Angel M.Y. Lin

Language Across the Curriculum & CLIL in English as an Additional Language (EAL) Contexts

Theory and Practice

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Angel M.Y. Lin
Faculty of Education
The University of Hong Kong
Hong Kong
Hong Kong

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In memory of Mr. Alistair Lawrence
of the Sarasas Ektra Bilingual School,
Thailand. He was a dedicated teacher
and school administrator, much loved
by his colleagues and friends,
and an inspiration to us all.

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Contents

Chapter 1
Introduction

Chapter Overview
In this chapter, the background, aims and objectives of the book are introduced. Different research traditions in Language Across the Curriculum (LAC) and related areas are outlined, and their terminologies are explained. The organization of the book and how the book can be used are also explained.

1.1 Introduction

Language Across the Curriculum (LAC) and Content and Language Integrated Learning (CLIL) constitute rapidly growing areas of both research and practice in many parts of the world, especially in Asia, Australia and Europe. In recent years, LAC and CLIL are gaining intense attention particularly in contexts where English is learnt as a foreign language or as an additional language (EAL). The global spread of English has arisen from a whole host of historical, political and socio-economic factors. Many Asian societies, with their respective socio-economic contexts, are often infused with a desire for development, modernity and human resource capital for successful participation in the new global economic order. Such capital often includes English with respect to information communication technology, international business and commercial know-how, and science and technology, and very often English comes in a package with all these desirable 'goodies', or is (mis-)recognized (see discussion in Chap. 8) as an indispensable medium for bringing in and acquiring these 'good things'. How to enable students to cross the English divide—how to make English linguistic capital accessible to most of the school population and how to spread English capital more evenly across different social sectors in society—has become important issues in research on

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language-in-education policy and practice. These concerns very often occupy priority places in national development agendas. For instance, in many Southeast Asian societies today, serious government attention is given to the option of using English medium education to promote the use and learning of English.

As a cluster of concepts and research studies first developed in Britain and Europe, respectively, LAC and CLIL have been expanded both in their theoretical conceptualizations and in their practice-oriented research to encompass the multifarious ways and contexts in which LAC and CLIL are being re/interpreted, adapted and extended in different contexts in recent years. This is particularly so in English as an additional language (EAL) contexts, where English is not the most familiar language (e.g. it is a second, third or foreign language) of the students and yet it is used as the medium of instruction in content lessons for these students. So far, however, there is no clear road map available and accessible to teachers, students, teacher educators and researchers who are often confronted with and confused by an array of related but slightly different concepts and terminologies arising from different research traditions. An initial road map can be found in Davidson and Williams (2001)'s article, which was written over ten years ago, and many new developments have taken place since. An updated road map which not only provides a summary of the recent developments in this area but also critically reviews and integrates theory and practice emerging in related areas is urgently needed given the rising trend to teach and learn content in an additional language at all levels (e.g. kindergarten, and primary, secondary and postsecondary levels), especially in EAL contexts in many parts of the world.

This road map, moreover, must be grounded in a comprehensive and in-depth review of the field and at the same time presented in a language that is accessible to teachers, school administrators, teacher educators, researchers and advanced undergraduate and postgraduate students including both language specialists and content specialists. Daunting as the task seems to be, a modest beginning was made when my colleagues and myself first started the master of education in Language Across the Curriculum (MEd-LAC) Programme at the University of Hong Kong in 2012. Having taught the MEd-LAC Programme for four years and having been confronted with the needs of students from diverse backgrounds: English teachers, science teachers, mathematics teachers, social studies teachers, as well colleagues who are non-language specialists but are teacher educators in the disciplines of science, mathematics and social studies, I feel that it is high time a book was written that critically reviews and integrates existing theories and research findings in this field (which encompasses both LAC and CLIL studies) and charts out a road map that points the way forward for future research and practice in various EAL contexts in the world.

The present book has thus arisen from an immediate and real need, which is expressed by my students, colleagues (who include both language and content teacher educators) and most of all from the communities that my colleagues and I have been serving. In interacting with teachers, school administrators, researchers and teacher educators, I was frequently given questions and requests for a comprehensive road map or 'book' where teachers, school administrators, government

language policy makers and teacher educators can refer to for a critical review of the field, some fresh insights into future directions of research and some practical tips on school-based LAC and CLIL practice. This book has thus aimed at contributing to the growing field that addresses the increasing interest in LAC and CLIL in EAL contexts such as Hong Kong, mainland China, Thailand, the Philippines, Taiwan, Malaysia, Japan, and Korea. In many of these places, my colleagues and I have been presenting papers, seminars and workshops, and exchanging research ideas with teachers, teacher educators and researchers working in these areas. Researchers and teachers working in EAL contexts in Europe, South America and Africa might also find the work relevant to them.

1.2 Aims and Organization

It is the aim of the book to offer a road map for the interested student and researcher in what appears to be a 'swampland' (borrowing a metaphor from Christiane Dalton-Puffer) in the fast burgeoning literature of diverse yet overlapping areas of research that can all bear on the work of teachers having to support students' learning content in a second, foreign or additional language, and very often in EAL. This book, in particular, aims at making two key contributions to the field. First, with its grounding in research in the past three decades in bilingual education, genre and register analysis, sociolinguistics, functional linguistics and sociocultural theories of language and literacy development, it seeks to critically review and integrate a diverse range of theories and disciplines to generate an accessible set of theoretical insights and principles that can inform teachers, students, parents, policy makers, researchers and teacher educators who are engaged in some form of work related to learning and teaching content in L2 or EAL. Second, the book is grounded in the concrete needs expressed by practitioners in front-line classrooms, school administrators, government policy makers, parents and students who need to tackle the day-to-day challenges and issues confronting them. These issues include how to facilitate the collaboration between content teachers and language teachers or between the content subject panels and the language panels, how to provide language support using a cross-curricular approach to students' learning content in an L2, how to design materials that offer that support, how to design classroom scaffolding strategies that address both the content and language learning needs of students, how to raise the language awareness of content teachers, how to raise the content awareness of language teachers, how to design appropriate ways of providing extra support in different school contexts (e.g. through adjunct language classes or through content and language integrated classes; through content-rich language classes or through language-rich content classes), how much of the academic language support should be made through explicit or implicit instruction, or through inductive, discovery or deductive explanatory approaches, how can assessment be designed to give due weight to both the language and content learning outcomes, what is the role of school leadership in facilitating a

whole-school approach in the provision of cross-curricular language support and how can parents be involved in this process.

There are no easy answers to these challenges, and the book does not promise to provide solutions to all of these urgent questions faced by the school communities and researchers. It is, however, the aim of this book to provide a systematic and critical review of the resources available in the diverse research literatures and to organize and present these resources in accessible language to researchers, practitioners, policy makers and school administrators to address their pressing needs.

This book thus aims to engage a wide readership regardless of whether they have a background in sociolinguistics, functional linguistics or genre theories. In fact, the book aims to forge an accessible '*metalanguage*' (i.e. a *language* to talk/think about language) that will be workable and usable for teachers and researchers from both language and content areas to facilitate collaboration across content and language subject panels. Chapters 2 and 3 aim to lay the theoretical foundation for this common metalanguage by critically reviewing and systematically presenting and integrating the most important theoretical resources that can inform teachers and researchers in this field. Chapters 4–7 focus on issues in pedagogy and assessment and in school-based approaches to LAC and CLIL and draw on both research studies and the experiences of front-line teachers and school administrators. Chapter 8 provides a critical reflexive angle on the field by posing difficult questions regarding how LAC and CLIL are often situated in contexts where there is inequality of access to the linguistic and cultural capitals, where the L1/local languages of the students are usually neglected or viewed unfavourably in relation to the L2 in mainstream society and where students and teachers are usually positioned as recipients of knowledge rather than makers of knowledge. Chapter 9 reviews the status quo with regard to research in the field and proposes directions for future inquiry.

1.3 A Note on Terminologies: Different Research Traditions

In the past four decades, many different terms have arisen in different research traditions and educational contexts where teachers and researchers are interested in exploring and researching ways of helping learners to *learn both language and content* at the same time. These terms include content-based instruction (CBI), immersion, sheltered instruction, LAC, Writing Across the Curriculum (WAC) and CLIL. Diverse as they might seem, they share a common interest in developing and researching programme models and pedagogical approaches involving (varying degrees of) integration of language learning and content learning. In what follows a synoptic description of a few important terms that are recurrently used in the literature is provided to equip the general reader with some initial tools to navigate the field without being bogged down by a theory-heavy introduction. The intention of this introduction is not to give final definitions to these terms as this will prove quite impossible given the nature of the humanities and social sciences disciplines

(to which education belongs), where different communities of practice in different research contexts tend to attach different meanings to the same terms, or use different terms to refer to a similar set of pedagogical approaches. As the reader gains more familiarity with the theories and concepts introduced in subsequent chapters, the reader can go beyond these sometimes confusing matrixes of terminologies and develop their own conceptual framework for analysing programme models and practices which are of interest to them in their own sociocultural and education contexts (see Chap. 7). However, some initial description of the historical contexts in which these different key terms have arisen will be useful. These include CBI, immersion, sheltered instruction, LAC, WAC and CLIL.

Content-Based Instruction

CBI is an umbrella term encompassing a wide range of 'instructional approaches that make a dual, though not necessarily equal, commitment to language and content-learning objectives' (Stoller 2008, p. 59). Describing the development of CBI in the USA, Stoller (2004) traces it back to the 1980s, when many applied linguists showed converging interest in 'integrated instruction', with five substantial books published on pedagogical approaches designed to achieve both language and content learning objectives (Brinton et al. 1989; Cantoni-Harvey 1987; Crandall 1987; Enright and McCloskey 1988; Mohan 1986). Lyster (2007) has also used the term CBI in a broad sense to refer to 'classrooms where subject matter is used at least some of the time as a means for providing second language learners with enriched opportunities for processing and negotiating the target language through content' (p. 1). Although CBI has gradually come to be more associated with second or additional language (L2) contexts, CBI as a broad curricular framework includes work done in first language (L1) contexts as well, as Stoller (2004, p. 271) points out:

> One curricular framework rarely referred to in second and foreign language discussions of content-based instruction is Concept-Oriented Reading Instruction (CORI), an approach to content learning and reading development used (and extensively researched) in first language settings (e.g. Guthrie et al. 1998, 2000; Guthrie and Ozgungor 2002; Guthrie, Wigfield, & Von Seker 2000). CORI … [is] organized around four stages: (1) immersion into a main theme through students' personal engagement with the topic, (2) wide reading and information gathering on the theme across multiple information sources, (3) reading strategy instruction to assist with comprehension, and (4) project work leading to a product that demonstrates what students have learned.

In principle, a CBI approach originally developed in L1 contexts (such as CORI) can have important implications for CBI in L2 contexts and vice versa. CBI has been implemented with diverse programme models and pedagogical practices in K-12 and postsecondary (tertiary) settings as well as in different sociolinguistic and sociopolitical contexts. Under the broad category of CBI are different approaches such as immersion, sheltered instruction, LAC, WAC and CLIL. While they all share some (but not necessarily equal) commitment to the integration of content and language learning, they differ in their historical contexts in which they have developed and thus their pedagogical and curricular emphases too.

Immersion is usually classified as a type of CBI (Met 1998, 1999; Genesee and Lindholm-Leary 2013; Tedick and Wesley 2015) and is meant to be a programme model contributing to *additive bilingualism* (Cummins 1979). In immersion classes, students coming from the same language background who speak the society's mainstream language as their first language (L1) are taught (some of) their content subjects in a language other than their first language (i.e. in an L2 or L3). The prototypical example of immersion is Canadian French immersion where English-speaking children are taught (some of the) content subjects in French (their L2). There are many different kinds of immersion programmes in the world, and the target languages usually include socio-economically important (trade) languages, e.g. Japanese and Chinese immersion programmes in Australia and English immersion programmes in China.

In contrast to immersion are sheltered instruction programmes in which linguistic minority children (who speak a home or community language that is different from the dominant language in society) are pulled out from mainstream classes and given '"sheltered" content instruction, characterized by the use of comprehensible language, the contextualization of subject matter, visual aids, modified texts and assignments, and explicit attention to students' linguistic needs' (Stoller 2008, p. 60). The Center for Applied Linguistics (CAL) in the USA has further developed an empirically validated Sheltered Instruction Observation Protocol (SIOP) to provide teachers and school administrators with an instrument for observing and quantifying teachers' implementation of quality sheltered instruction (Echevarria et al. 2004).

LAC, on the other hand, emerged in the 1970s in Britain as a whole-school approach to address the language and literacy needs of students studying in different subject areas. Unlike other CBI approaches originating from North America, LAC originally targeted all students (i.e. including students who study content subjects in their first language), not only linguistic minority students. The rationale behind LAC is that language aspects should be given due attention by teachers across different subject areas. A key document in the movement, the Bullock Report, stated, 'Each school should have an organized policy for LAC, establishing every teacher's involvement in language and reading development throughout the years of schooling' (Bullock 1975). LAC spread to the USA in the form of the WAC movement in the 1980s mainly in the context of helping English as a Second Language (ESL) students in content areas to learn both content and the language that carries that content (Hirsch 1988). LAC has also spread to Europe as a way towards plurilingualism, and LAC has been defined as both a concept and a policy 'linking different forms and aspects of language education within the school, particularly emphasising the role of language in all subject-matter learning' (Vollmer 2007, p. 177).

It can be seen that while immersion and sheltered instruction are terms that are more about programme models, LAC and WAC are terms that concern more about curricular and pedagogical approaches. So, in principle, LAC and WAC approaches can be implemented with different programme models. For example, in immersion programmes implemented with LAC/WAC approaches, content teachers are given

training in raising their language awareness and techniques and skills in integrating language support and language instruction in their content lessons.

In Europe, however, 'CLIL' is a term much more frequently used. Is CLIL different from immersion (and CBI programmes in general) or is it a European rebranding of North American programme models? Researchers (e.g. Cenoz et al. 2013) have argued that the lack of precision in the internal definitions of CLIL makes it difficult, if not impossible, to identify features that are uniquely characteristic of CLIL in contrast to immersion or other CBI programmes. Cenoz's (2015) analysis of examples from Basque education (where academic content is often taught through the medium of Basque and English to students with Spanish as a first language) shows that CBI and CLIL programmes share the same essential properties and are not pedagogically different from each other. The use of both CBI and CLIL to refer to programmes where academic content is taught through a second or additional language and the preference for one term over the other thus seems to be more an outcome of historical, contextual factors rather than distinctly different programme design principles.

In response to these discussions, Dalton-Puffer et al. (2014) proposed that different terminologies have their own histories and they called for researchers from diverse research traditions to develop 'a common non-hierarchical matrix, for the identification of features of bilingual/multilingual education programmes all over the world, to help researchers carry out comparative studies across contexts' (p. 217). Resonating with this, in Chap. 7, I shall build on and extend the existing literature to develop a programme planning analytical framework that will be useful for researchers, teachers and curriculum planners to classify, design and explore different possible programme options and approaches based on diverse needs and constraints in their own specific contexts.

In this book, CBI will be used as an umbrella term to cover various kinds of programme models and curricular approaches that have an interest in integrating content learning with language learning. Immersion and CLIL are treated as types of CBI with overlapping features. LAC is used as a general term to refer to a broad set of cross-curricular and pedagogical principles which can be incorporated into different kinds of CBI programmes. And LAC theories and concepts are seen as useful not only for L2/additional language learning contexts but also for L1 contexts, although many of the examples included in this book have come from EAL contexts.

1.4 How to Use the Book

Each content chapter starts with a *Chapter Overview*, which provides a succinct introduction to the key topics to be covered in the chapter. This serves as an 'advance organizer' for the reader to anticipate the key content and to activate their background knowledge and interest. Then, the content is organized into a few key sections. 'Application Scenarios' are built into the sections to engage the reader to actively examine the issues and topics being discussed and to draw upon their existing knowledge. This book can thus be easily adapted for use in teacher

preparation courses, workshops or research seminars on LAC, CLIL or related areas. Each chapter ends with a table of *Chapter Summary Points* to give a quick recap of key points discussed in the chapter. *End-of-Chapter Discussion Questions* are then provided to consolidate the reader's critical understanding of the concepts through applying them in culturally responsive ways in different contexts. This can be assigned as take-home activities or conducted at the end of the lecture, workshop or seminar. The book also includes three appendixes. Glossary provides a glossary of terms that can assist the student or reader new to the field to gain quick access to key concepts in the field. Students' attention can be drawn to this useful resource right from the beginning. Appendix A provides a sample science unit that my colleague Dr. Tracy Cheung and I have developed for a junior secondary class in Hong Kong (see Chap. 5). It is not intended as an example of 'best practice'; rather, it is a document showing our efforts in applying LAC and CLIL principles in designing a unit of work in a particular context. Appendix B provides some hands-on research tools and online resources for the student or reader who wants to conduct research in LAC, WAC, CLIL, academic literacies or related areas.

Chapter Summary Points

- LAC as a rising trend in different parts of the world, especially in EAL contexts.
- CBI as an umbrella term covering different approaches to integrating content learning with language learning: e.g. immersion, sheltered instruction, LAC, WAC and CLIL.

References

Brinton, D., Snow, M. A., & Wesche, M. (1989). *Content-based second language instruction*. New York: Newbury House.

Bullock, A. (1975). *A language for life: Report of the committee of inquiry appointed by the secretary of state for education and science under the chairmanship of Sir Alan Bullock*. U.K.: HM Stationery Office.

Cantoni-Harvey, G. (1987). *Content-area language instruction: Approaches and strategies*. Reading, MA: Addison-Wesley.

Cenoz, J. (2015). Content-Based instruction and content and language integrated learning: The same or different? *Language, Culture and Curriculum, 28*, 8–24.

Cenoz, J., Genesee, F., & Gorter, D. (2013). Critical analysis of CLIL: Taking stock and looking forward. *Applied linguistics* (pp. 1–21). NY: Oxford University Press. doi:10.1093/applin/amt011

Crandall, J. A. (Ed.). (1987). *ESL through content-area instruction; Mathematics, science, and social studies*. Englewood Cliffs, NJ: Prentice Hall.

Cummins, J. (1979). Linguistic interdependence and the educational development of bilingual children. *Review of educational research, 49*(2), 222–251.

Dalton-Puffer, C., Llinares, A., Lorenzo, F., & Nikula, T. (2014). "You can stand under my umbrella": Immersion, CLIL and bilingual education. A response to Cenoz, Genesee & Gorter (2013). *Applied Linguistics, 35*(2), 213–218.

Echevarria, J., Vogt, M. E., & Short, D. J. (2004). *Making content comprehensible for English language learners: The SIOP model* (2nd ed.). New York: Pearson.

Enright, D. S., & McCloskey, M. (1988). *Integrating English*. Reading, MA: Addison-Wesley.

Genesee, F., & Lindholm-Leary, K. (2013). Two case studies of content-based language education. *Journal of Immersion and Content-Based Language Education, 1*, 3–33.

