

Chapter 9

Directions for Future Research and the Way Forward

Chapter Overview

In this chapter, directions for future research in four important areas will be outlined: (1) assessment in CLIL¹, (2) discipline-specific thematic patterns and generic cognitive discourse functions, (3) the interplay of L1, L2 and multimodalities in scaffolding CLIL, and (4) teacher identity and pedagogical content knowledge (PCK) in CLIL. The discussion will be based on a review of the existing literature in these important areas. The existing literature reviewed will be drawn from studies in the cluster of interrelated fields: CBI, immersion, sheltered instruction, LAC, CLIL and academic literacies. Then the chapter concludes with some ideas on the way forward in LAC/CLIL theory and practice.

9.1 Research on Assessing Content and Language: Conceptualizing the Relationship Between Language and Content

Can content be assessed independent of language? If not, then how can assessment be designed in CLIL¹ contexts? Key research questions in this area have thus revolved around the conceptualization of content and its relationship to language. Heidi Byrnes (2008) has provided a comprehensive review of existing approaches to assessment of content in the context of L2 education while Mahboob and Dutcher's (2014) recent work on a Dynamic Approach to Language Proficiency (DALP) has provided some theoretical ground work which we can draw on to inform CLIL assessment research. The following discussion of research on assessment in L2 education will be mainly based on Byrnes' review and Mahboob and Dutcher's DALP model.

Research studies have shown that existing assessment tests on general language proficiency do not correlate well with tests assessing content knowledge. In other words, content learning and L2 language learning of students seem to show no relationship at all, at least as measured by the existing tests for content knowledge and for L2 language performance, respectively. For example, Stevens, Butler and Castellon-Wellington (2000) report only modest correlations between the results of Grade 7 English language learners (ELLs) on two tests: (i) a language proficiency test based on the widely used Language Assessment Scales (LAS), and (ii) a standardized test used in the assessment of social studies knowledge within the Iowa Tests of Basic Skills (ITBS) (quoted in Byrnes 2008). Byrnes (2008) comments that these discrepant results point to the need for better conceptualization of assessment of academic language in content areas.

However, in the tradition of second/foreign language (L2) assessment, some researchers have upheld the separation of language knowledge from topical or content knowledge (Bachman and Palmer 1996). This begs the question of whether content knowledge can be theoretically separated from language knowledge especially if we accept the idea that content is primarily mediated (or constructed) through language, although other semiotic (i.e. meaning-making) resources are also important such as visuals, diagrams and graphic organizers (see Chap. 6). In this respect, Widdowson (2001) has queried Bachman and Palmer's (1996) assessment model. For example, how does language knowledge connect or interact with content knowledge in one's actual performance in an assessment task? Widdowson recommends that we should not design tests based on a psycholinguistically conceived notion of competence that resides in learners. In other words, we should not see knowledge and skills as static concepts existing mainly in the learner's mind. Instead, we should conceptualize knowledge and skills as dynamic, ever-changing and shaped in social interactions and the conditions of the test design. (This resonates with Lemke (1990)'s critique of the mentalist model of learning.) The theoretical construct or concept of 'knowing a language'—and by implication being able to use language to interpret and communicate content—would be more fruitfully expressed in terms of a 'meaning potential', a notion that Widdowson has adopted from Halliday's meaning-oriented systemic functional theory of language (SFL). A dynamic model of language proficiency has thus been hinted at in Widdowson's (2001) discussion and it has been further developed and elaborated in Mahboob and Dutcher's (2014) recent work on the *Dynamic Approach to Language Proficiency* (DALP) model. Below we shall outline the DALP model and discuss how this model can inform future research on CLIL assessment.

Building on language variation research (World Englishes and English as a Lingua Franca) and systemic functional linguistics, the DALP model argues that being proficient in a language means that 'we are sensitive to the setting of the communicative event, and have the ability to select, adapt, negotiate, and use a range of linguistic resources that are appropriate in the context' and that 'this proficiency in language changes in a nonlinear fashion as our familiarity with diverse settings and contexts increases, and our repertoire of linguistic resources and strategies expands' (Mahboob and Dutcher 2014, p. 117). The DALP model

conceptualizes a person's language proficiency in terms of his/her position along two dimensions: (i) the dimension of familiarity with and control of the language resources (including genres, registers and lexico-grammatical resources) required in specific contexts of communication, and (ii) the dimension of familiarity with the experience required in a field of communication. These two dimensions are analogous to the two dimensions in the model of CLIL assessment developed by Lo and Lin (2014): (i) the cognitive/content demands of a CLIL assessment task, and (ii) the language demands of a CLIL assessment task (see Chap. 6). Before we discuss further the application of the DALP model in CLIL assessment, let us learn more about the DALP model.

