitive-linguistic principles.

This framework necessarily implies a change in methodology—that is, interactive methods as an alternative to lecturing. If content specialists reflect on their new teaching approach, ideally guided by a language specialist, this could also have an impact on how they perceive language per se, and this in turn might also change their mindset towards language integration. They might find it easier to accept that every teacher is, in some way, also a language teacher when this does not require them to take on the role of L2 teachers—a role not many content specialists in CLIL settings would identify with.

Figure 2. Integration informed by cognitive-linguistic principles

Source: Own elaboration.

Practical application: A task for a training course

We have said that an understanding of the cognitive architecture of the learner would be a strong incentive for lecturers to adopt a more interactive style of teaching. Even when lecturers make an effort to interact more with their students, we find many exchanges, such as this one between a lecturer at an Information Technology (IT) department at an Austrian university and one of his students (T = teacher, S = student):

- S: Well, I think it [a magnetometer] is installed in almost every smartphone. Probably only in Android.
- T: Good. Yes, it is.
- S: And the smartphone makes use of a magnetic field and because of this the smartphone can receive information [...] data, or better information. The phone has a sensor... uh...
- T: Ja, gut. This is correct.

Here, the lecturer engages his students in dialogue, but never asks clarification or follow-up questions and only perfunctorily acknowledges what the student has said. Thus, a valuable opportunity to build knowledge together is lost. Lecturers should, therefore, be trained to use methodologies that are conducive to knowledge building and transfer. The task discussed below is taken from a CLIL training course for content specialists at an Austrian university and is designed in such a way as to allow the participants to experience an interactive

approach to teaching from the students' perspective and then reflect on their experience and challenge their assumption about the role of language in teaching and learning. The task aligns with the framework discussed above.

Assessing intrinsic cognitive load. For this task, a video that summarizes the main points of *Peak: Secrets from the New Science of Expertise* by Ericsson and Pool (2016) was selected. *Peak* offers an explanation of how mastery of a skill can be achieved, and one of the main ideas discussed in the video is the fact that our short-term memory is limited, thus introducing the Narrow Limits of Change Principle discussed in previously in this article. The content of the video, therefore, provides a stimulus for a discussion of the cognitive architecture of the learner as it pertains to teaching in CLIL contexts, but any video that introduces content that is new and interesting to the participants of the training course would work as well, as long as the level of complexity is appropriate for the group participating in the training session.

Reducing extraneous cognitive load. For non-native speakers of English, it is not easy to follow the video, as a lot of complex content is presented in a short time. To reduce the extraneous cognitive load, participants are given graphic organizers to fill in to help them focus on the central ideas presented in the video. Depending on their level of English, a glossary can be helpful, too.

Activating cognitive resources. Once the participants have watched the video, they discuss their first reactions in general terms. As a next step, they are given a task that focuses specifically on the verbalization of concepts that are new to them. The video about *Peak* contains numerous terms and phrases that denote concepts that would not necessarily be familiar to the participants, such as "deliberate practice" or "level of acceptable performance." Each participant draws a card with one of those terms or phrases on it and thinks about how they would interpret it and explain it to somebody else. They cannot write anything down or take notes at this stage. Next, they have to share their provisional interpretations with the other participants, who have to say whether they agree or not and give reasons for their answers. In this way, the whole group develops interpretations for the key concepts presented in the video together. The trainer writes down the definition, ideally on a whiteboard or similar, so that parts of the text can be delet-

ed and changed as the ideas of the participants develop. This continues until the whole group is satisfied with the interpretations and arrives at a common definition.

Next, the participants are asked to work out what the role of the teacher in the process outlined by Ericsson and Pool (2016) might be. In order to do so successfully, they have to use language to build on the concepts presented in the video and develop an understanding of the topic that goes beyond the ideas presented in the video.

Once the participants have completed the task, they are asked by the trainer to reflect on their experience. At this stage, it is important to contrast the approach chosen here (the participants develop definitions for unfamiliar concepts together and then apply these new concepts to their personal situation; the trainer facilitates this process) with the traditional lecture model (the lecturer provides definitions for new concepts to the students and then explains how they can be applied to different situations; the students attempt to follow the explanations). The participants can now be made aware of the framework discussed above and how it relates to the task they have just completed.

The trainer then discusses the cognitive linguistic dimension of the task with the participants (for an example, see Table 1 below): it activates the learners' cognitive resources and foregrounds the epistemic function of language as they have to engage in "linguaging" for problem-solving and to build knowledge together, and they have to use the appropriate CDFs to achieve transfer of knowledge. Finally, the participants discuss if there is anything they—the content specialists—can do in their own teaching to facilitate the integration of content and language, taking relevant cognitive-linguistic principles into account.

Table 1. Grid for reflection task

Step	Relevant cognitive-linguistic principle(s)	Requirements for integration
Co-writing definitions	Linguaging	Realizing the relevant CDFs in dialogue (e.g., defining, classifying, describing)

Source: Own elaboration.

Implications for CLIL teacher training

It is clear that CLIL teacher training should include a focus on the cognitive-linguistic principles that are vital for the successful integration of content and language. Cognitive load theory can serve as an organizing structure for CLIL teacher training: if lecturers learn to think about the content they teach in terms of the cognitive load it presents, language takes on a new role in the teaching process as one of several factors that have to be considered when choosing the appropriate methodology. In such a framework, it becomes clear that language cannot be ignored and that teachers have to improve their own language awareness to be able to reduce the cognitive load for their students. CLIL teacher training courses will have to make an effort to take the training needs arising from a cognitive-linguistic approach to the integration of content and language in CLIL into account.

Conclusion

As this paper has demonstrated, the focus of CLIL research on the process of integration should be continued and deepened in order to strengthen its outcomes. What successful CLIL needs is a multi-perspectival approach that should inform training courses for non-language specialists. Research into cognitive linguistics has clearly illustrated the role of limited working memory in language learning. Language is central to the process of knowledge construction (epistemic function of language), and awareness of cognitive discourse functions are at the interface of thinking and language. If training courses for teachers incorporate these ideas, as described in this paper, the process of integration in CLIL will become more effective and lead to better learning outcomes, since awareness of the respective teaching methodologies for content and language, as well as proper understanding of the functions of language and the human cognitive architecture make integration possible.

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