Guthrie, J. T., & Ozgungor, S. (2002). Instructional contexts for reading engagement. In C. C. Block & M. Pressley (Eds.), *Comprehension instruction: Research-based best practices* (pp. 275–288). New York: Guilford Press.

Guthrie, J. T., Wigfield, A., & Von Seker, C. (2000). Effects of integrated instruction on motivation and strategy use in reading. *Journal of Educational Psychology*, 92(2), 331–341.

Guthrie, J. T., Schafer, W. D., Von Secker, C., & Alban, T. (2000). Contributions of integrated reading instruction and text resources to achievement and engagement in a statewide school improvement program. *Journal of Educational Research, 93*, 211–226.

Guthrie, J. T., Van Meter, P., Hancock, G. R., McCann, A., Anderson, E., & Alao, S. (1998). Does concept-oriented reading instruction increase strategy use and conceptual learning from text? *Journal of Educational Psychology, 90*(2), 261–278.

Hirsch, L. (1988). Language across the curriculum: A model for ESL students in content courses. In S. Benesch (Ed.), *Ending remediation: Linking ESL and content in higher education* (pp. 71–89). Washington, DC: TESOL.

Lyster, R. (2007). *Learning and teaching language through content. A counterbalanced approach*. Amsterdam: John Benjamins Publishing Company.

Met, M. (1998). Curriculum decision-making in content-based language teaching. In J. Cenoz & F. Genesee (Eds.), *Beyond bilingualism: Multilingualism and multilingual education* (pp. 35–63). Clevedon: Multilingual Matters.

Met. M. (1999, January). *Content-based instruction: Defining terms, making decisions.* NFLC Reports. Washington, DC: The National Foreign Language Center. Retrieved October 14, 2014, from http://www.carla.umn.edu/cobaltt/modules/principles/decisions.html

Mohan, B. (1986). *Language and content*. Reading, UK: Addison-Wesley.

Stoller, F. L. (2004). Content-based instruction: Perspectives on curriculum planning. *Annual Review of Applied Linguistics, 24*, 261–283.

Stoller, F. L. (2008). Content-based instruction. In N. Van Deusen-Scholl & N. H. Hornberger (Eds.), *Encyclopedia of language and education* (2nd ed., Vol. 4, pp. 59–70). New York: Springer Science+Business Media LLC.

Tedick, D., & Wesley, P. (2015). A review of research on content-based foreign/second language education in US K-12 contexts. *Language, Culture and Curriculum, 28*, 25–40.

Vollmer, H. J. (2007). Language across the curriculum: A way towards plurilingualism. In W. Martyniuk (Ed.), *Towards a common European framework of reference for languages of school education* (pp. 177–192). Krakow: Universität Osnabrück. Retrieved November 2013 from http://www.universitas.com.pl/media/File/Fragmenty/TOWARDS/mart/2-3.pdf

Chapter 2
How Language Varies: Everyday Registers and Academic Registers

Chapter Overview
In this chapter, the concept of language variation is introduced through examining the different features of everyday registers and academic registers with examples from everyday life and academic contexts. In particular, Jim Cummins' concepts of 'BICS' and 'CALP' are both delineated and enriched with insights from genre and register theory from the Sydney School. Ahmar Mahboob's three-dimensional framework integrating language variation theories and register theory is further discussed to explore possible ways of using L1 academic linguistic resources in scaffolding the learning of L2 academic registers.

2.1 BICS and CALP

How language varies has important educational implications. If language varies according to its use in different contexts, then students need to develop language proficiencies appropriate for use in different contexts. Regarding this, Cummins (1980/2001) has proposed two dimensions of language proficiency: Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP) (Fig. 2.1). We use BICS in our everyday life, such as in conversations with family members and friends, informal interactions with shop assistants when we go shopping or casual chit-chat on Facebook, WhatsApp, Twitter or Internet forums. In contrast, we use CALP to understand and discuss academic topics in the classroom and to read and write about these topics in school assignments and examinations. BICS are said to be used in *context-embedded* conversations and this means that the conversation is often face-to-face and offers many cues to the listener such as facial expressions, gestures and concrete objects of

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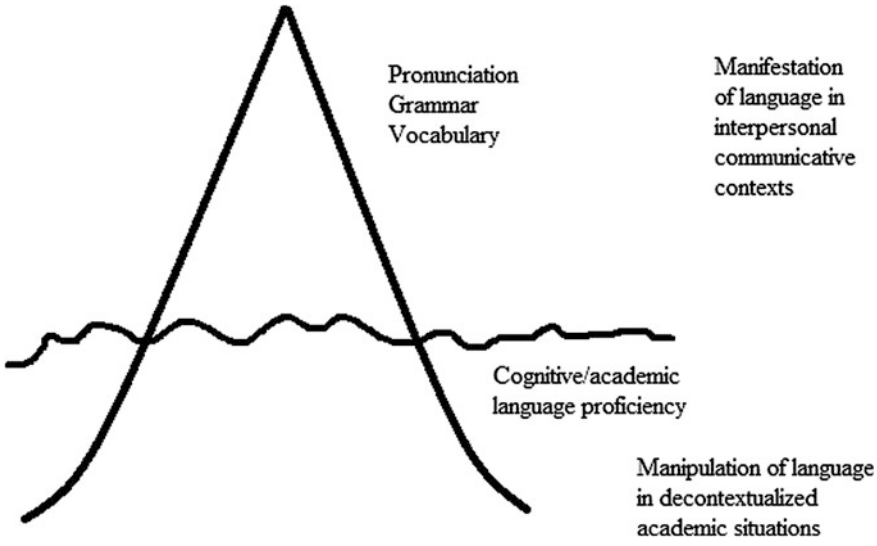

Fig. 2.1 The 'iceberg' representation of different aspects of language proficiency (redrawn based on Cummins 1980/2001, p. 112; reproduced here by permission of Professor Jim Cummins and the National Association of Bilingual Education)

reference. CALP, on the other hand, is said to be necessary for *context-reduced* communication, such as those that take place in the classroom where there are supposed to be fewer non-verbal cues and the language is more abstract. However, in recent developments of new media interactions, this face-to-face context can often be a virtual one such as that of a Skype or WhatsApp conversation. It is, therefore, better to conceive of BICS and CALP not as discrete categories but as lying on a continuum. Similarly, it is best not to see spoken and written modes as discrete categories but as discrete categories but as lying on a '*mode continuum*' (Derewianka 2014, p. 165). As Derewianka pointed out, it is important to provide ample support and explicit guidance to students, especially English language learners (ELLs), as they move from the everyday spoken mode to the formal academic written mode in their school studies. Similarly, the same can be said about helping students to move comfortably between BICS and CALP in their school career, as mastery of CALP does not come naturally and requires explicit instruction even for L1 speakers.

Derewianka's point reinforced the one made by Cummins when he proposed the distinction between BICS and CALP to explain why linguistic minority children learning English as an additional language (EAL) in North American contexts seemed to be mastering BICS much faster (e.g. 3–5 years) than CALP (e.g. 7–15 years). He recommended that school teachers should attend to students' need to develop CALP even when they seem to be speaking EAL fluently in everyday interpersonal contexts. In Cummins' conception, CALP is associated with cognitive and memory skills and is thus a major determinant of educational success. It is,

however, important to note that the development of both BICS and CALP is dependent on the quality of adult–child or teacher–student interactions, as Cummins pointed out:

> It should be noted that the development of CALP is not independent of interpersonal communication. On the contrary, as suggested by Wells' (1979) longitudinal study, the quality of communication between adults and children, both in the home and school, is a primary determinant of CALP development. The point is that in L1, certain aspects of BICS reach a developmental plateau considerably sooner than CALP, and thus proficiency in L1 BICS carries no implications in regard to level of development of L1 CALP, despite the fact that the development of both is dependent on interpersonal communication. (Cummins 1980/2001, p. 114)

In L2 or EAL contexts, Cummins summarized the research literature and concluded that while proficiency in L2 BICS seems to be independent of both L1 and L2 CALP, L1 CALP and L2 CALP are related and he proposed the Common Underlying Proficiency (CUP) model of bilingualism (Fig. 2.2). Cummins' proposal is particularly useful in policy contexts where the development of students' L1 CALP is neglected and only L2 CALP is being emphasized (e.g. linguistic minority children in Canada or the USA). In Southeast Asian contexts where many modernizing states are in a rush to design language acquisition policies to privilege the learning of EAL (see review in Lin and Man 2009), Cummins's advice serves as a useful reminder that L1 CALP must not be neglected and L2 CALP can well build on L1 CALP (Gibbons 2009) (more on this in Sect. 2.4).

Having considered Cummins' notions of BICS and CALP, and his CUP model of bilingualism, let us look at Text 2.1 and Text 2.2 and see which one is more associated with a BICS context and which one is more associated with a CALP context.

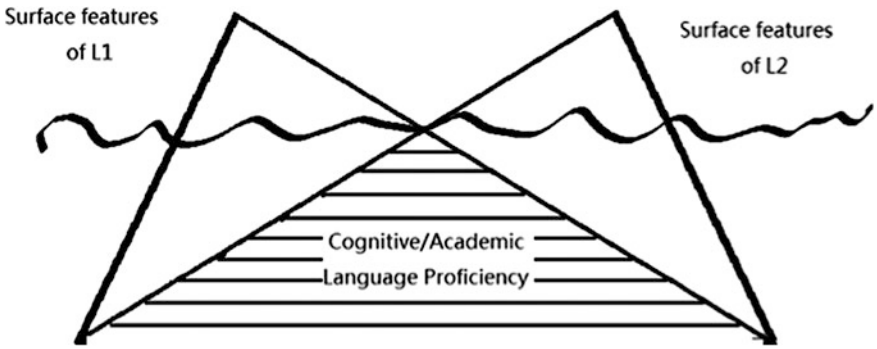

Fig. 2.2 The 'dual-iceberg' representation of bilingual proficiency (redrawn based on Cummins 1980/2001, p. 118; reproduced here by permission of Professor Jim Cummins and the National Association of Bilingual Education)

Text 2.1

- Angel: Hello, Adrian?
- Adrian: Good morning Angel! How're you today?
- Angel: I'm fine! I've been up for a couple of hours working on my computer—
- Adrian: Oh, that's good!
- Angel: Are there lessons for me to see today?
- Adrian: Um…, Ms. Bussie hasn't replied to my email yet—don't know if she's got something arranged…
- Angel: I see, in that case, I'd like to stay home to work this morning, and if she's got back to you, just give me a call, and I'll come back to school.
- Adrian: No problem! Have a productive day!
- Angel: Thanks Adrian! You have a good day too! Bye-bye!
- Adrian: Bye-bye!

Text 2.2

Flowering plants

are classified as high-class plants. At the adult stage, they produce flowers which develop into fruits and seeds after being pollinated and fertilized. Tulips, water lilies, mangoes and bananas are examples of flowering plants.

Application Scenario 2.1

Compare Text 2.1 and Text 2.2 in terms of content and the overall communicative purpose. Can you infer the different kinds of contexts where each text is likely to occur? Discuss in pairs some of the following questions:

- In Text 2.1, what are Adrian and Angel talking about? What's their role relationship likely to be? What's the channel or medium of this exchange? How is this talk organized (into stages)? Is the text originally in the spoken or written mode?
- What is the purpose of (and what has been achieved in) this conversation?
- In Text 2.2: Who is likely to be the author, and to whom is the author writing this text? What's the role relationship between the author and the reader? What's the channel or medium of this text? How is the text organized (into stages)? Is the text originally in the spoken or written mode?

2.2 Genre and Register Theory

While Cummins' conceptions of BICS and CALP provide broad orientations in understanding the differences between everyday language and academic language, a theory of language and, in particular, Michael Halliday and Ruqaiya Hasan's work in register theory as well as Jim Martin and David Rose's work in genre theory will help us elaborate what BICS and CALP mean in functional linguistic terms. It will also help us gain a deeper understanding of how students can be helped to master L2 CALP and how L1 CALP can facilitate this in the process.

Application Scenario 2.2: Analysing the Linguistic Patterns of Text 2.1 and Text 2.2
Let us revisit Text 2.1 and Text 2.2 in *Application Scenario 2.1* above. Re-examine the linguistic features of each text, e.g. How are they different in terms of choices of vocabulary and grammatical patterns? Which text seems to be easier to understand and produce? If someone is learning EAL, what are the different kinds of linguistic patterns that this person needs to master in order to participate competently in these different kinds of contexts? Do you have a *metalanguage* (i.e. a special '*language*' to talk and think about language) to discuss these linguistic patterns?

To have a metalanguage to analyse and talk about Texts 2.1 and 2.2, we can draw on the concepts from register theory (Halliday and Hasan 1976): *field* (what's the subject matter), *tenor* (who are involved) and *mode* (what's the channel). When we produce a text, we are constantly making (subconscious) choices among different vocabularies, grammatical patterns and different ways of organizing or structuring the text. The choices we make will depend on the overall purpose and situation of the communication. As Derewianka (1990) explained, the choices we make in a text depend on:

1. The relationship between the participants: speaker/listener; writer/reader (i.e. the tenor)
2. The subject matter of the text (i.e. the field)
3. The channel of communication: written or spoken (i.e. the mode)

These three factors together determine the register of the text (Derewianka, 1990, p.18)

To understand the different concepts in genre and register theory developed by researchers of the Sydney School (Martin and Rose 2008; Rose and Martin 2012), we can think of a culture as consisting different conventional ways of doing things (or different social processes), including different ways of organizing texts to achieve social purposes. These different ways of organizing texts to achieve different purposes are called different genres. In Sydney School genre theory, genre is

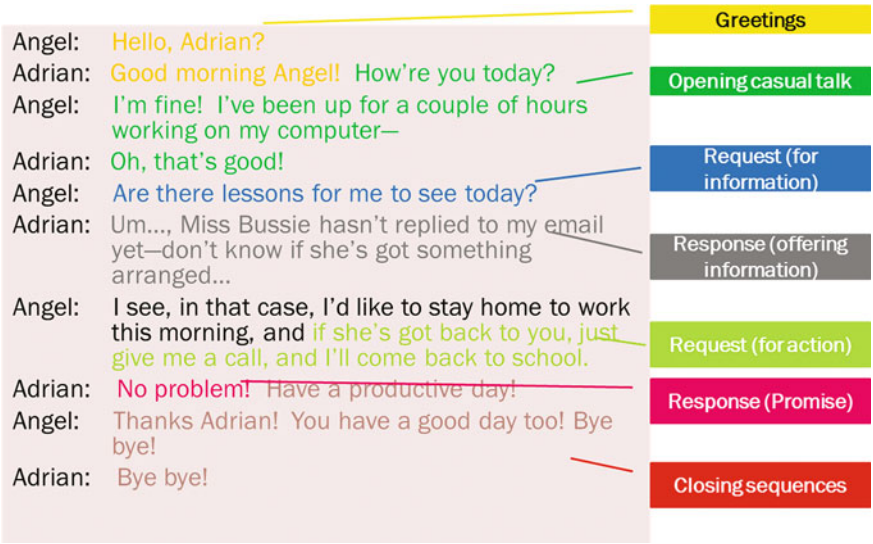

Fig. 2.3 Analysis of the schematic structure of Text 2.1

defined as a 'staged, goal-oriented, social process' (Rose and Martin 2012, p. 54). It is said to be 'staged' and 'goal-oriented' because a genre typically goes through different rhetorical stages to achieve its primary goal or social purpose. To understand how genre and register theory can deepen our understanding of how different texts are organized and produced, let us focus our analytical attention on Text 2.1 again. Figure 2.3 shows an analysis of the rhetorical stages (or schematic structure/genre structure) of Text 2.1. It can be seen that the primary communicative or social purpose of the exchange seems to be one of the requesting information and action (and responses to these requests) and it goes through a recognizable sequence of stages:

1. Greetings,
2. Opening casual talk,
3. Request (for information),
4. Response (offering information),
5. Request (for action),
6. Response (offering a promise), and
7. Closing sequences.

Text 2.1 thus has as its primary goal the achievement of requests for information and actions among colleagues in the field of school lesson visits arrangement. If we have collated and analysed a larger corpus of similar texts (spoken exchanges like this), we can establish with more certainty the features of this kind of genre and perhaps even give the genre a tentative name (e.g. 'workplace request'). Similarly, we can analyse the genre (or schematic) structure of Text 2.2. Figure 2.4 shows an

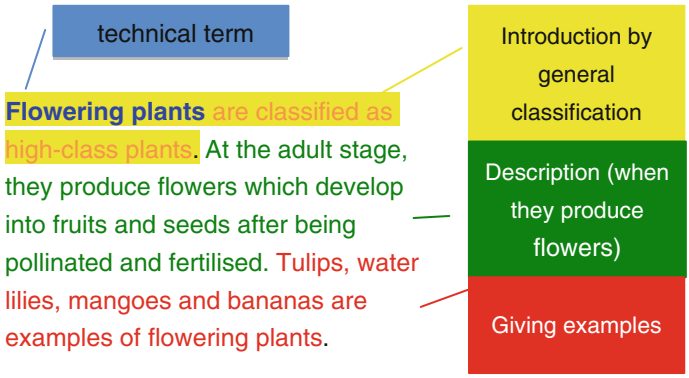

Fig. 2.4 Analysis of the schematic structure of Text 2.2

analysis of the schematic structure of Text 2.2. It follows a simpler but nonetheless recognizable sequence of stages to achieve its purpose:

1. Introduction by classification,
2. Description, and
3. Exemplification.

The primary communicative purpose of Text 2.2 seems to be that of providing a description of a topic (i.e. it belongs to the genre of descriptive texts, more on genres in Chap. 3). It first introduces the topic ('flowering plants') by classifying it as a specific type of plants ('high-class plants'). Then, it provides a description of when ('at the adult stage') they produce flowers and the processes involved ('…flowers…develop into fruits and seeds after being pollinated and fertilized'). In this way, the text is structured systematically, with its primary purpose of providing information on a general class of things or phenomena (flowering plants). Researchers of Sydney School genre theory have analysed numerous school texts and come up with systematic taxonomies of recurrent school genres (together with detailed description and illustration of different stages in different genres) so that school teachers can provide their students with explicit support and guidance in learning to read and write in different school genres (see Martin and Rose 2008; Rose and Martin 2012, more on this in Chap. 3). Under their genre classification system, Text 2.2 is an example of the genre, *descriptive report*.

To understand how register theory can help us analyse how a text is patterned, crafted or constructed, let us ask the following questions: How do differences in the three dimensions (field, tenor, mode) of the context of communication affect the choices made among the lexical (i.e. vocabulary) and grammatical patterns? While Text 2.1 seems to be about the arrangement of lesson visits in a school (the field) between Angel and Adrian, who seem to be friends or colleagues (the tenor), Text 2.2 is about a school science curricular topic—flowering plants (the field), and the writer of Text 2.2 seems to be using a formal tone addressing the reader who is likely to be a

student reading the text (the tenor). Text 2.1 takes the spoken mode, which is a usual mode in everyday social interactions, while Text 2.2 takes the written mode, which is common in school or academic contexts. It can be seen that Text 2.1 exemplifies 'the casual, fluid language characteristic of the spoken mode', while Text 2.2 exemplifies 'the heavily crafted, compressed written mode' (Derewianka 2014, p. 165).