In the DALP model, the two dimensions or clines intersect to form four *zones of proficiency* (see Fig. 9.1). A person is said to be in a zone of expertise if he/she can communicate in the context using appropriate language resources required in the context. For example, my friend Peter is a marine biology research student in the Chinese University of Hong Kong. As part of his academic training, he regularly needs to present his research in English (his L2) in front of an audience in his field (content domain). On one occasion he used the appropriate genre, register, and lexico-grammatical resources to present his scientific report on the impact of the degradation of Hong Kong's sea waters on coral growth in areas near Sharp Island, Tai Chau and Shelter Island, all within Port Shelter in Sai Kung, Hong Kong. He did a good job in his presentation and thus he can be said to be a proficient 'local' in such a situation. Similarly, using the Lo and Lin (2014) CLIL assessment framework (see Chap. 6), he can be said to be performing well in the most challenging kind of CLIL task (i.e. at the level of 'Analysis' on the dimension of cognitive/content demands and at the level of 'Text' on the dimension of language demands). However, if Peter needs to expand his research area to include the impact of land reclamation works on the habits of the Chinese White Dolphins in the North Lantau area in Hong Kong, he would be travelling into the *zone of expanding experience* (see Fig. 9.1). While he needs to pick up more vocabulary specific to the field of the habitats of the Chinese White Dolphins and the field of land reclamation, he can still rely on his knowledge and command of the scientific report genre and register in the field of marine biology. He can be said to be a 'visitor' in the *zone of expanding experience* in the DALP model.

Application Scenario 9.1

Imagine that Peter, the research student in marine biology, has been selected as the Chairman of the Marine Biology Society in the university. He has been invited to give a talk to the general public by the World Wide Fund of Hong Kong to raise the public's awareness on the impact of degradation of waters on coral growth in Hong Kong. He needs to draft a speech that will be accessible to the layman who does not have any knowledge of marine biology. Even more challenging is the fact that he needs to deliver this speech in Cantonese, the everyday local language of most people in Hong Kong (although he has been doing his studies in marine biology in the medium of

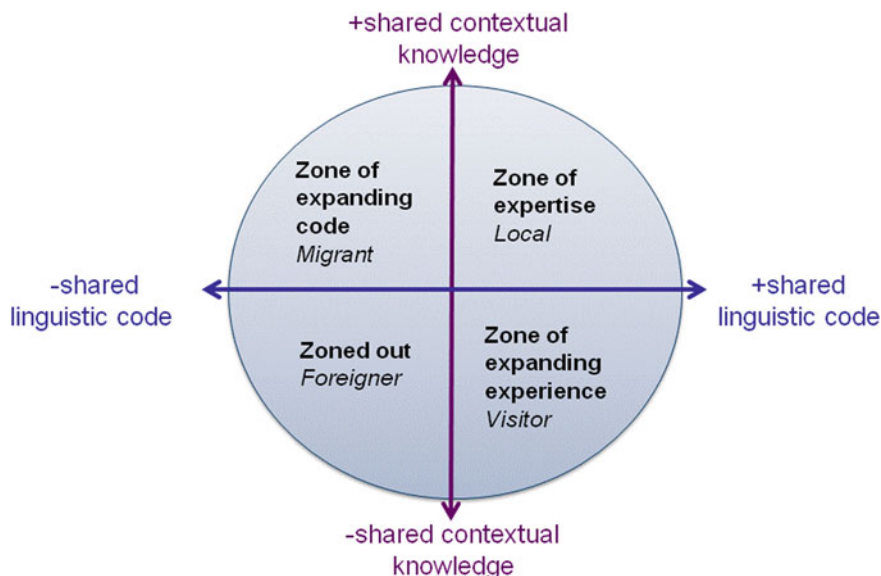


Fig. 9.1 Zones and metaphors of the DALP model (From Mahboob and Dutcher 2014, p. 126; reproduced by permission of Springer)

English in the university all along). Which zone of the DALP model do you think he is venturing into (see Fig. 9.1)? What kind of linguistic knowledge and skills (e.g. in terms of genre, register, vocabulary and sentence patterns) does he need to further develop in order to do well in this task?

Continuing our hypothetical example of Peter to illustrate the DALP model, let us consider Peter's situation in which he has been invited by his fellow students to represent the Association of Postgraduate Students in his university to petition to the University Council about a recent raise in the tuition fees of research study programmes. He needs to prepare a petition paper to submit to the Council and also to present their case in an upcoming Council meeting. Which zone do you think he is venturing into in the DALP model? It seems that he would be travelling into a very new zone where he is a 'foreigner' (see Fig. 9.1) as he has never attended any university Council meetings before; nor has he had any experience in writing petition papers. He has thus decided to seek help from the Chairman of the Academic Staff Association of the university, who is a Council member and who has had experience of writing and presenting petition papers in Council meetings.

In the example of Peter's experience in navigating different content-and-language-integrated communicative tasks, we can see that a person's *zone of proficiency* (in the DALP model) can change in a nonlinear fashion depending on his or her knowledge of the language resources (including knowledge of the specific

genre, register, vocabulary and grammatical patterns related to the particular field or content area) and/or contextual features of a situation. A student who is comfortable in a certain CLIL task can venture into the *zone of expanding experience* (along the dimension of content knowledge or field-specific experience) or the *zone of expanding code* or ‘zone of expanding linguistic resources’ (along the dimension of linguistic demands or familiarity with the specific genre, register and lexico-grammatical resources related to a particular field or content area).