Comparing the two texts, we find that everyday conversations (e.g. Text 2.1) seem to be characterized by the use of shortened forms (e.g. 'I've'), first and second personal pronouns (e.g. 'I', 'you'), simple sentences (e.g. 'I'm fine'), exclamations (e.g. 'Oh, that's good!'), hesitations (e.g. Um…) and a relative lack of technical terms. These lexical and grammatical choices have the potential of communicating personal and emotional involvement. Although the exchange does not take place in a face-to-face conversation and is mediated by the telephone, the 'here-and-now' context still seems to be shared by the conversation participants (Angel and Adrian) who are engaged in synchronous, dialogic communication, taking turns to speak to each other. The conversation participants also seem to share a lot of tacit background understanding and knowledge about the subject matter (field) being discussed (e.g. Ms. Bussie and her role in arranging lesson visits and Angel and her primary interest in visiting classes in the school).

In contrast, a school science text (Text 2.2), which belongs to the genre of *descriptive report*, is characterized by a higher frequency of technical terms (e.g. 'pollinated'), use of the passive voice, complex sentence patterns (e.g. 'At the adult stage, they produce flowers which develop into fruits and seeds after being pollinated and fertilized') and a general lack of personal pronouns. These lexico-grammatical choices have the effect of communicating detachment or social distance (i.e. to achieve a specific value on the dimension of tenor). In fact, the text producer (the writer of Text 2.2) is usually not in the 'here-and-now' context of the text receiver (the reader of Text 2.2). The communication is asynchronous and the text is more monologic than dialogic although a good writer often has the reader in mind and anticipates the reader(s)'s possible needs and points of view as the writer produces a text.

Also, comparing the two texts from the angle of speech acts or rhetorical functions, we see some everyday interpersonal speech acts such as 'request', 'response' and 'promise' in Text 2.1, whereas Text 2.2 involves the functions of 'classifying', 'describing' and 'exemplifying' an entity of academic interest (flowering plants). One can say that Text 2.1 is an example of an everyday register, while Text 2.2 is an example of an academic register. In functional linguistic terms, we can say that the author of these two texts has made different linguistic choices (i.e. in choosing different types of vocabulary and grammatical patterns and achieving different rhetorical functions) to achieve different sets of values on the dimensions of field, tenor and mode of the two different registers.

Summarizing the discussion above, we can say that texts are organized and constructed in different ways according to their genre (purpose) and register (field, tenor, mode); the genre shapes the overall organization or structuring of the text (e.g. what kinds of stages through which the text unfolds to achieve its overall purpose), while the register shapes the lexico-grammatical patterns or linguistic choices made in constructing the text (Derewianka 1990).

Application Scenario 2.3: Analysing the following text
What about the very text that you are reading now? What are the values on the dimensions of field, tenor and mode that are affecting the linguistic choices that I am making as an author of this text? It seems that this text that I am producing has some features of texts in the spoken mode (e.g. use of first and second personal pronouns such as 'I' and 'you' to signal more social involvement and less social distance between the writer and the reader) and does not fit neatly into the categories of everyday registers or academic registers. Why have I made these linguistic choices? What are my communicative purposes?

The above discussion leads us to conclude that different theories and concepts (e.g. Cummins' notions of BICS, CALP, the Sydney School's genre and register theory) are attempts by educators and linguists to help us understand *how language varies* (or how texts vary) according to different communicative purposes and different contextual factors. In other words, language in use in authentic contexts is not one single homogeneous entity (even though we might tend to say things such as the English language, the Chinese language, the Spanish language, everyday language and academic language). Instead, we can more fruitfully think of language as a repertoire of genres and registers which are chosen according to the overall communicative purpose and the aspects of field, tenor and mode in different contexts of communication. That is, when we use language to communicate in different contexts for different social purposes, we are constantly making different linguistic choices at all levels, from genre selection (choices about which genre to use—how to organize a text into different stages), to lexico-grammatical choices (which words, phrases, clauses or sentence patterns to use), to grapho-phonological choices (which spellings, font type and size, or which pronunciations and intonations to use, etc.). These theoretical considerations have important implications for education. For instance, if we can have a framework that describes how language varies (i.e. how texts vary) according to the user(s), according to use and according to mode, then we can systematically design our curriculum materials to help students master these variations in language patterning (or linguistic features) in different contexts (e.g. shifting confidently between everyday and academic contexts—which are, however, not discrete, binary categories but are often lying on a continuum). This brings us to a consideration of Ahmar Mahboob's work in the next section.

2.3 Mahboob's Three-Dimensional Framework of Language Variation: Everyday and Specialized Fields; Global and Local Tenors; and Spoken and Written Modes

Up to now, the reader might have the impression that the spoken mode is often associated with everyday registers and the written mode is strongly associated with academic registers. However, this does not need to be the case. For instance, in everyday interactions, we are increasingly using written email (asynchronous communication) to supplement face-to-face or mediated conversations (synchronous communication). In academic contexts, there are also important spoken modes of communication (e.g. oral presentations, lectures, seminar discussions) that go side by side with written communication. Increasingly, multimodality (i.e. using multiple modes of communication including spoken, written modes and images, music, videos, gestures, etc.) characterizes both our everyday and academic communication.

Ahmar Mahboob (2014) has proposed a useful framework to capture the criss-crossing of these different continua along the dimensions of field, tenor and mode. Figure 2.5 shows Mahboob's conceptualization of how the continuum of spoken-written modes criss-crosses with the continuum of social distance between the users. Language users can be said to be located on a social (tenor) continuum between the global and local poles. For example, family members or friends living in the same locale can be said to be located closer to the local pole of the social distance continuum; international business clients can be said to be located closer to the global pole of the social distance continuum. In Fig. 2.5, on the left-hand side, in the *local written* and *local oral* quadrants, we can find texts such as local newspapers, magazines, fiction, textbooks, radio and television. These are usually

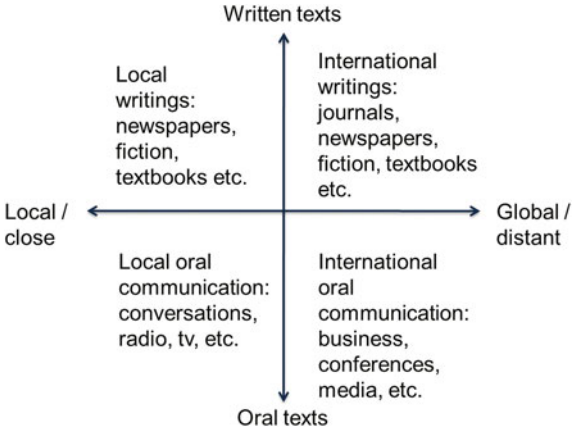

Fig. 2.5 Criss-crossing the spoken-written continuum with the continuum of social distance (*Source* Mahboob 2013; reproduced by permission of Dr. Ahmar Mahboob)

mediated in the local, familiar languages of the language users (can be first languages of the home or local community languages). On the right-hand side of the diagram, in the *global written* and *global oral* quadrants, we can find texts such as international newspapers, journals, textbooks, fiction, business conferences and media. One aspect of this framework that is interesting to discuss is the *ontogenetic* development of language (i.e. an individual's trajectory of language development, more on this in Chap. 3). We all, regardless of which first language we speak, develop language first in everyday, local and oral contexts (e.g. the family and the local communities) and then develop understandings of language use in the other domains including technical or specialized ones (often through formal education). This relates to Cummins' notions of BICS and CALP as well as Sydney school genre and register theory. That is, we all first develop BICS in our local familiar languages (L1s) (e.g. language(s) of the family and the local communities in which we live) and then later we learn to communicate with CALP both in our familiar first/local languages (L1s) or L2/L3 (additional languages) usually in formal education. Likewise, we also usually learn BICS in an additional language with formal instruction (e.g. in L2 language lessons in schools or adult learning centres). However, it is also possible to pick up BICS in an additional language such as in the situation of the immigrant child in the host country, or in the context of multiethnic/multilingual neighbourhoods. To summarize these various combinations of possible situations, we can look at the three-dimensional model of Mahboob (2013, 2014, in press) in Fig. 2.6. Mahboob's framework draws on the three concepts (field, tenor, mode) of register theory to map out the diverse possibilities of how language and texts vary according to the different aspects of the context of language use. The sociolinguists' current consensus about how language/texts vary can thus be summarized as follows:

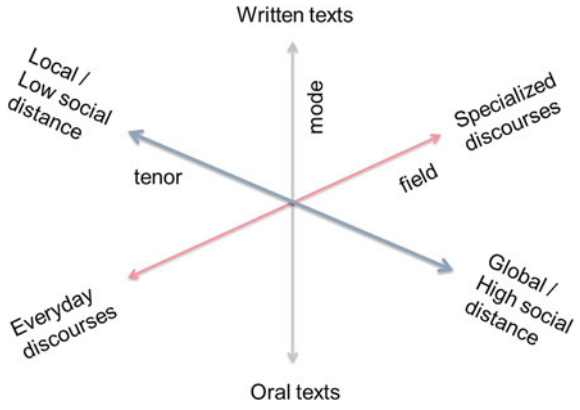

Fig. 2.6 The Mahboobian framework of language variation for education (*Source* Mahboob 2013; reproduced by permission of Dr. Ahmar Mahboob)

What would most (socio)linguists agree on about the nature of language variation?

1. Language varies based on whether we are talking to people in our community (local) or people outside our community (global),
2. Language varies based on whether we are speaking or writing, and
3. Language varies based on whether we are engaged in everyday or specialized discourses.

(Summary based on ideas from Mahboob 2014)

In this framework (see Fig. 2.6), we can identify eight different domains in which language varies depending on the combinations of different values on the three dimensions of field, tenor and mode of the context of communication. The first four domains include language variations that reflect local usage, and they can vary in the following ways:

1. Local everyday written,
2. Local everyday oral,
3. Local specialized written,
4. Local specialized oral,

This local usage can be done in one local language or multiple local languages depending on the context. For example, in neighbourhoods in Yaumatei (an area in Hong Kong where there are many different ethnic groups living together for a long time), local communication among neighbours can be done in everyday, informal and local varieties of languages. This local usage will also be found in similar contexts in other places, such as 'hawker centres' (local everyday eating places) in Singapore, where different varieties of local languages can be heard (e.g. Hokkien, Cantonese, Mandarin, Singlish). However, local usage can also involve specialized discourses. For example, in the Jade Market in Yaumatei in Hong Kong, specialized local usage can be found (e.g. specialized jade-related vocabulary is used). Similarly, when birdwatchers in the Maipo wetland area in Hong Kong meet in the field, local usage that involves specialized, birdwatching discourses (e.g. in Cantonese, Mandarin and English) can be heard (e.g. names of birds found in the Maipo wetland area, specialized vocabulary related to the birds' features and behaviour). In the same vein, local usage can also involve written modes. For example, instances of local everyday written usage can be found in neighbourhood posters (e.g. a poster looking for a lost pet). Likewise, examples of local specialized written usage can be found in the newsletters and web sites of local societies such as the Hong Kong Birdwatching Society.

In Mahboob's three-dimensional framework of language variation (Fig. 2.6), the other four domains involve global usage that varies with the dimension of written/oral and the dimension of everyday/specialized:

5. Global everyday written,
6. Global everyday oral,
7. Global specialized written, and
8. Global specialized oral.

These four domains of language usage differ from the first four domains in that they refer to contexts of language usage where participants need to communicate with people who do not share their local ways of using language. Globally oriented everyday written usage, for example, can be found in international editions of newspapers and magazines, which avoid local colloquialisms to make the text accessible to wider communities of readers. Global everyday oral usage can be found in interactions between people coming from different parts of the world when they are conversing about everyday casual topics. In contrast to global everyday usage, global specialized usage is involved when people coming from different parts of the world discuss specialized topics (e.g. in a paper presentation session in an international academic conference). This can involve spoken usage (e.g. academic presentations and discussions in a specialized conference on marine biology) or written usage (e.g. international research journal articles). In using this framework, however, it must be pointed out that there is considerable variation within each of these eight domains depending on the specific aspects of each context of communication (Mahboob 2014). This framework, however, provides us with an overall sociolinguistic 'road map' to chart out the different possible domains in which a student will need to develop different appropriate kinds of language proficiencies (e.g. BICS, CALP). The framework can thus inform our work in curriculum planning. Although more future research is needed to further elaborate this framework, Mahboob has pointed the possible way forward in our efforts to build an integrated model to analyse important features of everyday and academic language proficiencies (i.e. how people construct different types/styles of language and texts according to the needs of different contexts of communication), a distinction first proposed in the BICS and CALP concepts of Cummins.

2.4 Revisiting the Concept of CALP: What Is Common to L1 and L2 CALPs?

To continue with the theorizing work started by Cummins (see Sect. 2.1), we need to ask a further question: What do L1 and L2 CALPs share in linguistic terms? By drawing on genre and register theory as well as Mahboob's framework of language variation, we can reach some tentative conclusions about the nature of CALP and what seems to be shared by CALPs in different languages.

It seems that Cummins' prototypical CALP would map onto the 7th domain of Mahboob's three-dimensional framework and BICS would map onto the 1st and 2nd domains. We must also pay attention to the oral mode of CALP (i.e. in the 8th domain) and students need to be assisted to produce globally oriented, spoken, specialized texts as these are not the same as BICS in Cummins' conceptualization. These globally oriented spoken academic texts share features of both CALP and BICS implying that students need to learn both how to engage the audience in a formal oral academic presentation and how to articulate academic content using the

appropriate academic register for the content. Students would also need to be supported in developing language proficiencies in the 5th and 6th domains, as in the globalized world, most of our graduates will need to communicate with people from different parts of the world not only on specialized topics but also on everyday casual topics (e.g. in casual informal dinner parties with international business clients after the formal business meetings, or in informal email exchanges).

The next question to ask would be: how are CALPs in different languages (e.g. L1, L2, L3…) similar or different? Would a good foundation of CALP in one language be beneficial to learning CALP in another language? To address this question, we can draw insights from genre theory and register theory. From the systemic functional linguistic perspective, we can see language as a system of systems of choices (i.e. nested systems) for making meaning, and there are different choices to be made at different systemic levels, e.g. the more global textual level (e.g. genre structuring) and the more local lexico-grammatical level (more on this in Chap. 3). The textual level involves choices of different ways of structuring the text through stages to achieve the overall communicative purpose of the genre (e.g. compare Text 2.1 with Text 2.2), while the lexico-grammatical level involves choices of words, clauses and sentence patterns to signal different values on the dimensions of field, tenor and mode (register). With this linguistic understanding, the next question for us to ask would be: What would a student gain by having built a good foundation in CALP (in both spoken and written modes) in one language when he/she approaches the task of learning CALP in another language, and vice versa?

It seems that students who have developed a good foundation in CALP in one language are likely to have an enhanced *metalinguistic awareness* (i.e. awareness of how language works and varies across different contexts). They will be more likely to be aware that CALP involves the need to instantiate a certain set of values in academic registers (e.g. the need to turn dynamic *processes* into static *entities*), and different languages offer different concrete lexico-grammatical choices to achieve them. This is similar to Cummins' notion of surface features of L1 and L2. These surface features will be different in different languages (e.g. the lexico-grammatical choices will be different in L1 and L2). However, the overall communicative purposes of academic genres and their textual schematic structuring (i.e. the stages through which a text in a certain genre unfolds to achieve its overall purpose) will tend to be similar. For instance, an academic science text describing flowering plants is likely to have a similar overall purpose and textual structuring whether it is in L1 or L2. Given the increasingly globalizing trends in academic discourses, the genres and texts in academic contexts across different societies (i.e. in the 7th and 8th domains in Mahboob's framework of language variation) are likely to be sharing more similarities than differences.

In Mahboob's three-dimensional framework (Fig. 2.6), the texts in the 7th domain will tend to share similar information structuring features (given their shared *academic* field, *global* tenor and *written* mode) even though these texts might be produced in diverse languages. To illustrate this scenario, let us look at the *bilingual notes approach* reported in Lin (2013). Figure 2.7 shows a school science laboratory report which is written in the students' L1 (Chinese) and L2 (English),

5. 觀察 表 l：紅椰菜汁在不同化學品中的顏色				5. Observation (i.e. What do I observe?) Table 1：The colour of red cabbage juice in different chemicals			
化學藥品	紅椰菜汁 的顏色			**Chemicals**	**The color of red cabbage juice**		
	實驗前		**實驗後**		**Before**		**After**
酸 1 (鹽酸)		轉為		acid 1 (hydrochloric acid)		change to	
酸 2 (醋酸)				acid 2 (acetic acid)			
鹼 1 (氫氧化鈉)				alkali 1 (sodium hydroxide)			

Fig. 2.7 **實驗報告** Laboratory Report (Reproduced here by permission of the teachers, Mr. CHEUNG Kwok-wa and Mr. CHOO-KAN Kwok-wing)

with the 2 versions laid out side by side for easy comparison by the Secondary 2 (Grade 8) Hong Kong students, who were learning EAL. CALP is needed to read and write this laboratory report. While the surface features (or lexico-grammatical features) of this academic text is different in L1 (Chinese) and L2 (English), the generic structure (or information structuring through genre stages) to achieve the overall communicative goal is similar. By juxtaposing the L1 and L2 versions of the laboratory report, students are led to draw on their L1 CALP to facilitate their understanding of the L2 academic text, thus also facilitating their learning of the L2 'surface features' (or L2 lexico-grammatical features).

In this chapter, we have focused on introducing the concept of language variation and the various concepts and theories attempting to understand language variation. We have introduced Jim Cummins's conceptions of BICS and CALP and have discussed how these conceptions can be further enhanced by the genre theory

and register theory from the Sydney School and Mahboob's three-dimensional framework of how language varies according to the overall purpose of communication (genre) and the field, tenor and mode (register) of communication. All these theoretical concepts have educational implications as they inform us about the different features of everyday language styles and academic language styles and the different kinds of proficiencies that students will need to develop in different domains of communication. In the next chapter, we shall take a closer look at Sydney School genre theories, and how they can help both content teachers and language teachers develop a common vocabulary or *metalanguage* to collaborate in their cross-curricular efforts to support students learning content in an L2 or EAL.

Chapter Summary Points

- Language variation theories including Cummins' notions of BICS and CALP, genre theory and register theory of the Sydney School, the Mahboobian Framework of language variation (8 broad domains of different kinds of language usage)
- Educational implications of theories of language variation: different features of academic language styles and everyday language styles and why students need to be supported in moving between everyday language styles and academic language styles in different contexts
- How to use these concepts and theories of language variation to analyse different texts (e.g. everyday texts; school academic texts)
- How CALP in one language (e.g. L1) can support the learning of CALP in another language (e.g. L2) and vice versa.