The combined insights of the DALP model (Mahboob and Dutcher 2014) and Byrnes (2008) in drawing on a functional linguistics model to design assessment in L2 education contexts are useful to us in LAC/CLIL research. Their work implies that researchers should focus on identifying salient features of academic language in *functional* terms. For example, in formal academic writing to express the causal relationship between two phenomena, we usually use the sentence pattern: X has an impact on Y, where both X and Y are complex nominalized groups (see Chap. 3 for discussion on nominalization processes in academic genres) (e.g. ‘Degradation of sea waters has a negative impact on coral growth’). In this way, test designers in CLIL can generate descriptions of the likelihood (or probability patterns) of certain language features being used for expressing certain academic functions in a particular content area.

For example, such a description can go like this: ‘Language pattern X is likely to be used for expressing meanings/functions such as Y in content area Z’. Applied to our example of Peter, the description will be: the language pattern, ‘X has an impact on Y’ (where X and Y are complex nominalized groups used to construe processes involved in marine biology) is likely to be used to express causal relationships in the content domain of marine biology. The nominalized processes involved are: (i) the growth rate of coral (coral grows at a certain rate → the coral growth rate), and (ii) the degradation of waters (waters are degraded → the degradation of waters). In this way, CLIL assessment researchers can develop a systematic, empirical way of explicitly linking *form* (e.g. the sentence pattern and the nominalized groups) and *meaning* (e.g. to express causal relationship between two phenomena which are processes in marine biology), or *language* and *content*. Test designers in CLIL can then design their assessment criteria descriptors or rubrics based on these descriptions that link form to meaning in a specific field (i.e., linking language features to subject content).

Such attempts in linking form to meaning, or language patterns to subject content, have been pioneered in the Sydney School of Genre Analysis (Rothery 1996; Martin and Rose 2008; Rose and Martin 2012; see Chap. 3). Their research has uncovered systematic relationships between those content-oriented social (and school) activities and language forms at all levels of the language system, from the textual (genre structure) level to the lexico-grammatical level (vocabulary, sentence patterns; see discussion on the Genre Egg in Chap. 3). Specifically, the notions of register and genre can provide meaning-oriented, rather than just sentence grammar-oriented ways of analysing language use in academic content settings. In other words, grammar or language features are seen as resources for constructing specific content meanings rather than as isolated linguistic knowledge divorced

from the act of meaning-making. For example, Rothery (1996) and Martin and Rose (2008) have analysed the language features of different school genres in the sciences, history and English, differentiating major genre types (or text types) and their associated lexico-grammatical features for different content areas. Byrnes (2008) has thus concluded that such a theory is well suited to support a principled approach to the assessment of content in L2 contexts. Byrnes' conclusion is akin to our discussion in Chap. 3 of the Genre Egg, which provides a framework and meta-language to conceptualize and talk about different levels of language features (e.g. at the discourse, sentence and lexico-grammatical level) which are resources for expressing/construing-specific academic meanings and functions.

How can we apply a functional theory of language and genre analysis in the design of CLIL assessment? We can draw on three interrelated criterial areas proposed by Byrnes (2008):

Task performance was expressed through breadth of obligatory and optional genre moves; *task content* was conceptualised in terms of depth of information provided in each of these moves; and the nature of *task language* was conceptualised as the quality of language use at the discourse, sentence, and lexico-grammatical level in line with genre expectations. (p. 45; italics added)

'Criterial areas' refer to the areas of assessment that require the development of explicit criteria and rubrics. This assessment approach is exemplified in the curricular project *Developing Multiple Literacies* in the German Department at Georgetown University (see Byrnes et al. 2006). In this project, the professor-researchers developed elaborate rubrics or criterial statements about the salient language features in genres that instantiate (or express the meaning in) the content areas within its integrated genre-based and task-oriented curriculum. For example, in the final writing assignment of the course, students are required to prepare the script of a speech to be delivered at a German Rotary Club meeting. Students are required to argue about the comparability between federalist- and state-oriented tendencies in the creation of the US constitution and similar issues in the creation of the European Union (EU) constitution. Assessment guidelines and rubrics for content include statements about the need to establish the reasons for their stance regarding comparability in the first place, to present 3–5 specific areas that explicate that stance by comparing the situation in the young USA with that in the current EU. These should be supported by quotes from four previously read texts, and to offer concluding recommendations that might sensibly and sensitively be made by an American guest speaker. When the assessment task is designed in this way, assessment of content is simultaneously and explicitly linked to patterns and features of language that are appropriate for the genre and register that is used in performing the task in the content area.

The above project is akin to Liu et al.'s (2014) approach to helping English as an additional language (EAL) students in Hong Kong to prepare for the Diploma of Secondary Education (DSE) Liberal Studies examination. DSE is a high-stakes examination in Hong Kong and secondary school students need to do well in this examination in order to be considered for university admissions. Liberal Studies (LS) is one of the four core subjects in this examination. Around 10 % of Hong Kong

students have chosen to do the LS examination in the medium of English. Liu et al. (2014) *integrated* content and language guidelines help to scaffold EAL students in formulating essay responses to LS examination questions. In the absence of a systematic specification of the kind of language resources that L2 learners will need to write and interpret texts in specific content areas (e.g. Liberal Studies), teachers and assessment specialists most likely will continue to find it difficult to develop appropriate forms of assessing content knowledge in an L2. The pioneering work of Liu et al. (2014) is important in identifying and specifying both content criteria and language criteria (or resources) in the LS subject assessment tasks. This kind of work will inform our future work in designing CLIL assessment in different content areas.

Further developing the theoretical groundwork on conceptualizing the linking of content and language is thus an important area for future research on CLIL assessment. For the precise description of language patterns, we have in the research literature a well-developed framework (e.g. the Genre Egg framework based on the Sydney School of genre theories; see Chap. 3). However, for the precise description of content, we still need to develop a theoretical framework to enable us to describe units of meaning in specific content areas. And most importantly we need an integrative framework that can further enable us to link up specific language patterns that are related to specific units of meaning. For instance, what does it mean *in theoretical terms* to specify content and language criterial statements in a CLIL task? This leads us to the consideration of future work that is needed in the theory of thematic patterns (Lemke 1990) and cognitive discourse functions (Dalton-Puffer 2013). These seem to be promising directions of research on the issues of how to conceptualize the relationship between language and content and specifically, how to describe units of meaning in conjunction with specific language patterns that are part and parcel of these units of meaning (i.e. a framework that can handle the integration of content meaning and language form).

9.2 Thematic Patterns and Cognitive Discourse Functions

In this section, I shall first introduce the key notion of ‘thematic pattern’ from Jay Lemke (1990) and then the notion of ‘cognitive discourse functions’ (CDF) from Dalton-Puffer (2013). Then the gaps in the research on how to conceptualize integration of content and language pedagogies across the curriculum will be discussed and future directions of research outlined.

Thematic patterns refer to ‘the patterns of connections among the meanings of words in a particular field’ of human activity (Lemke 1990, p. 12). The language of each specialized field of human activity has its own unique semantic patterns, or patterns of meaning. The content of the field of science, for instance, is constituted by the thematic patterns of language use in this field. To illustrate this, we can look at the content of science under the topic of ‘elements’. To learn the content under this topic, students need to master the semantic relationships in a thematic pattern such as the following (Lemke 1990):

- an element [has] number [of] electrons
- electrons [are located in] orbitals

Each field of content is thus made up of patterns of patterns (i.e. thematic patterns made up of semantic patterns). To learn the content of a field involves learning to comprehend (e.g. read and understand) and express (e.g. write and talk about) these thematic patterns. The resources useful in communicating these patterns can be linguistic and/or multimodal (e.g. visuals, gestures, diagrams, flow charts, symbols and equations). In communicating the content of junior secondary science and mathematics subjects, one might argue that there can be less language and more multimodalities used. However, in communicating the content of senior level science or humanities subjects, language is still the primary semiotic resource.

Traditional science pedagogy (and in general, content pedagogy), however, tends to privilege the notion of ‘concepts’ and views mastery of science chiefly as mastery of science concepts. However, concepts are mediated by discourse and Lemke argues that the mentalism underlying traditional science pedagogy is not helpful as it tends to ignore the role that language and thematic patterns play in the teaching and learning of science or any subject:

I will argue... that for the most part ‘concepts’ are just thematic items and their customary semantic relationships, that is, they are just bits of thematic patterns. We never use them one at a time; their usefulness comes from their connections to one another. So it is really the thematic patterns that we need and use. Purely ‘mental’ notions of what a concept is tend to mystify how we talk and reason. They ignore the essential role of language and semantics in teaching and learning *any* subject. (Lemke 1990, p. 91; italics original)

Lemke argues that what science teachers typically do in the classroom is in fact exposing students repeatedly to the thematic patterns of science. To illustrate this, let us look at an example from Lemke (1990, p. 88, italics original):

[March 19:]

Teacher: What happened was, more than likely is, the crust was pushed up. OK, and when we say the crust was pushed up, we say that it’s *uplifted*. And that’s why we find these marine fossils up on high mountaintops.

[March 20:]

Teacher: I’d like to go on with what we were talking about. And we were talking about *fossils*, that are used as *evidence*, that the earth’s crust has been moved. Now what did we say about these fossils, how do they help us... *know* that, uh, the earth’s crust has been moved?

Student: Like, if y’ find, *fish* fossils on top of a mountain, you know that once there was water... up there, ‘n the land *moved* or somethin’.

Teacher: OK, and what else besides....

In terms of science content, these two examples have only two words in common: *crust* and *fossils*. However, as Lemke delineates, the above two lesson excerpts have at least three more *thematic items* in common: MOVED (pushed up, uplifted and moved), MARINE (marine, fish), and HEIGHTS (high, mountaintops

and top of a mountain), apart from CRUST (earth's crust, land) and FOSSILS. Among these five thematic items, the two lesson excerpts construct the same semantic relations:

CRUST—medium/process—MOVED

MARINE—classifier/thing—FOSSILS

FOSSILS—location—HEIGHTS

These individual semantic relationships are further joined to each other to make up a full thematic pattern in each of the two lesson excerpts:

[MARINE—classifier/thing—FOSSILS]—location—HEIGHTS

&

CRUST—medium/process—MOVED

The above two sets of thematic units are made to relate to each other in a specific way to form a logical argument: *Evidence/Conclusion* (this is akin to Dalton-Puffer's notion of 'cognitive discourse function'; more on this later). With this example and many others, Lemke (1990) shows that mastery of a subject entails mastery of the thematic items and their semantic relationships (i.e. thematic patterns) which constitute the discourses specific to the subject.