End-of-Chapter Discussion Questions

1. While the concepts of BICS and CALP can offer teachers a quick understanding of the differences between everyday language styles (and texts) and academic language styles (and texts), what are some of the limitations of these 2 concepts? How can genre theory and register theory of the Sydney School and Mahboob's three-dimensional framework help overcome some of these limitations?
2. Can you analyse the lexico-grammatical features of this chapter, e.g. Are there many technical terms? What about the grammatical patterns? Do these features resemble those of everyday conversations or academic texts?
3. Can you analyse the field, tenor and mode of this chapter? Does this chapter fit neatly into the category of academic texts? Why? Why not?
4. Which domain of the Mahboobian Framework (Fig. 2.6) would you place this chapter into? Is it possible to have examples of language usage that border on two or more domains? Give examples and justify your decision.
5. What is the main argument of this chapter? To what extent do you agree or disagree with the main argument of this chapter? Explain your answer.

References

Cummins, J. (1980/2001). The entry and exit fallacy in bilingual education. In C. Baker & N. H. Hornberger (Eds.), *An introductory reader to the writings of Jim Cummins* (pp. 110–138). Clevedon: Multilingual Matters. [This paper was originally given as a keynote address at the Workshop on 'Comparative Review of Identified District Continua' sponsored by the National Origin Desegregation LAU Centre, at the 9th Annual Bilingual Bicultural Education Conference (NABE), San Diego State University, Anaheim, California, April, 1980].

Derewianka, B. (1990). *Exploring how texts work*. Australia: Primary English Teaching Association.

Derewianka, B. (2014). Supporting students in the move from spoken to written language. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 165–182). Dordrecht: Springer.

Gibbons, P. (2009). *English learners, academic literacy, and thinking: Learning in the challenge zone*. Portsmouth, NH: Heinemann.

Halliday, M. A. K., & Hasan, R. (1976). *Cohesion in English*. London: Longman.

Lin, A. M. Y. (2013). Towards paradigmatic change in TESOL methodologies: Building plurilingual pedagogies from the ground up. *TESOL Quarterly, 47*(3), 521–545.

Lin, A. M. Y., & Man, E. Y. F. (2009). *Bilingual education: Southeast Asian perspectives*. Hong Kong: Hong Kong University Press.

Mahboob, A. (2013). *World Englishes, identity management and education* [PowerPoint slides]. Seminar presented at the L1 & L2 Academic Literacies Seminar Series, Faculty of Education, University of Hong Kong, Pokfulam, Hong Kong.

Mahboob, A. (2014). Language variation and education: A focus on Pakistan. In S. Buschfeld, T. Hoffmann, M. Huber, & A. Kautzsch (Eds.), *The evolution of Englishes* (Vol. 2, pp. 267–281). Amsterdam: John Benjamins.

Mahboob, A. (in press). Understanding language variation: Implications of the NNEST lens for TESOL teacher education programs. In J. de Dios Martinez Agudo (Ed.), *Native and non-native speakers in English language teaching: Implications and challenges for teacher education*. Boston: De Gruyter Mouton.

Martin, J. R., & Rose, D. (2008). *Genre relations: Mapping culture*. London: Equinox.

Rose, D., & Martin, J. R. (2012). *Learning to write, reading to learn: Genre, knowledge and pedagogy in the Sydney School*. Bristol: Equinox.

Wells, G. (1979). Describing children's linguistic development at home and at school. *British Educational Research Journal, 5*(1), 75–89.

Chapter 3
Analysing Academic Texts

Chapter Overview
This chapter introduces a theoretical framework and metalanguage that researchers and teachers can use for analysing how language is used in academic contexts, in particular the variation of language according to different subject domains and the recurrent genres in these domains. The special features of genres specific to different academic subjects will be examined and how text analysis can be conducted by teachers and researchers to inform teaching will also be discussed.

3.1 A Functional View of Language

Academic language can be analysed using different linguistic theories. For instance, traditional school grammar books which draw on a structuralist linguistic theory usually teach sentence grammatical structures such as the 'passive voice', and the passive voice is said to be a feature of academic language (e.g. science laboratory reports). However, we do not get a lot of mileage if we analyse academic texts only focusing on linguistic structures without seeing these structural patterns as resources for achieving communicative purposes. A functional view of language will enable us to both ask and answer questions such as Why is the passive voice used frequently in academic genres such as laboratory reports or academic theses? What communicative function(s) does this linguistic structure realize in these types of texts? Can the function(s) be realized or achieved by using other kinds of linguistic structures? Are there disciplinary variations in these patterns? Are there some functions which are more important in science than in History, for instance? Is a similar function realized by different linguistic features in different subjects at different levels (and in different languages and cultures)? Furthermore, how can language teachers and

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different content subject teachers develop metalinguistic awareness about these questions and help their students identify and appreciate linguistic and functional variations across subject domains (and across different languages such as L1 and L2) so that they can make useful connections and comparisons of different academic language styles across different subjects (and languages)?

The approach to linguistic analysis of academic texts adopted in this chapter draws mainly on the seminal work by Michael Halliday, Raquia Hassan, Clare Painter, Jim Martin and David Rose in systemic functional linguistics (SFL) and the Sydney School of genre analysis and genre-based pedagogy. However, other linguistic and genre theories will also be drawn upon when they are relevant to the topic in focus. The difficulty created by the technical terminology of SFL will also be mitigated by drawing on some of the traditional pedagogical grammar terminology that most teachers and students are familiar with.

A functional approach to language analysis 'looks at how language enables us to do things in our daily lives' (Derewianka 2011, p. 3) or how we mobilize language as a resource to understand and construct (or 'construe'—i.e. construct using semiotic resources) the world around us, our social relationships, as well as our texts in both spoken and written modes.

A succinct summary of the SFL assumptions about language is presented by Derewianka (2011):

- Language is a dynamic, complex system of resources for making meaning.
- Language reflects the culture in which it has evolved. It is not a neutral medium, but expresses certain world views, values, beliefs and attitudes.
- Our language choices change from situation to situation, depending on the social purpose for which language is being used, the subject matter, who is involved and whether the language is spoken or written.
- The emphasis in language study is on how people use authentic language in various contexts in real life to achieve their purposes… [e.g.] on the language needed for successful participation in school contexts.
- A knowledge of grammar can help us to critically evaluate our own texts and those of others (e.g. identifying point of view; examining how language can be manipulated to achieve certain effects and position the reader in different ways; knowing how language can be used to construct various identities or a particular way of viewing the world) (Derewianka 2011, p. 3; words in square brackets added).

We can add to the above list the importance of multimodal and new media texts as increasingly we are immersed in not just spoken/written linguistic texts but also linguistic texts that are 'meshed with' visuals, (moving) images, hyperlinks [to other texts/images, music and sounds—in short, multimodalities (see Kress and van Leeuwen 2006)]. Also, language use in both primary/secondary and tertiary academic contexts will be discussed in this book.

3.2 The 'Genre Egg': A Metalanguage for Dissecting the Language Learning Task

A functional view of language focuses on analysing language use in context (i.e. as *text-in-context*) rather than on analysing language as abstract patterns and elements detached from real people using language as a resource to achieve their social purposes in real-life situations. In order to do this, an analytical framework is needed.

Martin (2010) provides a very good visual summary (Fig. 3.1) of the SFL model of how language is structured as hierarchical patterns at different layers (called strata). Linguistic analysis starts at the most macro-stratum of genre (e.g. analysis of the primary social goals of a genre) to the stratum of register (e.g. analysis of how the social goals of the genre interact with and shape the three dimensions—field, tenor and mode—of the register that affects language choices). The analysis then proceeds to the stratum of discourse semantics (e.g. analysis of how a text is schematically structured into stages, phases and messages to achieve its primary social goal) and to the stratum of lexico-grammar (e.g. analysis of how morphemes[1] combine to form words and how words combine to form groups, clauses and sentences) and ultimately to the microstratum of phonology/graphology (e.g. analysis of how phonemes combine to form syllables and tone groups).

In the above linguistic analysis, we do not start with the most microlevel (phonology/graphology) working up to the macro-levels of register and genre. That is, we do not start our linguistic analysis using a bottom-up approach, which is the way in which linguistic students and language teachers in education courses are usually taught (i.e. a bottom-up approach to linguistic analysis of the target language). As Rose (2015) points out, this bottom-up approach needs to be changed in order to help language learners to be able to apply bottom-level linguistic knowledge in authentic contexts of language use (i.e. to connect bottom-level patterns to register and discourse patterns):

> A similar [bottom-up] assumption underlies traditional language pedagogies–namely that by teaching the grammatical structures of classical and modern languages, linguistic analysis skills transfer to other learning tasks. Although grammar is explicitly taught, transference depends on students intuitively applying these skills to register and discourse patterns (Rose 2015, p. 5; words in square brackets added).

Rose (2015) continues to point out that this approach might work for some students, but other students might not benefit from it. In fact, many students might be turned off by the boredom of this bottom-up approach. Or, if they can bear with it to pass the tests and exams, it is very likely that they cannot apply the bottom-level linguistic knowledge (e.g. grammar knowledge) in authentic contexts of language use (i.e. in real-life registers and genres to achieve authentic communicative goals). The Reading to Learn (R2L) genre-based pedagogy (Rose 2010, 2015; Rose and Martin 2012) was developed to recontextualize this bottom-up approach to language analysis by starting from the level of genre and register patterns and helping students to connect these macro-discourse patterns to lexico-grammatical patterns.

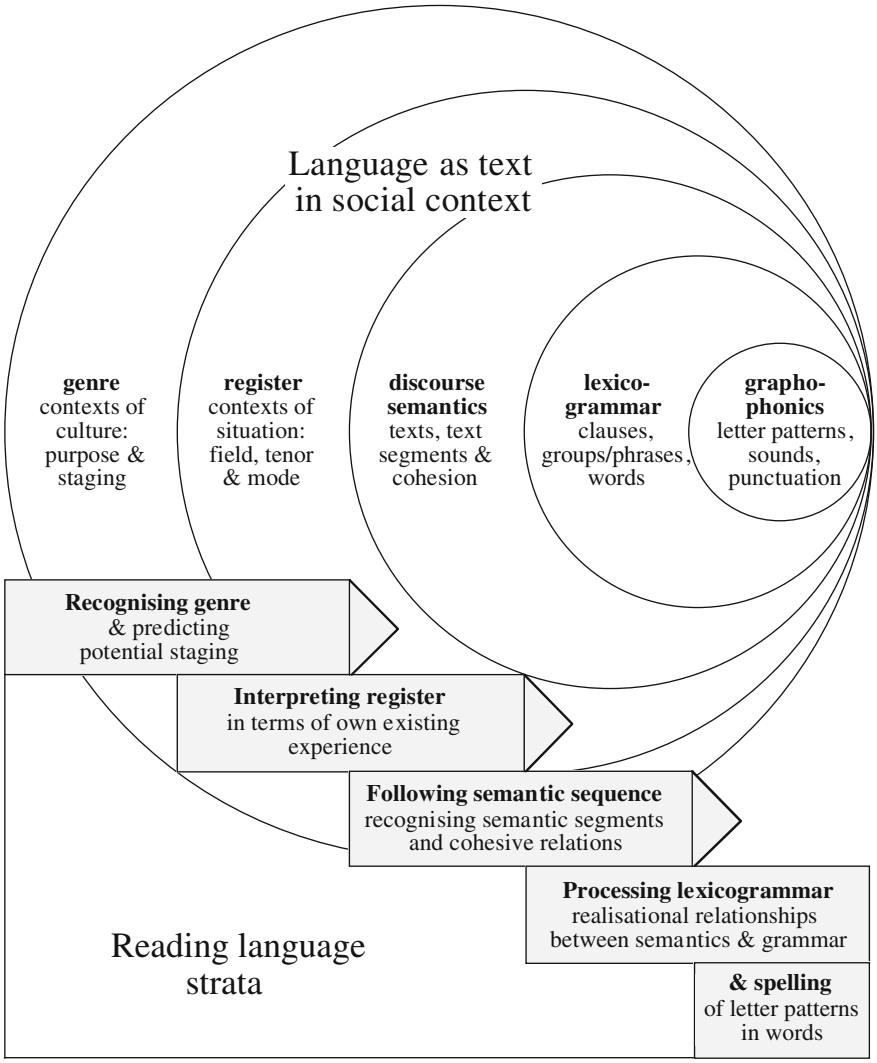


Fig. 3.1 Stratal and rank hierarchies in the linguistic model of SFL (image from Martin 2010, Slide 40; reproduced here by permission of Prof. Jim Martin)

The SFL model of *language strata* and *instantiation of meanings* provides a theoretical framework to understand and design studies on learning, curricular and pedagogical issues. It answers questions such as How is language structured and organized? How are these linguistic patterns hierarchically related? How do they simultaneously instantiate (i.e. exemplify) social meanings in context? From the SFL perspective, every time we produce or comprehend an instance of language, we are at once immersed in two contexts: (i) the context of the multiple levels of

contrasts (or options) in the language system (i.e. *paradigmatic* contrasts: What could go instead of what—choices about *selection*), and (ii) the context of the immediate contrasts in the unfolding text (i.e. *syntagmatic* contrasts: What goes together with what—choices about *combination*). The following family interaction reported in Painter (1993) helps to illustrate this:

> Father: This car can't go as fast as ours.
>
> Child: I thought–I thought all cars could–all cars could go the same–all cars could go the same (pause) fast…
>
> Mother: The same speed.
>
> Child: Yes, same speed.
>
> (Painter 1993, cited in Rose 2012a, p. 3)

In this example, the child is guided through the mother–child interaction in the context of shared experience (both the mother and child are in the car sharing the here-and-now context) to develop mastery of the linguistic contrast between 'fast' and 'speed' within the linguistic system of lexico-grammar (i.e. the contrast between an adjective and a noun). At the same time, the child is also immersed in the shared social context of interaction (i.e. the unfolding conversation text). Prior to the mother's provision of the right word ('speed'), the child seems to be struggling to find the appropriate linguistic item (from his fledging language system) to express his meaning, hence the pause before his coming up with the word 'fast', which has got the semantic meaning right but not the lexico-grammatical contrast (permitted by the language system) right (i.e. it is an adjective instead of a noun). This struggling effort seems to be reflected in his shifting extra conscious attention to finding the right linguistic structure from the linguistic system (of English) in order to instantiate a social meaning that he wants to contribute to the ongoing conversation (that all cars can go the same speed—that the father's statement needs to be corrected or qualified).

L2 learners, likewise, also often have this experience of struggling to find the right linguistic structure or contrast (from their fledging mastery of the L2 system) to instantiate a meaning which is often important in the context of ongoing social interaction. This linguistic struggle is one that many English language learners (ELLs) can resonate with: they feel that they have something important to say in this matter (e.g. in the ongoing academic argument) but only that they cannot find the right linguistic means to do so. In the same vein, 'focus on form/focus on meaning' is the researcher's analytic term to capture these quick moments of shifting extra conscious effort/attention between the *twin* contexts that every speaker, writer or user of language seems to be experiencing all the time (whether it is in one's L1, L2, L3 …). Notice that the mother's linguistic scaffolding (provision of the right linguistic structure) is *just in time* and *just in need* (Gee 2003). In second language acquisition (SLA) theoretical terms, it seems to be a focus-on-form (FonF) technique (Lyster and Ranta 1997) that the mother is using (a recast: 'the same speed') which has resulted in the child's *noticing* and subsequent *uptake* (i.e. using

the correct form 'speed' instead of 'fast') without interrupting the conversation flow. This focus on form would not be perceived by the child as equally helpful if the mother were to give the child a preconversation drill on the conversion between adjectives and nouns (e.g. fast ↔ speed), not to mention the fact that the mother could not have anticipated *all* the specific linguistic needs of the child as they arise moment-to-moment in everyday conversations. Also, chances are that the child will remember this linguistic feature better, and more importantly, how to use it in the appropriate context, as it is provided to him just when he is struggling to put *his* meaning into words (notice that it is *his* meaning and not the mother's meaning). All these will have important implications in our discussion on how to integrate content and language learning in Chap. 7.

How does this linguistic theory help us conceptualize the nature of the language learning task confronting the student? With a series of schematic representations of what I call the 'Genre Egg', Rose illustrates the different aspects of the language learning task based on the notion of *text-in-context*, which is delineated in (Fig. 3.2a–c).

Let us first look at Fig. 3.2a. The diagram conceptualizes the language learning task as one of learning to understand and produce not just a text but a *text-in-context.* That is to say, a text (whether spoken or written) is always a text produced and understood *in context*. The learner's task of understanding a *text-in-context* involves first understanding the primary social goal of the text (genre) and the three dimensions of the context—field, tenor and mode (register):

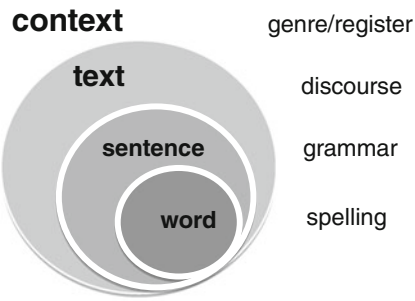
- What it's about—its subject matter (field);
- Who is involved—such as writer and readers, teacher and students, parent and child; and
- The social purpose of the text—what the speakers, writers and readers are trying to achieve (i.e. the social goal of the genre which the text instantiates).

Figure 3.1a shows that the linguistic *text(-in-context)* is crafted out at different linguistic levels: the levels of discourse (text), grammar (sentence) and spelling (word). In other words, the learner needs to simultaneously understand the text's contextual aspects (genre goals and register dimensions) as well as its linguistic aspects (e.g. linguistic choices made at the levels of discourse, grammar and spelling). As Rose (2010) delineates:

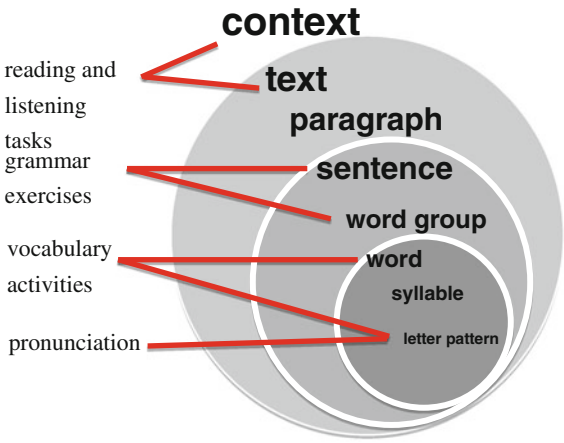
> This model of language as 'text-in-context' is derived from the theory of systemic functional linguistics (SFL). It seems like common sense because SFL is a theory of how people make meaning in language (Halliday 1994; Martin and Rose 2007), so it is very useful for investigating how language works, and how it is learnt, and then for designing effective language teaching strategies. (Rose 2010, p. 8)

So, how does the SFL theoretical framework inform us when we design language teaching and learning strategies? Figure 3.2b, c shows two different ways of approaching the language teaching/learning task: (i) the disintegrating approach and (ii) the integrated approach. In Fig. 3.2b, under the disintegrating approach, the language learning task is disintegrated into separate tasks such as reading and

(a) The language learning task–text-in-context



(b) Disintegrating the language learning task



(c) An integrated approach

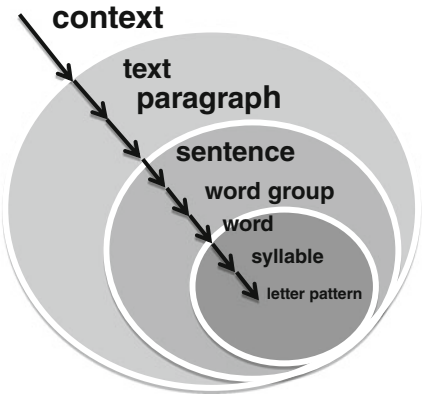


Fig. 3.2 **a–c** Illustrating different conceptualizations of the language learning task (images from Rose 2013, Slide 3, 7 and 8; reproduced here by permission of Dr. David Rose)

listening to texts, grammatical exercises, vocabulary activities and pronunciation practice. These tasks might be done separately and might not need to follow any particular sequence. In contrast, in Fig. 3.2c, under the integrated approach, the language learning task is always approached by reading the text-in-context while at the same time drawing students' attention to the linguistic choices that the author made at different linguistic levels (e.g. paragraph, sentence, word group, word…) to achieve the overall communicative purpose of the *text-in-context*.