Lemke's seminal work on thematic patterns (1990), however, has not been further elaborated in subsequent research in science content and language-integrated education. It is almost three decades later when Dalton-Puffer (2013) introduces the notion of 'cognitive discourse function' which has the potential to serve as a unit of analysis to map out the generic academic language functions that learners are required to perform across different content curriculum areas.

As Lemke (1990) points out, learning to do science means learning to do 'observing, comparing, classifying, analysing, discussing, hypothesising, theorising, questioning, challenging, arguing, designing experiments, following procedures, judging, evaluating, deciding, concluding, generalising, reporting, writing, lecturing, and teaching *in and through the language of science*' (Lemke 1990, p. ix, italics added). Teaching science in the classroom is thus in a sense analogous to engaging students in performing what Dalton-Puffer (2013) has called *cognitive discourse functions* (CDF). For instance, the above logical relationship of Evidence/Conclusion, into which students need to learn to sequence the different thematic units, is close to Dalton-Puffer's (2013) cognitive discourse function of *doing explaining*: i.e. I'm providing reasons for or cause/s of something. In the above example, the students need to learn to give evidence (that deep-water marine fossils are found in high-altitude locations) for arriving at the conclusion (that the earth crust has been uplifted at some point in the past). Among the CDFs proposed by Dalton-Puffer (2013), we can find familiar functions such as 'classify', 'define', 'evaluate', 'report' (p. 234). The interested reader can refer to Dalton-Puffer's taxonomy of CDFs and the communicative intentions associated with the CDFs in her article (2013).

From Lemke (1990) to Dalton-Puffer (2013), there has been a growing recognition among education scholars that mastery of the content of a discipline is in large part mastery of the discipline's specific ways of using language, or discipline-specific discourses. Here, 'discourse' is understood in the sense of not just ways of talking but also ways of thinking, reasoning, explaining, arguing, evaluating, etc. While CDFs are proposed as generic to different disciplines, the specific ways in which CDFs are performed in a discipline are shaped by the discipline-specific thematic patterns. For instance, the ways a historian argues and reasons will not be the same as the ways a scientist argues and reasons although there can be some generic overlap (e.g. the use of generic logical relational patterns such as Evidence/Conclusion). The ways in which generic CDFs are realized by discipline/content topic-specific thematic patterns will, therefore, need to be a key area for future research. The findings can inform LAC/CLIL curriculum planning and mapping; e.g. what are the generic functions that can be mapped across different subject areas, and what are the subject-specific thematic units and thematic patterns that need to be mastered in particular subjects, and the interplay between these two (generic and specific) dimensions and how to scaffold the learning of both. This brings us to the following discussion on the role of L1 and multimodalities in scaffolding students' learning in CLIL lessons.

9.3 Languageing, Translanguaging, and Trans-semiotizing in Scaffolding CLIL

Suppose future research can provide us with more information on the generic cognitive discourse functions and their specific realizations in content subject areas as well as how they interplay and interrelate with content specific thematic patterns. While detailed descriptions of these functions and patterns will inform us in LAC/CLIL syllabus design and curriculum mapping, we are still left with the task of designing classroom and curriculum scaffolding strategies that will raise students' awareness of these functions and patterns. That is, we need research on classroom processes and pedagogical strategies that will scaffold the mastery of CDFs and subject-/topic-specific thematic patterns. While the teacher can make use of more or less monologic (e.g. teacher expositions/lecturing) or dialogic pedagogical strategies (e.g. student debates, student inquiry projects, pair/group work and teacher-student dialogue), as Lemke (1990) points out, teaching a content subject ultimately entails enabling students to make meaning using those thematic items (e.g. subject-specific words, phrases made to relate to each other in a certain semantic relationship) in subject-specific thematic patterns (e.g. what counts as evidence to a certain conclusion).

Lemke's argument echoes the sociocultural turn in education starting from the 1970s with the growing influence of Vygotskian theories of language, thinking and learning (Vygotsky 1978, 1986). In the field of language education and Content and

Language Integrated Learning (CLIL), the sociocultural turn has led to keen insight into how one learns and constructs meaning (i.e. what is commonly called ‘ideas’, ‘concepts’) *through language*. This is captured in the notion of *linguaging*; as Swain and Lapkin (2013) delineate:

When one *linguages*, 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 and Lapkin 2013, p. 105; italics added)

... linguaging, in the form of collaborative dialogue or private speech, constitutes part of the process of formulating the idea; it mediates the formulation of the idea. Indeed, it is when language is used to mediate conceptualisation and problem-solving, whether that conceptualisation or problem-solving is about language-related issues or science issues or mathematical ones, that linguaging takes place. (Swain and Lapkin 2013, pp. 106–7)