To understand the theoretical basis of these two approaches as discussed by Rose, let us revisit in more detail the SFL theory of the stratified organization of language as *text-in-context* and the relation between language systems and instances in texts, i.e. *stratification* and *instantiation*. As mentioned in Sect. 3.1, SFL theorizes language as a hierarchical system of different stratified layers (i.e. strata) of patterns of different combinations of elements, which together instantiate meanings (see Fig. 3.1). Rose (2010) delineates stratification and instantiation as follows:

> Stratification refers to the organisation of language and its social contexts as a hierarchy of levels or strata. The relation between strata is modeled in SFL as *realisation*. Thus patterns of meaning in texts (or discourse semantics) are realised (manifested/symbolized/expressed) by function of words in clauses (lexico-grammar), which are realised by patterns of sounds or letters (phonology or graphology). Looking up the hierarchy to social context, language enacts social relations between speakers (tenor), construes the activities they are involved in (field), and plays various roles in doing so (mode). Collectively, field, tenor and mode are referred to as register … and together realise the global social purpose of a cultural context or genre. …
>
> … Instantiation refers to the relation between features in language systems and instances of meaning in actual texts. Thus each genre and its attendant register variables (field, tenor, mode) is a specific instance of the language system as a whole. Within each genre we can then distinguish more variable sub-types, and each text is recognizable as an instance of one of these types. Instantiation occurs at all language levels, for example, … sequences of phonemes in a word instantiate phonological systems. (Rose 2010, pp. 1 and 3; italics added)

The disintegrating approach (Fig. 3.2b) is one that many of us are familiar with, e.g. the Chinese practice of teaching children to write by starting with tracing the pattern of the strokes to form a Chinese character. The phonics approach is also an example of explicit teaching of bottom-level linguistic (e.g. phonological, graphological) patterns by helping students to form letter–sound relationships early on so that they can have the skills to decode or 'sound out' new words. The disintegrating or bottom-up approaches are criticized by top-down approaches such as the whole language approach (Goodman 2005) which emphasizes literacy learning in holistic meaningful contexts and de-emphasizes explicit teaching of bottom-up patterns and skills. In L2 learning, the top-down approach is manifested

as the communicative language teaching (CLT) approach (Littlewood 1981). Migrant children, linguistic minorities and L2 learners (e.g. EAL learners), however, might need to be explicitly taught some of the bottom-level skills as they often do not have enough naturalistic experience with the L2 to infer these patterns/relationships themselves without explicit teaching. How to resolve the tension between bottom-up approaches (often criticized as decontextualized) and top-down approaches (often criticized as neglecting the development of basic language skills) remains a key question in the literature (e.g. No *Phonics* against *Whole Language*). Rose (2010) summarizes this situation well:

> Different approaches to literacy try to handle the complexity of learning to read and write in different ways, depending on the particular theory of language they come from.
>
> - Phonics, phonemic awareness and basal reading book programs start at the bottom, with sounds and letter patterns, then words, then phrases, then sentences.
> - 'Sight word' approaches and spelling lists focus on recognizing words and their letter patterns.
> - Grammar activities in school and ESL programs focus on rules for word groups and sentences.
> - Traditional composition writing focused on sentences in paragraphs.
> - Whole language and critical literacy approaches focus at the top, on what the text is about. This also includes shared big book reading in the early years.
> - Genre writing (text types) starts with the context, then focuses on the staging of texts, as well as various language features.
>
> Most teachers use a 'balanced approach' that addresses the various parts of reading and writing tasks with a combination of strategies. However, each activity may be done in a separate part of the day's program, using different texts, sentences, words and letter patterns. For children with rich experience of reading in the home, each of these activities is meaningful, so they can put them together and develop as readers and writers. But children without such experience often struggle to understand and synthesize all these activities, and so develop more slowly. (Rose 2010, p. 11)

Up to now, the reader might think that the integrated approach is similar to the top-down approach. However, Rose's notion of the *integrated* approach is actually very different from the top-down approach. To Rose, the top-down approach errs in not providing enough scaffolding to the learner in acquiring the bottom strata patterns. To Rose, in the extreme form of top-down approaches,

> all explicit teaching of language features was rejected from both the classroom and teacher training, leading to generations of students and teachers without the rudimentary knowledge of language afforded by traditional school grammars (2012a, p. 4)

Rose's integrative approach refers to the Sydney School genre-based pedagogy, which seeks to integrate both bottom-up and top-down approaches by proposing a *teaching/learning cycle (TLC)*; as Rose (2012a) explains:

> …[genre] pedagogy begins not with low level language features nor with a generalized notion of communicative contexts but with the specific social purposes and staging of written genres. Furthermore, its starting point is not with decontextualised language systems but with instances of actual texts. In the teaching/learning cycle designed by Joan Rothery and colleagues (Rothery 1994), an instance of a genre is 'deconstructed' by the teacher and students by reading it together and guiding students to recognise its stages and key relevant language features. After deconstructing the model text, teacher and students then jointly construct a new text, using similar organisation and key language features, but writing about a field that they have built up together. (Rose 2012a, p. 4)

These different layers of pedagogical activity—building content (field), analysing (deconstructing) the genre and jointly constructing a text—all prepare students for the task of constructing a new text of their own. The teaching/learning cycle (Rothery 1994/2008) is schematized in Fig. 3.3. The Sydney School of genre-based pedagogy will be discussed in more detail in Chap. 5. In this chapter, we shall mainly look at the first layer of the teaching/learning cycle: deconstructing or analysing the text.

Our discussion has so far focused on different conceptualizations of and approaches to the language learning task. The content teacher might be asking this question: What has the language learning task got to do with my content teaching? Since one fundamental principle underlying this book is the assumption that language and content cannot be separated, the learner's task of learning content cannot be separated from the task of learning the kinds of linguistic resources that are

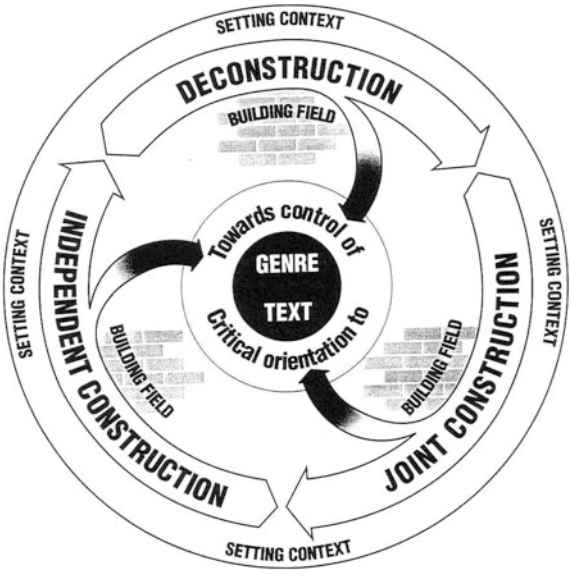


Fig. 3.3 The teaching/learning cycle (image from Martin and Matthiessen 2014, Fig. 9.6, p. 149; reproduced by permission of Springer)

essential to construing (or constructing) the content in a specific field or domain. Below, we shall focus our discussion on how we can develop a metalanguage for both content teachers and language teachers to talk about and analyse academic texts in different content fields.

3.3 Analysing Academic Texts in Content Subject Domains

The 'Genre Egg' framework is useful in providing a metalanguage (or a common vocabulary) for both content teachers and language teachers to work together to analyse academic texts found in content subject areas. Without a common vocabulary, it is almost impossible to foster collaboration between the language specialists and content specialists as they are typically trained in different disciplines with different theories and concepts underpinning their pedagogical practices. For instance, a math teacher once said to me, 'In math lessons we focus on communication, not language'. At that time, I found it hard to make sense of her sentence, precisely because she seems to be making a semantic contrast between 'communication' and 'language' as if the two are not related, or perhaps, what she wanted to say is that math teachers do not focus on highlighting language aspects but just focus on getting messages across. Many language teachers might have a similar experience when trying to communicate with content teachers about language matters (and how language *matters* in content learning and teaching). On the other hand, content teachers might find it hard to communicate with language teachers as they are often put off by the language teacher's use of technical linguistic terms (e.g. gerunds, imperatives and type I/II conditionals).

How would the 'Genre Egg' framework provide an accessible common vocabulary for both content specialists and language specialists to communicate with each other about the language demands of academic texts and genres found in content subject domains? I have developed an adapted version of the SFL Genre Egg (Fig. 3.4) to present to both content teachers and language teachers in seminars

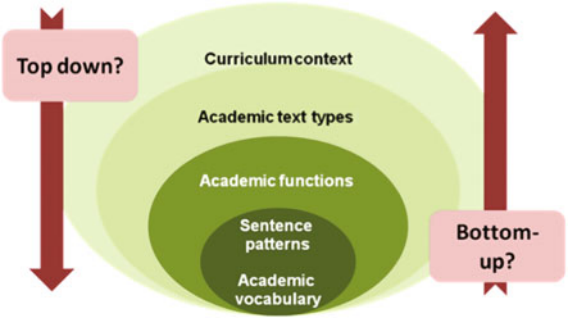


Fig. 3.4 The 'Genre Egg' (from Lin 2010)

on language across the curriculum. Usually, a practical concern of teachers is how they can provide language support to students learning content subjects in an L2 and how content teachers and language teachers can collaborate in providing this support. With the Genre Egg as a common analytical framework, both content teachers and language teachers can conduct analysis of the linguistic demands at different levels (e.g. vocabulary, sentence patterns, language functions, genre conventions) of key academic texts in a subject domain and then to collaborate on designing tasks that would provide language support to their students (more on task design in Chaps. 5 and 6). In the following, I shall demonstrate how the adapted 'Genre Egg' can assist teachers and researchers in conducting analysis of academic texts and how the analysis can inform our teaching.

3.3.1 Analysing Academic Vocabulary

The research literature speaks of three general types of academic vocabulary (Mercuri 2010). The first type is field-specific, technical vocabulary, for instance, in the field of science, e.g. *water cycle, pollination, antioxidant, partition coefficient and photodiode*. The second type is general academic vocabulary which is found in academic texts across a range of subjects. For instance, Coxhead (2000) has collated a list of 570 high-utility academic *word families*. The word family of 'analyse' will contain words such as analysis, analyser, analytical and analytically. The third type is linking words or logical connectors such as *however, in contrast, firstly and secondly*, which indicate the logical relationships between different parts of the text.

Application Scenario 3.1
In Text 3.1, can you find examples of the three types of academic vocabulary? Use a different colour to highlight the three different types of academic vocabulary.

Text 3.1
In the process of photosynthesis, carbon dioxide is taken in by plants through the *stomata* of their leaves. Simultaneously, the plants release oxygen and excess water through the stomata, providing us with fresh air.

Application Scenario 3.1 represents a simple *focus-on-form* exercise that teachers can use to raise both their own and their students' academic language awareness. Examples of field-specific technical vocabulary are *photosynthesis, carbon dioxide and stomata*. Examples of general academic vocabulary include *release and excess*. An example of logical connectors is *Simultaneously*. It is

important to notice that the boundaries between field-specific vocabulary can be blurred as more and more technical words have spilled into everyday life through repeated exposure in the mass media, e.g. QE (quantitative easing, subconsciousness, antioxidant, high-maintenance). Likewise, the boundary between field-specific vocabulary and general academic vocabulary can be porous, e.g. 'the water cycle' is a technical name given to a process in science and yet the word 'cycle' is found in many other academic texts as a productive element in the formation of names of field-specific processes (e.g. the teaching/learning cycle; the recession cycle). Sometimes, the field-specific technical vocabulary looks like everyday vocabulary and can lead to misunderstanding of academic concepts. For instance, words such as 'force' and 'pressure' in physics have specialized definitions, and if students interpret them using their everyday life understanding of these words, confusion can arise.

The aim of this kind of simple vocabulary analysis is to gauge the language demands of a text at the vocabulary level. For instance, if there is too high a concentration of academic vocabulary, the text might need to be adapted to suit the proficiency level of students in a particular class. For instance, 'release' can be replaced by 'give out'; 'excess' can be omitted without considerably changing the meaning of the text. While this will be very useful for EAL students, this will also be relevant to L1 speakers of English especially those students coming from disadvantaged backgrounds or those who speak a local variety of English as a home language. On the other hand, if the texts used in a subject curriculum are all simplified texts that do not provide students with enough exposure to field-specific vocabulary, then some intervention needs to take place (more on this in Chaps. 4–6). Content teachers and language teachers can also discuss how they can design enrichment tasks and coordinate their efforts in helping students master these different kinds of vocabulary across the curriculum (more on this in Chap. 7).

3.3.2 Analysing Sentence Patterns that Realize Language Functions

Lexico-grammatical patterns (or 'sentence patterns', which is a term that can be more easily understood by both content and language teachers) realize a range of language functions that are commonly found in academic texts, e.g. comparing and contrasting, exemplifying, defining, classifying, interpreting, hypothesizing, predicting, giving evidence and expressing conditional or causal relationships. More or less similar lists of functions are given different names under different theoretical frameworks, e.g. knowledge structures (Mohan 1986; Kong 2009); aspects of the scientific method (Zimmerman 1989); rhetorical functions (Hirvela 2004); and language functions (ELDAC). I have chosen to call them 'language functions' following ELDAC as this term can be easily understood by teachers. An example of

an important language function in academic texts is *defining*. Let us analyse Text 3.2 to illustrate how this function is realized in lexcio-grammatical (sentence) patterns.

Application Scenario 3.2
Can you find the sentence that realizes the function of defining? Can you analyse the lexico-grammatical (sentence) pattern of such sentences?

Text 3.2
Preservatives are additives that maintain the freshness and quality of food. They prevent food from spoilage caused by mould, bacteria and yeast and from flavour and colour changes due to exposure to oxygen.
Many countries have laws that ensure that manufacturers list all preservatives used together with the amounts on the ingredient part of the label. Chemical names such as *sodium nitrate* and *sodium benzoate* are often found on the labels of food products.

You would notice that the author of this Grade 4 science text chooses to define 'preservatives' right at the beginning of the text just as this term is introduced: '**preservatives** are additives that maintain the freshness and quality of food'. Similarly, Text 2.2 in Chap. 2 has a similar pattern: '**flowering plants** are classified as high-class plants'. The field-specific term ('flowering plants' and 'preservatives') is bolded to highlight its key term status, and it is immediately defined by first classifying it into a category of entities (e.g. 'high-class plants' and 'additives'). Then, some unique features are provided (although this part is omitted in the sentence in the flowering plants text).

A sentence pattern that is useful in realizing the language function, *defining*, can thus be outlined (Table 3.1).

Here, we minimize the linguistic terminology to make this sentence pattern easily grasped by content teachers who do not have a linguistic background. When content teachers read this text with students, it is useful to highlight at some point how useful language functions such as *defining* can be realized by sentence patterns like this. As teachers guide the students to experience instances of *defining* like this

Table 3.1 A sentence-analysis/sentence-making table to analyse and generate useful sentences to do *defining*

X	=	Y	
Preservatives	are	additives	that maintain the freshness and quality of food.
Technical term	Relating verb	General class word	Clause/phrase giving specific characteristics

in repeated encounters with them in different academic texts, the academic language awareness of students will be raised. They will start to become not just *information readers* or *form readers* (Cai 2014), but also *rhetorical readers* (Hirvela 2004) or *writerly readers*, i.e. they will now have an eye for noticing the lexico-grammatical resources (e.g. words and sentence patterns) useful in achieving different rhetorical or language functions such as *defining*, which they can use themselves when they are constructing an academic text of their own (e.g. in assignments, projects, presentations or examinations). It is important to highlight to students that there are usually many more diverse ways of achieving a rhetorical or language function although some basic linguistic resources (such as the sentence pattern outlined above) can be useful to start with. Students can be encouraged to keep a 'writerly reader's notebook' where they jot down instances of different recurrent functions which they come across in different texts in different subject areas.

My research associate Emily He and I have analysed the Sarasas Science Corpus (which we have built from the grades 1–6 science textbooks used in and published by the Sarasas Affiliated Bilingual Schools, Thailand) and have found many more instances of the 'defining' function in the corpus (Table 3.2).

The key point in deconstructing/analysing academic texts is thus to heighten the academic language awareness of both (content/language) teachers and students so that each individual experience (or encounter) with a curriculum text becomes a learning opportunity to infer the linguistic resources (e.g. vocabulary and sentence patterns) useful for achieving functions, and these resources can come in useful when students are constructing texts of/on their own (i.e. they become *writerly* readers—reading with an eye to becoming a writer themselves). It is important that students are encouraged to discover these patterns from the texts they read in their subject domains (initially under the teacher's guidance), and they can keep *a writerly reader's notebook* on these patterns, instead of just teaching them a list of

Table 3.2 Instances of the language function *defining* in the Sarasas Primary Science Corpus (from Lin and He 2014)

Terms	→	**General class**	**Specific details**
Fertilizers	are	compounds	made to support plants' growth.
Vitamins	are	organic compounds	found in fruits, vegetables, also in meat, eggs, milk and animals' internal organs.
Minerals	are	organic chemical elements	found in vegetables, fruits, milk, meat, egg yolks and all kinds of seafood.
Calorie	is	a unit of energy	used as a measurement for the amount of energy a particular food provides.
Flowers	are	the structures	where reproduction takes place.
Fruits	are	ripened ovary walls of flowers	that contain seeds.
Fertilization	is	the process	where the male's pollen grains fuse together with the female's ovules inside the ovary and become one new cell.

decontextualized sentences outside of the curriculum context. In other words, these instances of language functions need to be experienced and noticed in a meaningful *text-in-context*. And this 'noticing' process (or 'focus on form') must not impede content learning (i.e. not turning a content lesson into a language lesson), and this requires skilful 'shifting' between *focus on form* and *focus on content* on the part of the teacher. We shall discuss this in more detail in Chap. 5.