Much of what (especially L2) students are required to do in the classroom, however, might just involve mouthing or reciting/reproducing (L2) subject-specific wordings in worksheets or test/examination items without much linguaging taking place. Here we can achieve a deeper understanding of the processes of linguaging (in the same language) and translanguaging (across languages, e.g. L1, L2; see García and Li 2014) in the light of Lemke’s notion of thematic patterns and the wordings that mediate these patterns. In order for CLIL students to understand ‘concepts’, instead of merely reciting/mouthing L2 wordings that mediate these concepts, students need to have a chance to: (i) relate the new thematic patterns (that mediate the new concepts) to their existing thematic patterns (that mediate the concepts they already know or familiar with) and, (ii) to realize that the everyday (e.g. L1) wordings that they already know can be used to mediate these new concepts while at the same time learning new academic (L2) wordings to mediate these new concepts so as to speak/write like a content specialist (e.g. a scientist, a historian and a social scientist). Let us illustrate these with the following example on how to teach the concept of classification of living things by explicitly making connections between the new academic wordings (which mediate the thematic pattern) of the academic concept and the familiar everyday (L1) wordings (which mediate the thematic pattern) of the students’ existing concepts. This example is drawn from the work of my colleague, Dr. Maurice Cheng, who is a science educator.

Maurice Cheng (2015) mentions two models of science concept teaching. One model can be called the ‘empty-bucket’ model (Nuttall 1996) which assumes that the student’s mind is like an empty bucket and it is the job of the teacher to ‘pour’ new concepts into their minds. Under this model, for instance, if a teacher is to teach the concept of mammals, the teacher will introduce this concept like this:

T: Today we’ll talk about mammals. The features of mammals are: (a) having hair, and (b) having mammalian glands.

Students are then likely to just rote memorize these features of mammals as isolated, compartmentalized pieces of information and reproduce them to answer test/examination questions. However, if we adopt the second model which does not assume the students' minds as empty buckets, then we shall first activate students' existing knowledge and concepts (i.e. thematic patterns) and then relate these existing concepts to the new academic concept. For instance, students are likely to have an everyday concept (thematic pattern) of 'animals' with familiar examples of cats, dogs and pigs and the teacher can introduce the topic as follows:

T: Cats, dogs, and pigs are different animals, right? But in science these different animals are all called mammals. Why? What do they have in common? What do mammals have in common? They all have hair, right? Besides hair, what do they have in common? The females of cats, dogs, and pigs all have mammalian glands (Teacher showing pictures of examples of mammalian glands on the power-point slides). So, these are the two features of mammals: having hair and having mammalian glands. All mammals have these two features. So, can you give me more examples of mammals?

Cheng (2015) shows that in this way the teacher can start *not* with the new concept but with students' existing concepts and then proceeds to relate the new academic concept to students' prior concepts so that students can form a coherent pattern of information by connecting new information with known information. Notice how the teacher does this by doing what Lemke (1990) has called 'translation practice' (see Chap. 8), by saying, 'But in science, these... are all called...'. This also seems to be what Swain and Lapkin (2013) are focusing on when they use the notion of 'linguaging'—i.e. using language to mediate the formation of conceptual knowledge. If students are not given a chance to connect prior conceptual knowledge, which is likely to be mediated in their everyday language (including L1) to new academic conceptual knowledge, which is mediated in subject-specific academic language (e.g. L2 academic language), then students are likely to be reduced to just parroting or rote memorizing the formal academic wordings without actually doing languaging (i.e. without doing the conceptualizing work that is essential to learning).

García and Li (2014) further elaborate the notion of 'translanguaging' and the ways in which it is essential to learning for bilingual learners. Their work both resonates with and further develops the theorizing of Swain and Lapkin (2013) by highlighting the need for bilingual learners to do translanguaging if these learners (e.g. with a well-developed L1) are to connect new L2 academic knowledge to their existing (L1) knowledge. In the same vein, I have developed the notion of *trans-semiotizing* (Lin 2015b) to expand the notion of 'linguaging' to 'semiotizing' in order to cover the use of multimodalities or multiple semiotics (meaning-making systems including languages, visuals, gestures, diagrams, etc.) to do the conceptualizing work of learning and to expand the meaning-making/communicative repertoires of learners (see the 'Rainbow Diagram' in Fig. 5.12 in Chap. 5). This is also what Gibbons (2009) refers to as 'message abundance' (p. 156) by encouraging content teachers to use multiple channels or mediums (i.e. multiple semiotics or multimodalities) to communicate content to their L2/EAL students (see Chap. 5). While all these are very useful principles for scaffolding, how they are actually

realized in LAC/CLIL contexts with basic-L2-proficiency learners (e.g. EAL learners) and what are the challenges involved remains an important area for future research. Of particular interest is the need to have more research on designed scaffolding (Gibbons 2009) in planning both the written CLIL lesson materials and the CLIL spoken curriculum genre, for instance, the pioneering work of Laupenmühlen (2012) in planned scaffolding of CLIL through designing the functional interplay of L1 and L2 in different stages and phases of the curriculum genre (see also the Multimodalities–Entextualization Cycle in Fig. 5.15 in Chap. 5). However, much more research is needed to find out in more detail how to do both designed and spontaneous scaffolding in different subject areas in order to reveal the possible variation of scaffolding strategies and principles across different disciplines (e.g. in what ways trans-semiotizing scaffolding in mathematics will be different from that in history, geography, biology, chemistry, physics, etc.).