There are many other useful language functions such as *exemplifying*. In Text 3.2, can you find the sentence pattern(s) used to achieve this academic function? Notice that there are often diverse ways of achieving a similar function in different texts and genres. Different researchers have come up with different categories of functions. For instance, researchers of the English Language Development Across the Curriculum (ELDAC) Project have come up with a list of 19 language functions (ELDAC Functions Index, see Department of Education Queensland, 1989). Kong and Hoare (2008), following the knowledge structure framework of Mohan (1986) and Tang (1992), have come up with a list of knowledge structures, which resemble what other researchers call functions. Cutting-edge research is being conducted by Dalton-Puffer (2013) on cognitive discourse function (CDF) which seeks to provide a comprehensive and yet teacher-friendly list of CDFs (more on this in Chap. 9).

Whatever theoretical traditions or functional taxonomies we choose to follow, it is important to recognize the need to allow students the opportunity to discover how these functions are realized in texts that are meaningful to them. A pitfall exists for teachers to organize their lessons simply according to a list of 'functions—sentence patterns' that are presented to students in decontextualized ways. It is very important to help students to see how these functions contribute to achieving the overall communicative purpose of a text in a specific genre (e.g. a descriptive report) rather than as a set of isolated functions standing on their own.

Academic texts in tertiary education are usually much more complex, and functions are generally realized with much more sophisticated lexico-grammatical patterns that can be outlined in a few basic sentence patterns. They are also tightly related to the generic structuring or organization of the text to achieve the overall purpose of the text. Teachers can encourage students to read with a 'writer's eyes' to see how these functions are typically realized in context. Teachers can continue to raise students' academic language awareness to a point when students can see these patterns on their own. We shall discuss more of this in Chap. 5.

3.3.3 Analysing Academic Genres in a Curriculum Context

In the Genre Egg (Fig. 3.5) that guides our analysis of academic texts, the layer embedding language functions and vocabulary is text type or 'genre'. While genre is defined slightly differently under different theoretical traditions (see review of the three traditions by Hyon 1996), the Sydney School's definition seems to be most useful to teachers:

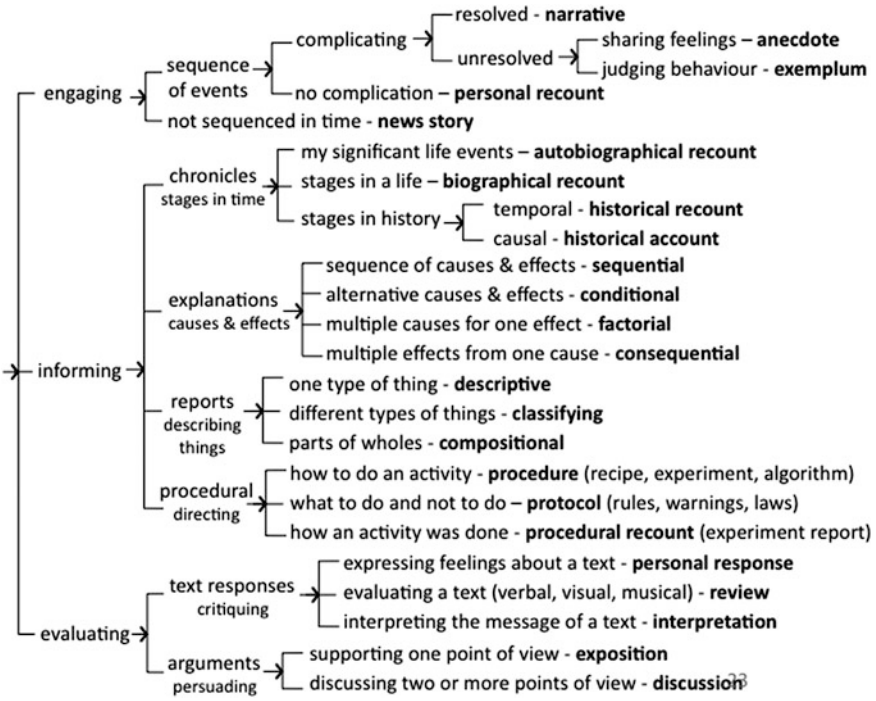


Fig. 3.5 Genres in the school curriculum (from Rose 2012b, Slide 12; reproduced here by permission of Dr. David Rose)

> The Sydney School approach starts with a broad definition of genres as 'staged goal-oriented processes': they are goal-oriented because a text unfolds towards its social purpose, and staged because it usually takes more than one step to reach the goal. Genres evolve in a culture to achieve common social purposes that are recognised by members of the culture so that the stages they go through are generally predictable for members of the culture. (Rose 2012a, p. 1)

Genres are thus patterned ways of organizing our speaking and writing for specific communicative purposes in specific contexts. To succeed in school or university, a student needs to master a number of key academic genres for different academic subjects, e.g. to write a book review for the English class, to write an expository essay for a social studies assignment, to write a descriptive report on endangered species or to write a research proposal or research report for the science or engineering project. Genres are usually introduced to students as 'text types', though we must remind students of the fluid and evolving nature of genres so that students see text types as helpful tools rather than static, set-in-stone templates for speaking and writing.

Different theoretical traditions have approached genre analysis using slightly different terminologies, but they basically follow the same procedure of identifying

Table 3.3 Genre analysis of a Grade 4 science text—flowering plants

Introduction	
Classifying	Flowering plants are classified as high-class plants.
Description 1: adult stage	At the adult stage, they produce flowers which develop into fruits and seeds after being pollinated and fertilized.
Description 2: examples	Tulips, water lilies, mangoes and bananas are examples of flowering plants.

stages and phases in a text (called 'moves and steps' in John Swales' genre analysis tradition) as the text unfolds to achieve its primary communicative purpose.

If we revisit Text 2.2 in Chap. 2 (which is reproduced in Table 3.3 with genre structure analysis in the left margin), we shall notice that this short Grade 4 science text is an instance of a descriptive report under the taxonomy of school genres developed by the Sydney School of genre analysis (Martin and Rose 2008, 2012). A descriptive report usually has two stages: Introduction ^ Description (the symbol ^ is used to indicate 'followed by'). In the Introduction stage, the topic is introduced, usually by defining or classifying it. Then, the text unfolds into the Description stage, where more descriptive details are given. While the *stage*s are quite predictable across different instances of the genre, the *phases* under each stage can be quite variable, and so instead of prescribing a template for writing a descriptive report, students can be encouraged or guided to discover both the predictable stages and the variable phases across different texts in different curricular contexts.

The school genres identified by the Sydney School researchers are divided into three main types depending on their global communicative purpose: Informing, Engaging, Persuading (Fig. 3.6). David Rose, in particular, has written a series of booklets entitled *Reading to Learn* (http://www.readingtolearn.com.au/) which presents the Sydney School genre-based pedagogy in teacher-friendly language with many practical examples drawn from genre analysis of the Australian school curriculum texts.

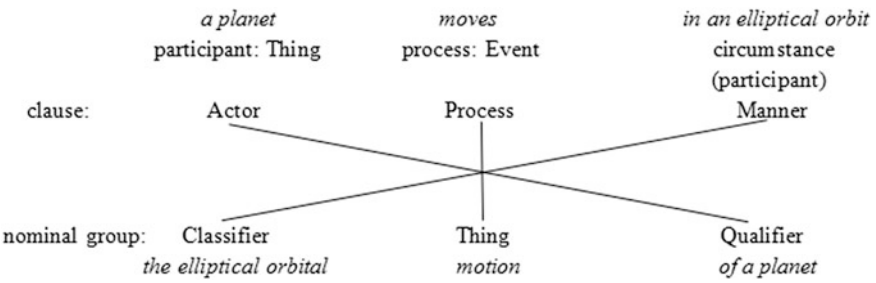


Fig. 3.6 Grammatical metaphor: shifts in grammatical class and functional status

The Sydney School genre researchers have mostly worked on analysing school genres and have made great contribution to the teaching of academic literacies in school settings. As for genre analysis of academic texts in university settings, it is the English for Academic Purposes (EAP) and English for Specific Purposes (ESP) studies which are influential in the literature. John Swales and his colleagues have conducted genre analysis on research writing genres, catering for the L2 EAP needs of international students in universities in the US Swales' CARS (Creating A Research Space) model (1990) for writing in research genres which is classic now and frequently drawn upon in academic writing courses in universities.

3.4 Technicality and Abstraction

It is generally rather easy to distinguish academic writing from other kinds of writing, as academic language is usually characterized by a high level of *technicality* and *abstraction*, two notions introduced by Halliday and Martin (1993). Halliday (2004) describes the 'history' of the evolution of language forms on the individual plane (ontogenesis), on the societal plane (phylogenesis), as well as on the textual plane (logogenesis). 'History' is here understood as having three dimensions:

(1) the history of the child's language development,
(2) the history of the evolution of language, and
(3) the unfolding of the text (or information flow of the text).

On the ontogenetic plane, the child goes through three stages:

- from protolanguage to language,
- from everyday spoken grammar to the grammar of written language (or literacy), and
- from the grammar of written language to that of the language of the subject disciplines (e.g. science, mathematics, geography, history).

Speaking in terms of knowledge development, the critical moments are when the child learns to develop additional layers of knowledge:

- Common-sense knowledge (age 1–2),
- literate educational knowledge, (age 4–6),
- technical knowledge (age 9–13) and
- theoretical knowledge (age 18 onwards).

Developing the additional layers of educational and technical knowledge, the child needs additional language resources to construe and configure these new layers of knowledge. The language for these additional layers of knowledge is characterized by increasing *lexical density* but decreasing *grammatical delicacy* (or clausal complexity). Let us illustrate these ideas with the hypothetical 'repacking' examples provided by Halliday (2004: 31–32):

1. Look—it must be raining! People have their umbrellas open.

The above sentence might very naturally be said by a 3-year-olds, and Halliday shows how this sentence can be 'repacked' step by step going up the age range (age is included in brackets at the end of each sentence):

2. How can you tell that it's raining? You can see that people have got their umbrellas open. (6)
3. We can prove that there's rain falling by seeing that people's umbrellas are open. (9)
4. What best proves that it's rainy weather is the fact that the umbrellas have been extended. (12)
5. The best proof that the weather is pluvious is the fact that the umbrellas are extended. (15)
6. The truest confirmation of the pluviosity of the weather is the extendedness of the umbrellas. (18 up)

To successfully participate in school work, the child needs to learn how to repack sentence 1 into sentences 2 and 3 in primary school and further into sentences 4–6 in secondary school. As the child gets increasingly apprenticed into school ways of writing, the sentences that they produce are marked by increasingly complex nominal groups but decreasing grammatical delicacy. Grammatical delicacy or intricacy refers to the complexity of clause structure. For instance, sentences 2–3 are dominated by verbal clauses and their structure can be schematically represented as follows:

Sentence 2: How can you tell *A*? You can see *X*.
(*A* = that it's raining) (X = that people have got their umbrellas open)

Sentence 3: We can prove *A* by seeing *X*.
(*A* = that there's rain falling) (*X* = that people's umbrellas are open.)

On the other hand, sentences 4–6 have a simpler sentence structure but increasingly more generalized and abstract nominal (i.e. noun) groups:

Sentences 4–6: **B** is **Y**.
(**B** = What best proves *A'*) is (**Y** = the fact that *X'*),
(**B** = The best proof that *A''*) is (**Y** = the fact that *X''*),
(**B** = The truest confirmation of *A'''*) is (**Y** = *X*'''),
Wherein:
A' = that it's rainy weather,
A'' = that the weather is pluvious,
A''' = the pluviosity of the weather,
X' = the umbrellas have been extended,
X'' = the umbrellas are extended, and
X''' = the extendedness of the umbrellas.

We can notice that the nominal groups (B, Y) in sentences 4–6 are becoming increasingly abstract, and they function to re-present a dynamic process into a static nominal entity. This abstraction process takes away the specificities of the 'here and

now' of what is happening (it's raining) and turns it into a general, impersonal, atemporal, static and abstract concept (the pluviosity of the weather). However, the clause structure is a relatively simple one, i.e. a relational clause (B = Y). It can be said that the child initially lives in a world of rich clause complexes (e.g. If you don't give me …. I'll tell Mum about it…!), and upon entering the school, the child starts to encounter both technical and abstract nominalizations; e.g., preservatives are additives that help maintain the freshness and quality of food. In this sentence, preservatives and additives are both technical terms. Preservative is a nominalized entity; i.e., the verb *preserve* is turned into the noun *preservative* (to refer to the chemicals that function to preserve food) and becomes further technicalized—it is a technical term. The same process has taken place with the verb *add* which is converted into the noun *additive* (chemicals that are added to food) and is given field-specific, technical meaning in the discipline of science. The adjective *fresh* is turned into the noun *freshness*; however, it has not gained the status of technical term and can readily be unpacked back into everyday language and its meaning is not field-specific (i.e. not technical). We can see that technicality and abstraction are the result of linguistic transformation processes, which are called *nominalization* and *grammatical metaphor*. Both are technical terms themselves in the discipline of linguistics and need to be unpacked with further explanations below.

3.4.1 Nominalization and Grammatical Metaphor: The Linguistic Engine for Constructing Technicality and Abstraction

Consider the adjective, 'hot'. When it is used in everyday language, one can say, 'Be careful, the water is hot!' However, in a science textbook, the adjective 'hot' becomes nominalized (i.e. turned into a noun) as 'heat', which is then turned into a technical term that can be classified into different types, e.g. latent heat and radiant heat. Scientists can also talk about 'heat transfer' (e.g. it would be difficult to talk about 'heat transfer' if there is only the word 'hot' without the technical term 'heat' in the language of science). Sometimes, the L1 of the students might not encode or construe technicality in the same way as English. For instance, the Chinese word for 'heat' (technical term, a noun) and 'hot' (everyday word, an adjective) is the same: 熱 and this has an impact on Chinese students' learning of the concept of 'heat transfer' (Fung and Yip 2014). Another example is the verb, 'move'. When it is used in everyday language, it is easy for an EAL learner to pick it up in conversations, e.g. 'Move on! Quick!' However, in a science textbook, the verb 'move' becomes nominalized as 'motion' and becomes a technical term, as Halliday explains:

> So, for example, when we turn *move* into *motion* we can say things like *all motion is relative to some fixed point*; we can set up *laws of motion*, and discuss problems like that of *perpetual motion*; we can classify *motion as linear, rotary, periodic, parabolic,*

> *contrary, parallel*, and the like. Not because the word *motion* is a noun, but because in making it a noun we have transformed 'moving' from a happening into a phenomenon of a different kind: one that is at once both a happening and a thing. … By calling 'move' *motion*, we have not changed anything in the real world; but we have changed the nature of our experience of the world. (Halliday 2004, pp. 15–16; italics original)

There is no mystery in academic language as we can actually trace the origins of academic language (and their technicality and abstraction) in everyday interpersonal conversations. For instance, Halliday mentions the example of his son, Nigel, when he was 3:

> When my son was small, he used to play with the neighbour's cat, which was friendly but rather wary, as cats are with small children. On one occasion he turned to me and said 'Cats have no other way to stop children from hitting them; so they bite'. He was just under three and a half years old. Some years later, in primary school, he was reading his Science textbook. One page was headed: 'Animal Protection'; and underneath this heading it said 'Most animals have natural enemies that prey upon them. … Animals protect themselves in many ways. Some animals … protect themselves with bites and stings.' (Halliday 2004, pp. 12–13)

So, in repackaging a verbal process (*so they bite*) into a nominal entity (some animals protect themselves with *bites*), the primary science textbook has re-presented the child's common-sense knowledge as school knowledge or educational knowledge. If one needs to help an L1 child to go through these linguistic transformation processes in order to succeed in school, helping L2 learners (e.g. EAL students) to *unpack* academic language into everyday language as well as to *repack* everyday language into academic language (e.g. in writing assignments and examinations in schools or writing research reports or papers in university) becomes an even more important curricular and pedagogical design question when L2 is used as the medium of instruction (MOI) in schools. In order to do this, it is worth spending some more effort in understanding the lexico-grammatical resources that have evolved in the English language (and in many other languages as well, e.g. Chinese) to construct *technicality* and *abstraction* in different academic disciplines through nominalization and the use of grammatical metaphor.

Technicality 'refers to the use of terms or expressions … with a specialised field-specific meaning' (Halliday and Martin 1993, p. 144). In the example above, the word 'bites' has not been turned into a technical term. It functions mainly to make school language more abstract and to package information in a more compact manner (e.g. with higher lexical density). However, the disciplines of physical sciences (physics, chemistry, biology, earth science) have employed a process of technicalizing which involves two steps: (i) naming the phenomenon and (ii) making that name technical (i.e. with field-specific meaning) (Halliday and Martin 1993).

To support students in tackling technical academic texts, this two-step process can be highlighted to students to show how a term has become technicalized in a specific discipline. This explicit discussion can heighten students' awareness of how everyday words are transformed into technical terms (e.g. add → additives; preserve → preservatives). Likewise, students can be explicitly engaged in

discussing the different technical (i.e. field-specific) meanings that different disciplines give to seemingly similar terms (e.g. the word 'field' has a very different meaning in science, Mathematics and daily life, respectively). Once these action-processes (verbs) are turned into entities (nouns), a lot of things can be done with them, e.g. you can pluralize them (e.g. additives), qualify them (e.g. food additives) and 'tag' more information onto them (e.g. modern-day food additives).

Technicality is closely linked to an important practice that the disciplines of modern physical sciences have evolved to embrace. Modern sciences are basically about naming, defining, describing, classifying phenomena and establishing hierarchies of taxonomies of these phenomena (Halliday and Martin 1993). Mastering the academic subject science is about mastering these taxonomies which consist of technical terms that enter into different taxonomic oppositions (e.g. living things vs. non-living things; flowering plants vs. non-flowering plants; vertebrates vs. invertebrates; plant cells vs. animal cells). Naming, defining, classifying, describing, exemplifying, comparing and contrasting and so on thus become important *cognitive discourse functions* that students need to learn to master in relation to the subject content of modern sciences. These functions are simultaneously cognitive and linguistic/discursive as they require students to apply the technical terms and taxonomies (embedded in the specialized discourses of the disciplines) to name, define, describe, compare, contrast and classify different physical (and social) phenomena. Learning content in the science subject is thus a semiotic process, i.e. learning to use the technical terms and taxonomies (i.e. specialized discourses) handed down from the traditions of the disciplines to see (or construe) the world around them or to make technical sense of (or technical meaning out of) their everyday experience (i.e. to turn or reconfigure their experience into technical knowledge) (Lemke 1990).

However, technicality is only half of the story of the evolution of the academic language in the past five hundred years (Halliday 2004). Analysing the science writings of key figures (e.g. Bacon, Descartes, Newton) in Western science, Halliday comes to the conclusion that starting from the sixteenth century and increasingly so into the nineteenth centuries, science writings in the Western tradition have gone through not just a technicalizing process but also an abstracting process. Specifically, these writings have used the lexico-grammatical resources of nominalization and grammatical metaphor to construe the technical and abstract knowledge of their disciplines. We have explained nominalization above, and let us explain grammatical metaphor below.

Grammatical metaphor is closely linked to nominalization. When a nominalized word or group functions *as if* it were a grammatical *participant* (e.g. grammatical *subject* or *object* in traditional grammar terminology), it is called a grammatical metaphor. For instance, consider the following clause and its nominalized counterpart:

clause: a planet moves in an elliptical orbit

nominal group: the elliptical orbital motion of a planet

Figure 3.6 shows a schematic explanation of how the verb *move*s which functions as a *process* (in the original clause: a planet moves in an elliptical orbit) becomes nominalized as *motion* and functions as a *thing* in the nominal group (the elliptical orbital motion of a planet). This analysis is modelled on the analysis offered by Halliday and Martin (1993) in their example:

> clause: an electron moves in an orbit
>
> nominal group: the orbital motion of an electron (Halliday and Martin 1993, p. 128).

This nominal group ('the orbital motion of an electron') can in turn function as a constituent further embedded in a more complex nominal group:

> the combined motion of an electron resulting from the coincidence of the orbital with the rotational motion [X] (Halliday and Martin 1993, p. 129; [X] is added by the author)

In principle, such further embedding can go on and on to create an increasingly complex and compact nominal group [X] which can function as a *participant (e.g. as a grammatical subject or object)* in a sentence that has a simple relational structure: [X] is/is known as [Y] (where both [X] and [Y] are called *participants* in Halliday's systemic functional grammar), for instance:

> The combined motion of an electron resulting from the coincidence of the orbital with the rotational motion is known as…[Y]

Halliday calls this 'grammatical metaphor' to contrast with lexical metaphor. To unpack the meaning of grammatical metaphor, let us start with an example of a lexical metaphor, which is easier to understand, e.g. 'Juliet is cold to her father'. We know that 'cold' here is a metaphor because it is based on comparison or analogy with temperature (e.g. the weather is cold → she is cold to her father). But now let us consider another kind of metaphor, e.g. the coldness of Juliet to her father is due to her love for Romeo. This is an example of grammatical metaphor. What is originally an adjective or a *quality* of things ('cold') gets nominalized into a noun or a *thing* ('coldness'), which now functions in another sentence as a *grammatical participant* (as the *grammatical subject*) of the sentence—hence the name, *grammatical* metaphor.

We are, of course, not trying to turn Shakespeare's play into a technicalized or abstract academic text by writing modern-day 'fan fiction' on it. However, if we do this experiment of taking a literary work and transforming the text into one full of nominalizations and grammatical metaphors, we can see how a literary text can be transformed into an academic text through mobilizing what Halliday calls the lexico-grammatical resources (the linguistic powerhouse) of the English language. In literary writing, accomplished writers use lexical metaphors to achieve the purpose of engaging the audience by turning some abstract processes into concrete, visualizable processes. For instance, consider the following sentence from Suzanne Collins' popular fiction, *The Hunger Games—Catching Fire*:

> 'Just the sound of his voices twists my stomach into a knot of unpleasant emotions like guilt, sadness and fear.' (Collins 2013, p. 11)

We know that 'twists' and 'knot' are lexical metaphors as their meanings here are based on analogy with the concrete action of twisting (verb) something into a knot (a physical entity). By employing these lexical metaphors, Collins visualizes for the reader vividly the sudden invisible change of emotions in the female protagonist (Katniss Everdeen) upon hearing the voices of President Snow.

In academic writing, we use grammatical metaphor for just the opposite effect: turning what is concrete and everyday into something abstract and technical. But why do scientists do that? Halliday (2004) argues that the use of grammatical metaphor in scientific writing enables the writer to construe not only technicality but also rationality. To understand this, we need to turn to the next topic: thematic progression and logical flow.

3.5 Thematic Progression and Logical Flow

Nominalization and grammatical metaphor play an important role in construing rationality (Halliday 2004, p. 124) by enabling the writer to construct logical semantic relations in the text. Logical semantic relations are not a privilege of scientific or academic texts. Hasan (1992) shows the importance of reasoning in the conversation of three-year-old children. However, what is special about scientific discourse, according to Halliday, is:

(1) that it constructs an argument out of a long sequence of connected steps, and
(2) that at any one juncture a large number of previous steps may be marshalled together as grounds for the next. (Halliday 2004, p. 124)

The language unit for construing one such step is a clause (e.g. 'If you don't take the medicine'). A clause is both a unit of experience and a unit of information. Clauses are the building blocks of an argument. Consider the following hypothetical conversation (A child is coughing hard but refuses to take the medicine and his mum tries to 'reason' him into taking it):

> Mother (to Child): If you don't take the cough syrup, you'll be coughing all night. Coughing all night will make your Mum and Dad unable to sleep well. Not sleeping well will make us unable to do our job well tomorrow. Not doing our job well will make us lose our jobs. Losing our jobs will make us unable to buy you the computer games you want…

To understand how the mother constructs the flow of information and the logic of her argument, let us do a theme–rheme analysis of the above utterances. The theme is the stable part, the anchor or the point of departure, and it is typically a noun or a nominal group (usually the subject of the sentence, together with any minor clause or phrase). It is also the given (or shared) information. The rheme is the new information or the focus (usually the main clause) in a sentence or utterance. Table 3.4 shows a theme–rheme analysis of the utterances.

We can see in the above hypothetical example that nominalization takes place to 'pack' or summarize the rheme (the main clause) of the previous sentence into the

Table 3.4 Theme–rheme analysis of the mum's utterances

	Theme (given/shared information)	Rheme (new information)
1	If you don't take the cough syrup	you'll be coughing all night.
2	*Coughing all night*	will make your Mum and Dad unable to sleep well.
3	*Not sleeping well*	will make us unable to do our job well tomorrow.
4	*Not doing our job well*	will make us lose our jobs.
5	*Losing our jobs*	will make us unable to buy you the computer games you want…

new theme (a nominal group) of the next sentence. And this process repeats itself to move the argument forward step by step.

Imagine what you would feel if we interrupt this information flow or thematic progression by reverting the theme–rheme sequencing (i.e. put new information in the place of the theme and old information in the place of the rheme) as in the following reconstructed utterances of the Mum above:

> Mother (to Child): If you don't take the cough syrup, you'll be coughing all night. Your Mum and Dad will be unable to sleep well if you're coughing all night. We will be unable to do our job well tomorrow if we are unable to sleep well. We will lose our jobs if we are unable to do our job well. We will be unable to buy you the computer games you want if we lose our jobs…

The above example helps us to understand the ways in which scientists or academic writers present their information systematically and construct their argument logically. Halliday uses the following example from a science text to illustrate how the presentation of logical reasoning hinges on mobilizing the linguistic resources of nominalization and grammatical metaphor to 'pack' the rheme(s) in previous sentence(s) into the theme(s) in new sentences:

> If electrons were not absolutely indistinguishable, two hydrogen atoms would form a much more weakly bound molecule than they actually do. The absolute *indistinguishability* of the electrons in the two atoms gives rise to an 'extra' attractive force between them. (Layer 1990, pp. 61–62; cited in Halliday 2004, p. 125; italics added)

In the theme–rheme analysis of this example (Table 3.5), we see that what has been presented in a clause in the theme of the first sentence ('If electrons were not absolutely indistinguishable') is condensed into a nominal group and condensed as a more compact theme in the next sentence ('The absolute indistinguishability of the electrons in the two atoms…'). This succinctly phrased or highly condensed packet of information serves as a point of departure and anchor to which further

Table 3.5 Theme–rheme analysis of a science text

	Theme	Rheme
1	If electrons were not absolutely indistinguishable	two hydrogen atoms would form a much more weakly bound molecule than they actually do.
2	The absolute *indistinguishability* of the electrons in the two atoms	gives rise to an 'extra' attractive force between them.

new information ('gives rise to an 'extra' attractive force between them') is attached. Halliday argues that the linguistic resources of nominalization and grammatical metaphor enable the academic or scientific writer to achieve systematicity and logicality—rationality—in their writing.

Learning how to mobilize these linguistic resources to achieve a systematic information flow and logical argument in their writing is precisely that part of invisible learning that confronts every school child if he/she is to participate successfully in different school subject lessons. This task is often made more difficult by the jumbled ways of presenting information in the school textbooks, especially those written for EAL learners as the textbook writers tried to 'make the language simpler' by turning text into a cluster of bullet points or scattering the information among pictures and visuals. My colleague, Dr. Dennis Fung, who is a science subject specialist, laments the lack of coherent texts in many of the science textbooks produced in Hong Kong. On one occasion, we were preparing for a teacher seminar and were looking for a coherent text to present the process of energy conversion in a closed circuit, and we looked in several science textbooks in Hong Kong and could not find a good model text to illustrate the kind of thematic progression and information flow discussed above. In the end, we worked together to reconstruct a text as a model text. How we can make this invisible learning task visible and help both teachers and students notice the operation and functioning of these linguistic resources in academic texts will be discussed in Chap. 5.

Note 1:
A 'morpheme' is the smallest unit of meaning in a language; e.g., 'love' has one morpheme, while 'lovely' is made up of two morphemes. A 'phoneme' is the smallest unit of meaning-differentiating sound, e.g. /h/ in 'hat' and /s/ in 'sat', by changing the sound from /h/ to /s/, the meaning of the word is changed.

Chapter Summary Points

- The SFL theoretical framework and the 'Genre Egg' as a metalanguage for both content teachers and language teachers to talk about and analyse the language demands of academic texts,
- Different conceptualizations of the language learning task: the bottom-up, top-down and integrated approaches,

- The Sydney School genre-based pedagogy, the teaching/learning cycle (TLC) and analysis of school genres (text types),
- Construing technicality and abstraction through the use of nominalization and grammatical metaphor, and
- Theme–rheme analysis, thematic progression and information flow.

End-of-Chapter Discussion Questions

1. What kind of learning goals do you want to set for your students ultimately? Can you use the concepts of 'information reader', 'rhetorical reader' and 'writerly reader' to discuss how they are related to the content or language focuses of the lesson?
2. How can we avoid showing students a list of language functions with a number of sentence patterns under each? How can we teach functions and the sentence patterns realizing these functions in a meaningful, contextualized way?
3. What would you do if you find that the curricular text that you are analysing does not fit into the genre taxonomy and the predictable stages and phases in the existing research literature?
4. By understanding the 'linguistic engines' of academic language (technicality and abstraction), is it possible to develop a systematic way to help students unpack and repack the abstract and technical sentences of academic texts?
5. What are the practical constraints on doing a guided analysis of academic language in class, especially the possible impact on the logical flow and coherence of content delivery?
6. If you were a language specialist, what would be the biggest challenge in persuading content subject teachers to pay attention to the hidden linguistic devices that may hinder students' understanding of the content?

References

Cai, J. (2014). *An integrated genre-based approach to scaffolding novice academic writers: genre awareness, academic lexical phrases and student uptake*. Doctoral dissertation, The University of Hong Kong, Pokfulam, Hong Kong.

Collins, S. (2013). *The hunger games book 2-catching fire*. New York: Scholastic Press.

Coxhead, A. (2000). A new academic word list. *TESOL Quarterly, 34*(2), 213–238.

Dalton-Puffer, C. (2013). A construct of cognitive discourse functions for coneptualising content-language integration in CLIL and multilingual education. *European Journal of Applied Linguistics, 1*(2), 216–253.

Department of Education Queensland (1989). *English language development across the curriculum (ELDAC).* Immigrant Education Services, Division of Special Services.

Derewianka, B. (2011). *A new grammar companion for teachers* (2nd ed.). NWS: Primary English Teaching Association.

Fung, D., & Yip, V. (2014). The effects of the medium of instruction in certificate-level physics on achievement and motivation to learn. *Journal of Research in Science Teaching, 51*(10), 1219–1245.

Gee, J. P. (2003). *What video games have to teach us about learning and literacy?*. New York: Palgrave Macmillan.

Goodman, K. S. (2005). *What's whole in whole language* (20th ed.). RDR Books.

Halliday, M. A. K. (1994). *An introduction to functional grammar*. London: Arnold.

Halliday, M. A. K. (2004). The collected works of M.A.K. Halliday. In J. J. Webster Series (Ed.), *The language of science* (Vol. 5). London: Continuum.

Halliday, M. A. K., & Martin, J. R. (1993). *Writing science: Literacy and discursive power*. London: The Falmer Press.

Hasan, R. (1992). Rationality in everyday talk: From process to system. In J. Svartvik (Ed.), *Directions in corpus linguistics: Proceedings of Nobel Symposium 82*, Stockholm, 4–8 August 1991 (pp. 257–307). Berlin: de Gmyter.

Hirvela, A. (2004). *Connecting reading and writing in second language writing instruction*. Ann Arbor: The University of Michigan Press.

Hyon, S. (1996). Genre in three traditions: Implications for ESL. *TESOL Quarterly, 30*(4), 693–722.

Kong, S. (2009). Content-based instruction: What can we learn from content-trained teachers' and language-trained teachers' pedagogies? *The Canadian Modern Language Review, 66*(2), 233–267.

Kong, S., & Hoare, P. (2008). Late immersion in Hong Kong: Still stressed but making progress? In T. W. Fortune & D. J. Tedick (Eds.), *Pathways to multilingualism: Evolving perspectives on immersion education* (pp. 242–263). Clevedon, UK: Multilingual Matters.

Kress, G., & van Leeuwen, T. (2006). *Reading images the grammar of visual design* (2nd ed.). London: Routledge.

Lemke, J. L. (1990). *Talking science: Language, learning, and values*. Norwood, NJ: Ablex Publishing Corporation.

Lin, A. M. Y. (2010). *How to teach academic science language.* Keynote speech delivered at the Symposium on Language and Literacy in Science Learning, 24 June 2010. Hong Kong Education Bureau (Curriculum Development Institute—Science Education Section), Hong Kong.

Lin, A. M. Y., & He, P. C. (2014). *Academic language functions and examples from the Sarasas corpus*. Unpublished manuscript. Faculty of Education, University of Hong Kong.

Littlewood, W. (1981). *Communicative language teaching*. Cambridge, UK: Cambridge University Press.

Lyster, R., & Ranta, L. (1997). Corrective feedback and learner uptake: Negotiation of form in communicative classrooms. *Studies in Second Language Acquisition, 19*(1), 37–66.

Martin, J. R. (2010). *Modelling and mentoring: The Yin and Yang of teaching and learning from home through school*. [PowerPoint slides]. Seminar presented at the Faculty of Education, the University of Hong Kong, Pokfulam, Hong Kong.

Martin, J. R., & Rose, D. (2007). *Working with discourse: meaning beyond the clause*. London: Continuum.

Martin, J. R., & Matthiessen, C. M. I. M. (2014). Modelling and mentoring: Teaching and learning from home to school. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 137–163). Dordrecht: Springer.

Martin, J. R., & Rose, D. (2008). *Genre relations: Mapping culture*. London: Equinox.

Martin, J. R., & Rose, D. (2012). Genres and texts: Living in the real world. *Indonesian Journal of SFL, 1*(1), 1–21.

Mercuri, S. (2010). *Teaching English versus teaching in English: Understanding the complexity of academic English* [PowerPoint slides]. Seminar presented at the Faculty of Education, the University of Hong Kong, Pokfulam, Hong Kong.

Mohan, B. (1986). *Language and content*. Reading, UK: Addison-Wesley.

Rose, D. (2010). *Reading to learn—Book 1—Preparing for reading and writing*. Sydney: Reading to Learn.

Rose, D. (2012a). Integrating SFL theory with literacy teaching. In Z. Yan, J. Webster, & F. Yan (Eds.), *Developing systemic functional linguistics: Theory and application*. London: Equinox.

Rose, D. (2012b). *Designing curriculum genres.* [PowerPoint slides]. Seminar presented at the Faculty of Education, The University of Hong Kong, Hong Kong.

Rose, D. (2013). *The potential of detailed reading for second language literacy* [PowerPoint slides]. Seminar presented at the Faculty of Education, the University of Hong Kong, Pokfulam, Hong Kong.

Rose, D. (2015). Building a pedagogical metalanguage II: Knowledge genres. In J. R. Martin (Ed.), *Applicable linguistics and academic discourse* (pp. 29–58). Shanghai: Shanghai Jiao Tong University Press.

Rose, D., & Martin, J. R. (2012). *Learning to write, reading to learn: Genre, knowledge and pedagogy in the Sydney School*. Sheffield, UK: Equinox.

Rothery, J. (1994/2008). *Exploring literacy in school English (write it right resources for literacy and learning)*. Sydney: Metropolitan East Disadvantaged Schools Program. Republished 2008, Sydney: Adult Migrant Education Service.

Swales, J. M. (1990). *Genre analysis: English in academic and research settings*. New York: Cambridge University Press.

Tang, G. (1992). *The effect of graphic representation of knowledge structures on ESL reading comprehension*. Cambridge: Cambridge University Press.

Zimmerman, F. (1989). *English for science*. New Jersey: Prentice-Hall.

Chapter 4
Disconnects in Bilingual Education Settings and Research Traditions

Chapter Overview
This chapter serves as a critical 'hinge' or connection point between the theory-oriented chapters in the first half of the book and the practice-oriented chapters in the second half of the book by providing an analysis of possible kinds of disconnect that can be found in curriculums and pedagogies in bilingual education settings. These disconnects include intracurricular disconnects, intercurricular disconnects, pedagogical disconnects and disconnects among major research traditions bearing on the field of LAC, academic literacies and CLIL. How to 'bridge' these different kinds of disconnects will be dealt with in Chaps. 5–7.

4.1 Disconnect One: Intracurricular Disconnects

The first kind of disconnect has to do with the way a subject curriculum is organized around its *input genres* and *output genres*. Typically, the input genres (i.e. the kinds of genres that a student is exposed to and taught in) are different from the kinds of output genres in which the student is expected to be able to produce their assignments and assessment tasks. This kind of disconnect is especially pervasive in content subjects, and teachers of content subjects are often unaware of this kind of disconnect. In many English as an additional language (EAL) contexts, English is used as the medium of instruction (MOI) for content topics (e.g. in many schools in Hong Kong, some private schools in Thailand, Japan, Korea, and China). In these contexts, frequently the textbook publishers present the concepts and topics using one set of genres while the assignment and assessment tasks require the students to produce writing in a different set of genres.

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To illustrate this intracurricular disconnect, let us look at a question in the integrated science paper in the Hong Kong Diploma of Secondary Education (DSE) examination in 2012. The DSE is a high-stakes public examination that all senior secondary school leavers need to take at the end of Secondary 6 (Grade 12) in Hong Kong. In this question, students are asked to describe two measures that are used in nuclear power plants to ensure the safe use of nuclear energy. They are also asked to discuss whether using nuclear energy is better than using fossil fuels for generating electricity with reference to the impact of nuclear energy and fossil fuels on the environment (to see the entire question, please consult 'Hong Kong DSE Examination—Integrated Science Paper, Question 11', published by the Hong Kong Examinations and Assessment Authority 2013).