Also, in terms of evidence-based research we still have much more to do, as Swain and Lapkin (2013) point out:

...we need to extend the research conducted in immersion classes. ... It is clear that the L1 is used for languaging both cognition and affect, but what is the impact of this L1 languaging on L2 development? We need both qualitative and quantitative studies, descriptive and experimental studies that focus on this issue (pp. 123–124).

Future research would thus benefit from the following considerations:

1. Do not focus on analysing the isolated functions of naturally occurring instances of classroom spoken L1 alone (as most studies in the literature have done so far; see review in Lin 2013a); focus on studying the possible impact of systematically planning the functional use of both L1 and L2 (e.g. both everyday and academic registers; both spoken and written) as well as multimodalities in the different stages and phases of a designed curriculum genre (e.g. the teaching/learning cycle, the Reading to Learn Cycle, or the Multimodalities/Entextualization Cycle; see Chap. 5); design empirical studies that can generate evidence connecting this systematic planning to the development of content knowledge, L1 academic language as well as L2 academic language.
2. Consider other important factors mediating the role of L1 in CLIL, in particular: the age and degree of cognitive maturity, and the level of L1 academic literacy of the students; e.g. the role of L1 might be greater in secondary and tertiary CLIL classes than in kindergarten or primary CLIL classes and might be greater with students with some foundation in L1 academic literacy; however, these are all empirical questions to be investigated.
3. Adopt interdisciplinary approaches—we need to be ‘disciplinary plurilinguals’ (Lin 2013a, p. 14) in order to develop evidence-based approaches to researching the role of translanguaging and trans-semiotizing in CLIL. There have been much more qualitative than quantitative studies in the existing literature but we need both kinds of approaches in the same study.
4. Promote more practitioner research—In the existing literature on LAC, CLIL and academic literacies, while there is some researcher-practitioner collaborative

research (e.g. Harders and Macken-Horarik 2008) there is very little practitioner-led research. It would be important for teachers involved in LAC, CLIL and academic literacies to take an active role in researching their own context and work.

However, all this work cannot have its full impact if teachers do not change their identities to embrace the new dual roles (as both content teacher and academic language teacher) for them in LAC/CLIL contexts. In the next section, we shall discuss this in more detail.

9.4 CLIL Pedagogical Content Knowledge (PCK) and Teacher Identity Change

Shulman (1986, 1987) has conceptualized the sources of teacher knowledge and drawn our attention to the processes of teachers' pedagogical reasoning and action. According to Shulman, the teacher knowledge base consists of the following categories:

- content knowledge,
- general pedagogical knowledge,
- pedagogical content knowledge,
- curriculum knowledge,
- knowledge of educational contexts,
- knowledge of learners, as well as
- knowledge of educational ends, purposes, and values, and their philosophical and historical grounds.

Among these different categories of the teacher knowledge base, Shulman (1986) highlights the most distinctive category—pedagogical content knowledge (PCK), which he elaborates as subject matter knowledge for teaching, the particular form of content knowledge that is most relevant to its teachability. In sum, PCK refers to 'ways of representing and formulating the subject that make it comprehensible to others' (Shulman 1986: p. 9). It is the effective representation of content knowledge to students. In CLIL contexts, where content is taught in the L2 of the students, what are the ways of representing and formulating the subject content that will make it comprehensible to students become the most important overarching research question.

A teacher's PCK may include useful alternative forms of representation including analogies, examples, illustrations, explanations and demonstrations, which may derive from either research findings or the teacher's experience and practice. In CLIL teaching contexts, it will involve multimodalities, everyday registers and academic registers, L1 and L2 resources, etc. (see the 'Rainbow Diagram' for bridging pedagogies in Fig. 5.12 in Chap. 5). However, this goal of representing/formulating content in ways that make the content interesting and

comprehensible to L2 students will necessarily involve the integration of both content teaching methodology and second/foreign language teaching methodology (i.e. integration of discipline-specific content pedagogy and L2 pedagogy). While there has been a well-established literature on teacher PCK, the research on CLIL teachers' PCK is just beginning (Lin et al. 2013). Traditional PCK research focuses on the interplay and integration of content knowledge and content teaching approaches, leaving out the focus on the language(s) of teaching and learning in a particular subject area (but see Lemke 2002). Of particular interest in CLIL teacher PCK research is also the interplay between teacher identity transformation and change in the CLIL teacher's PCK. Lin et al. (2013) have outlined some important research questions in this area of research as follows:

1. What is the nature of the teacher knowledge base (i.e. PCK) required in CLIL teaching? How do different categories of the teacher knowledge base interact and interrelate during CLIL teaching?
2. How does the content teacher's PCK shape (and is shaped by) the transformation of teacher identity (e.g. transforming from a content teacher identity to a CLIL teacher identity)?
3. What's the driving force behind teachers who work for transformation of their PCK? How can this agency of teachers be explored?
4. What role does teacher education play in developing the CLIL teacher's PCK?

For instance, to answer research question (1), we need to analyse the interplay and intertwining of the thematic development strategies and social interactional strategies (Lemke 1990) that are skillfully employed by successful CLIL teachers in different subject areas (e.g. any differences in the use of these strategies across different disciplines?). How are these strategies acquired or developed as part of the CLIL teacher's knowledge base? Would these strategies in some contexts conflict with each other and how can they be reconciled; e.g. would teachers overly concerned with involving students via daily life examples and everyday language lose lesson time to develop the academic thematic patterns mediated in technical language? How can these two concerns be balanced/integrated in actual classroom practice? How can CLIL teacher preparation courses include these strategies (and their potential conflict, their balancing and integration) as part of the CLIL teacher's knowledge base? How does content teacher education differ from second/foreign (L2) language teacher education and how do these two differ, in turn, from CLIL teacher education? How can CLIL teacher education courses integrate (or reconcile the potential conflict between) content pedagogy and L2 pedagogy? For instance, would the inquiry-based pedagogy of the science subjects conflict with the detailed reading approach (Rose & Martin 2012)? If yes, under what kinds of conditions? If no, under what other kinds of conditions? All these require systematic careful studies guided by both theory and practice in the integration of content teaching and language teaching.

9.5 Looking Ahead

In the above sections, we have briefly reviewed the existing literature and pointed out some areas in which further research work is needed. While immersion education has been around for over half a century, research in immersion education has traditionally focused on measuring the outcomes of immersion and has been successful in proving that if given the right kinds of conditions, immersion approaches can provide efficient ways of achieving both content learning and L2 learning (see review in Lin and Man 2009). Recently, however, there has been increasing research attention paid to the issue of how to *integrate* or *balance* content teaching with language teaching (e.g. Lyster 2007; Cammarata and Tedick 2012; Dalton-Puffer 2007; Nikula et al. 2013). The trends in the research studies on immersion, LAC and CLIL thus seem to be converging—i.e. researchers are devoting more attention to the key issue of *integration* in different aspects: e.g. design of assessment tasks for learning, teaching strategies that integrate scaffolding of both academic content learning and academic language learning, design of curriculum genres that integrate both multimodal and linguistic scaffolding, design of teacher education programmes that facilitate integration of teacher identities (i.e. CLIL teacher as both academic content and academic language teacher) and the interplay and integration of different components of the pedagogical content knowledge of CLIL teachers.

In conducting research in these different new areas, we can fruitfully draw on the theoretical and analytical resources in existing research areas such as systemic functional linguistics (Halliday 1993, 2004; Halliday and Hasan 1976; Halliday and Martin 1993), discipline-specific pedagogies (e.g. McDiarmid et al. 1989; Staver 1998; Ball and Bass 2000; Mortimer and Scott 2003), second/foreign language (L2) pedagogies (e.g. Bygate et al. 2013), sociocultural theories of scaffolding (e.g. Swain and Lapkin 2013), assessment for/as learning (e.g. Carless 2005, 2011) and teacher PCK research (e.g. Shulman 1986, 1987; Tsui 2003). However, as LAC and CLIL teaching contexts constantly present new challenges, these existing theories need to be expanded and enriched when applied to these new challenging contexts *without guarantees* of analytical success, and new theories will need to be generated based on old ones. There is a Chinese idiom which goes like this: ‘Moze shitou guo he’. It can be translated roughly as: ‘Crossing the river by paving one stone to the next’. In short, although we do not have a fully complete knowledge base (e.g. a well-built bridge to cross the river) yet, we can all work towards building and enriching this knowledge base through joining efforts and sharing and enriching our experience and theorizing based on research studies in LAC and CLIL in the years to come.

Note:

1. In this chapter, the acronym ‘CLIL’ is used in a general sense as an umbrella term to refer to any educational and curricular contexts where there is a general need to integrate content learning with language learning.

Chapter Summary Points

- Using the Dynamic Approach to Language Proficiency (DALP) Model to link form (language) and meaning (content) in designing assessment tasks in LAC/CLIL contexts
- Thematic patterns, generic cognitive discourse functions; thematic development strategies and social interactional strategies in content delivery in the classroom
- The sociocultural turn, languaging, translanguaging and trans-semiotizing in LAC/CLIL classrooms in multilingual settings
- Developing the pedagogical content knowledge (PCK) base for LAC/CLIL teacher preparation.

End-of-Chapter Discussion Questions

1. How can Lemke's (1990) 'thematic patterns' be fruitfully linked to the new framework of cognitive discourse functions (CDFs) proposed by Dalton-Puffer (2013)? And how would this integrated framework inform research on assessment in CLIL?
2. What are the limitations of 'mentalism'? Why is a sociocultural turn needed for understanding meaning-making, languaging, translanguaging and trans-semiotizing?
3. Has this chapter given you any idea of what kind of research you can conduct in your own context to contribute to the theory/practice of LAC and CLIL?
4. Does the DALP model imply that one is considered 'proficient' in a language only if he/she is able to perform communicative tasks well in all the four zones? In other words, how shall we assess the 'overall' or 'general' language performance of Peter? Or, does the DALP model challenge us to revamp our traditional definition of 'general proficiency'?

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