To successfully respond to the above question, students need to be able to not just recall all their knowledge about the topic but also organize this knowledge into an argument and present it in a combination of descriptive and discussion texts. However, when we look at the typical textbooks in integrated science available in Hong Kong, we can hardly find any examples of coherent texts in the discussion genre.

While this disconnect can be summarized as a mismatch between the input genres and the output genres that characterize a content curriculum, the source of this mismatch is much deeper than just an oversight on the part of the science curriculum developer. Rather, this mismatch seems to have its source in the domination of a certain theoretical tradition in education. Lemke (2010) points out that this disconnect seems to have originated from a dominant 'mentalist' tradition in education:

> If you ask most teachers of science what their main goal is, they will probably say: for my students to understand the basic concepts of physics, chemistry, biology, or whatever other field is being studied. The critical words here are 'understand' and 'concept', and both of these terms assume a fundamentally psychological approach to learning. They belong to the tradition of mentalism, in which concepts are mental objects and understanding is a mental process. In more modern terms, they belong to a cognitive model of science education. I do not believe that this kind of theoretical model can tell us enough to help us to become better teachers of science. I believe that it lacks the necessary vocabulary to tell us just what we must lead students to do in order to learn to reason and act scientifically. (Lemke 2010, p. 1)

The kind of 'necessary vocabulary' that is lacking includes what I was trying to introduce in Chap. 3 (e.g. the Genre Egg; see Fig. 3.4)—a vocabulary (or a metalanguage) to talk about the languages of the academic disciplines. However, if one looks at the way a content subject syllabus is usually written, one will discover that when it comes to communicating in science, the vocabulary used to write the curriculum goals is rather vague or general. For instance, there is only a half-page under the heading 'communicating' in the 147-page syllabus for Secondary 1–3 (Grade 7–9) science issued by the Hong Kong Curriculum Development Council. Under 'communicating' are listed the following skills:

- talking, listening or writing to sort out ideas and clarify meaning
- making notes of observations in the course of an investigation
- using drawings, graphs, charts and tables to convey information

- choosing an appropriate means of communication to suit the purpose
- recording of activities carried out

(Hong Kong Curriculum Development Council 1998, p. 17)

Nowhere in this half-page of the Syllabus can we find the kind of necessary vocabulary that Lemke (2010) calls for in order for textbook writers and teachers to realize the kind of *language modelling and scaffolding* work that needs to go into the design of the curriculum materials—both the written texts of the textbooks and the spoken texts in the classroom; that is, the way teachers and textbooks can *model* and *scaffold* communicating in science both in spoken texts and written texts, and in appropriate spoken genres and written genres.

It is precisely this modelling and scaffolding which is often absent from both the curriculum texts and the classroom interactions in many content lessons, not just the science lessons. And yet students are typically required to produce writing in appropriate genres in high-stakes examinations or assessment tasks such as the 2012 DSE question on nuclear energy discussed above. I call this kind of disconnect a *horizontal* disconnect within the content curriculum, to contrast it with a vertical kind of disconnect within the content curriculum, which will be discussed next.

A *vertical* disconnect has to do with the rather abrupt change in the nature and kinds of assessment tasks that students are required to do in the curriculum when progressing from junior levels to senior levels. For instance, typically in junior secondary content curriculums, students are required to complete tasks that require responses such as fill in the blanks, labelling, matching, one-word or two-word answers, or selecting an answer from multiple choices. Figure 4.1 shows some typical junior secondary science tasks found in Hong Kong textbooks. However, when a student proceeds to senior secondary levels, even though some simple tasks such as matching (see Fig. 4.2) can be found, the student is suddenly required to give extended answers in the form of paragraphs or essays. The simple tasks usually only account for a small % of marks in the examination in contrast to the extended text tasks. At the same time, the senior-level curriculum is more packed with sophisticated content topics and less time can be devoted to helping students to unpack and repack dense and abstract academic language required in the disciplines (see Chap. 3).

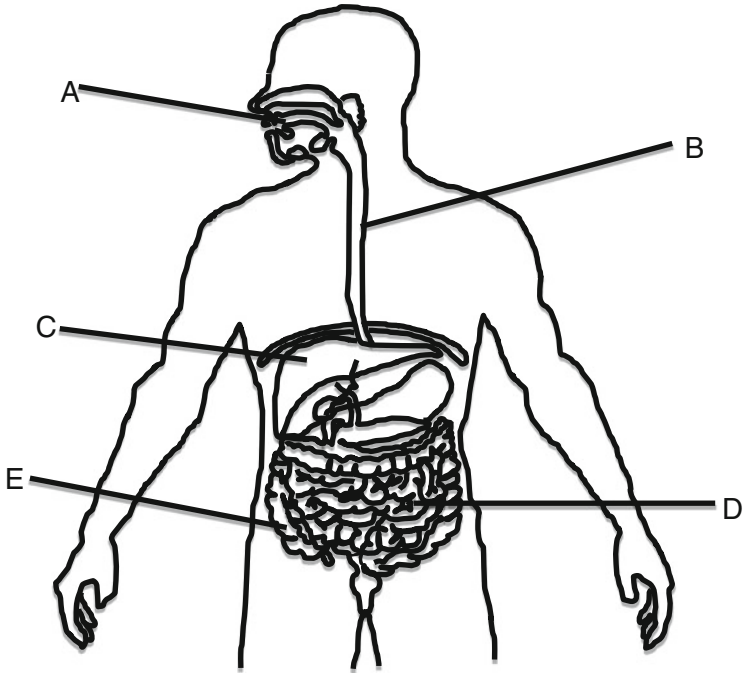
Application Scenario 4.1

Take a junior secondary textbook in your subject (math, science, history, geography, social studies, etc.) and compare it with a senior secondary textbook in the same or comparable subject. Compare the kinds of tasks found in the two textbooks and jot down the main differences between the tasks found in the two textbooks. Compare them in terms of the different kinds of language demands required by the tasks; e.g. what kinds of genres, language functions/sentence patterns, and vocabulary are required (refer to the Genre Egg in Fig. 3.4 in Chap. 3)? What kinds of language skills are required—receptive or productive?

Task 1

	Section Quiz: Write "T" for true statements and "F" for false statements in the boxes provided	T	F
1.	Animals react to stimuli but plants do not.		
2.	Non-living things show none of the seven characteristics of living things		
3.	The only way to study animals is to observe them in the laboratory.		
4.	When studying living things, scientists observe the characteristics of living things and record their observations.		

The diagram below shows the human digestive system



Task 2 Name the Structure A to E

Fig. 4.1 Some common junior secondary science tasks found in Hong Kong textbooks

1. For each of the parts of a cell listed in Column 1, select from Column 2 one description that matches it. Put your answer in the spaces provided. (3 marks)

Column 1		Column 2	
Ribosome	_____	A.	where some lipids are made
Nucleus	_____	B.	is differentially permeable
Smooth endoplasmic reticulum	_____	C.	where polypeptides are made
		D.	controls the activity of the cell

Fig. 4.2 A matching task modelled on questions found in the Hong Kong Diploma of Secondary Education (DSE) biology paper (reproduced here by permission of Dr. Kennedy Chan)

Both horizontal and vertical disconnects are within the same subject curriculum, with the horizontal disconnect happening at the same year level and the vertical disconnect across different year levels. There is, however, another kind of disconnect found across the curriculum.

4.2 Disconnect Two: Intercurricular Disconnects

There are often disconnects among the curriculums of content subjects (e.g. science, math, history, social studies, geography) as well as lack of coordination between the content subject curriculums and the curriculums of the language subjects (e.g. English as a foreign language subject, Chinese as the first language subject). Very often teachers and curriculum planners of content subjects and language subjects operate in insulated bubbles without talking to each other as if they do not need to know what is being taught and learnt in each other's subject domains, not to mention collaboration. In Chap. 2, we discussed the differences between BICS and CALP and the mode continuum and the need to provide students with ample support to help students move from the spoken mode of everyday language to the increasingly written mode of academic language. We also introduced Mahboob (2014)'s model of language variation along three different dimensions: (i) the continuum between everyday and specialized fields, (ii) the continuum between global and local tenors and (iii) the continuum between spoken and written modes. This model gives us eight different domains of language use as characterized by their different features on the three continua:

1. Local everyday written,
2. Local everyday oral,
3. Local specialized written,
4. Local specialized oral,
5. Global everyday written,
6. Global everyday oral,
7. Global specialized written,
8. Global specialized oral.

Typically, in the English language lessons, a student learns about the kind of language resources appropriate for use in domains 5–6 (global everyday written and oral). However, in the content areas (e.g. science, geography, history), a student is

confronted with the kind of academic texts and tasks typically found in domains 7–8. Students are thus not prepared by their English language lessons (domains 5–6) for the kinds of English language use in content subjects (domains 7–8). Students are also usually left on their own to make any connections across the different subject areas in their school curriculum. Every day they move from one subject lesson to another as if moving from one compartmentalized field to another without being helped to make any connections between these different fields of learning. Thus, school learning experienced by students often constitutes fragmented and insulated pockets of knowledge, values and skills unrelated to one another, and when confronted with novel problems that cut across the subject boundaries (as they often are nowadays, e.g. issues related to energy crisis, food safety, environmental protection, political participation) students cannot mobilize all the knowledge, values, and skills that they have learnt from different subjects as resources to help them come up with novel solutions to problems or new perspectives on issues. This section thus focuses on disconnects between content subjects and language subjects to see how these cross-curricular disconnects are not helping students to cope with content learning on the one hand and language learning on the other.

As discussed in Chap. 3, academic language (e.g. academic English) is characterized by high lexical density and complex nominal groups (noun-like structures), which stands in contrast to everyday language. For examples, look at the sentences in Application Scenario 4.2 and see if you can decide which subject area these sentences are taken from.

Application Scenario 4.2: Contrasting the kind of English found in content textbooks and the kind of English found in English as a foreign language (EFL) textbooks.

(A) The destruction of rainforests constitutes a great loss of resources to humanity and science.
(B) His decisive and farsighted acts in accepting the Truce of Villafranca, in stopping Garibaldi from marching on to Rome, and in allying with Bismarck made the unification movement possible.
(C) My name's Jennifer. I have lots of friends. We like reading magazines and going on Facebook.

Activity: Can you decide which subject area each of the above textbook sentences[1] belongs to?
What are the different language demands on the student in these different subject areas?
Can you analyse the different kinds of lexical and grammatical complexity using the concepts and terminology learnt in Chap. 3 (e.g. refer to the Genre Egg in Fig. 3.4)?

[1]Note1: For copyright issues, these sentences have undergone some modifications.

Table 4.1 A basic structural analysis of sentences from different subject textbooks

	Noun (group)	**Verb**	**Noun (group)**
(A)	The destruction of rainforests	constitutes	a great loss of resources to humanity and science.
(B)	His decisive and farsighted acts in accepting the Truce of Villafranca, in stopping Garibaldi from marching on to Rome, and in allying with Bismarck	made	the unification movement possible.
(C)i	My name	's	Jennifer.
(C)ii	I	have	lots of friends.
(C)iii	We	like	reading magazines and going on Facebook.

As you might have guessed, (A) comes from a social studies textbook, (B) from a history textbook and (C) from an EFL textbook. They are all from the same grade level (Grade 10).[1]

As discussed in Chap. 3, we notice that (A) and (B) are characterized by complex noun groups but a relatively simple clausal structure. Table 4.1 shows a basic structural analysis of the sentences.

The disconnect in terms of the kind of language used in academic content subject textbooks and English language textbooks can be noticed in Table 4.1. The sentence from the social studies textbook has a simple relational sentence pattern: *X constitutes Y*, where *X* is a nominalized group (the destruction of rainforests) and *Y* is another nominalized group (a great loss of resources to humanity and science).

The sentence from the history textbook, likewise, has a simple sentence pattern: *X* made *Y* possible. However, *X* is an extremely complex nominalized group and it is made up of three subcomponents:

i. His decisive and farsighted acts in accepting the Truce of Villafranca,
ii. [his decisive and farsighted acts] in stopping Garibaldi from marching on to Rome,
iii. and [his decisive and farsighted acts] in allying with Bismarck (the repeated material in the square brackets has been elided without interfering with understanding).

The English language textbook sentences also have a simple sentence pattern:

X is/has/likes *Y*. However, the nouns/noun groups are relatively simple;
X → I, My name, We;
Y → Jennifer, lots of friends, reading magazines and going on Facebook.

One can imagine the huge disconnect that a student would feel encountering the kind of English sentences in the social studies and history subjects and the kind of English sentences in the English language subject. It seems that the English language subject is not helping a student to master the kind of English useful in content subjects. However, many content subject teachers look to the English language

Table 4.2 Common genres (text types) found in the English language and content subjects

Category	Example	Subject areas		
Information texts	Information reports Laboratory reports/experiments Descriptive reports Investigative reports Essays	English Social studies	Geography History Economics	Science
Recount texts	Historical recounts Biographical recounts Newspaper reports	English Social studies	Geography History	
Procedural texts	Directions Instructions Recipes Rules Manuals Agendas	English	Geography	Science Math
Explanation texts	Explanations on sequence/process Explanations on cause and effect	Social studies	Geography History Economics	Science
Persuasive texts	Expositions Discussions Advertisements Editorials	English Social studies	Geography History Economics	Science

teacher to address the language needs of their students and do not consider it their job to provide language support to students in their own academic content lessons.

Apart from the disconnect at the sentence level, there is a disconnect at the level of genres found in the content subjects and the English subject and very often few attempts are made to connect the kind of genres learnt in the English subject and those useful in content subjects. Table 4.2 shows a comparison of the different kinds of genres useful in English subjects and other content subjects. We can see that while there is some overlap between them (e.g. procedural texts, exposition texts, discussion texts), there is also a range of different genres not shared by English and other content subjects (e.g. email letters, narratives, film reviews vs. laboratory reports, explanation texts, information reports).

4.3 Disconnect Three: Pedagogical Disconnects

Apart from disconnects within the curriculum and across the curriculum, there is a further kind of disconnect which has to do with the usual kind of pedagogies practiced in content classrooms and the kind of pedagogies that is needed to enable students to produce appropriate writing in their assignments and assessments. While the within-curricular and across-curricular disconnects discussed above have to do with *what* to teach, the pedagogical disconnects discussed in this section have to do with *how* to teach.

To describe how teachers teach (or an enacted pedagogy) requires us to become familiar with a few analytical tools used in the classroom interaction analysis, the most important of which is the notion of the triadic discourse format (Sinclair and Coulthard 1975; Mehan 1979; Heap 1985; Lemke 1990; Lin 2007). The triadic discourse format is the most commonly found interaction pattern in all kinds of classrooms. It consists of three parts: initiation, response and feedback (IRF) (in some studies, the last part is termed evaluation, and thus IRE). For example, consider the following teacher–student IRF exchange in a math lesson:

T	Okay, so yesterday I've asked you to bring back something. What to bring in?	Initiation
S	Cylinder	Response
T	Yes, something in the shape of a cylinder. Yeah	Feedback

Notice that it is often the teacher who does the initiating, the student(s) who do(es) the responding and the teacher who gives the evaluation or feedback.

Freebody (2013) analyses an excerpt from a science lesson in which the teacher is going through a worksheet with his Grade 11 students in a science class:

64. T: ((reading)) 'glands that produce starch digesting enzymeˆ'

65. SC: salivary^{v}

66. T: salivary glandsˆ (.) good^{v} (3)

a. let's go round (.) so we don't just always have the same person answer (.)
b. thanks (.) thanks Caitlin (.) so Kateˆ the next oneˆ
c. ((reading)) 'part of the gut where faeces are formedˆ' (11)

67. SK: I don't know^{v}

68. T: not sureˆ (.) next one Patriciaˆ (3)

69. SP: umm (2)

70. T: where the faeces are formed (.) we know it's down here somewhere ((rubbing her stomach)) don't weˆ

71. SP: oh (.) the colonˆ=

72. C: = it's part of the large intestineˆ

73. T: OK^{v} (.) so y'all think it's the colonˆ (.) OKˆ that's fine (.) the colon^{v} (2) The next oneˆ um:m (1) Emilyˆ

74. SE: I have no idea

75. T: you have no ideaˆ (.) OK^{v}

a. you'll have more idea in a moment won't you (.)
b. so Leannev (.)
c. ((reading)) 'digested in stomach and small intestineˆ'

76. SL: proteins^

77. T: proteins^v

((lesson continues))

(From Freebody 2013, p. 67)

Many teachers will find this lesson excerpt familiar. It is a practice commonly found in the classrooms of many different subject areas. I have called this 'answer-checking practice' (Lin 1996, 2000). The whole point of this practice is to co-construct a corpus of certified true answers ('model answers') (Heap 1985) to a list of questions on a worksheet and the students are expected to be able to reproduce (parts of) this corpus of answers as 'knowledge' items in subsequent assessments or assignments. This kind of pedagogy is thus predisposed by the use of worksheets and exercises that do not require extended writing as answers (e.g. multiple-choice questions, fill in the blanks, matching, labelling). The teacher typically uses the triadic discourse format (IRF) to elicit candidate answers from students and then to certify some as acceptable and some as partial in the Feedback slot and through a reiterative use of these IRF speech exchanges, the teacher monitors the understanding of students and works some of the partial answers into acceptable answers.

Freebody makes a similar analysis of the excerpt in this science class as he observes, 'The knowing here is coproduced in and by the speech-exchange system' (2013, p. 68). And he points out that this knowing does not necessarily match the kind of knowing that students are required to display when the subsequent assignment or assessment goes beyond asking for just bits and pieces of (oral) information but rather asks for a written paragraph or essay. There is thus a disconnect between what counts as 'knowing' in the classroom and what counts as 'knowing' in subsequent formal school written assignments or assessments. Despite this disconnect, this practice has its local function of engaging the attention of a large group of students as any student can be called upon by the teacher to provide an answer at any time during this IRF interaction process. In many Asian classroom contexts where the class size tends to be large, this practice is especially pervasive.

Apart from this disconnect between what counts as a proper display of 'knowing' in the pedagogical set-up of the classroom and what counts as a proper display of 'knowing' in subsequent formal written assessment tasks, there is another frequent pedagogical practice that functions to help students to 'unpack' difficult academic topics and texts into everyday language and examples but falls short of helping students to 'repackage' or 'repack' these back into academic texts.

For example, a Secondary 2 (Grade 8) student is likely to encounter school texts with sentences like the following one (taken from a Secondary 2 integrated science textbook commonly used in English medium (EMI) schools in Hong Kong:

> Waste gases released by motor vehicles, power stations and factories are the main sources of air pollution in Hong Kong.

To 'unpack' academic language for students, a competent EMI teacher might typically transform (or translate) the sentence into everyday language that usually consists of the following ensemble of sentences delivered in an IRF classroom discourse format; such IRF exchanges function to engage students in talking about the text, to relate the textbook topic to students' daily life experience, and to get students interested in the topic:

T: Why do we have air pollution in Hong Kong? What are the things that pollute the air? What are the things that make the air dirty, making it smelly or bad for people? Can you give me some examples? What are the things that make the air bad and the bad air will make you sick?

S1/S2/S3: Factories! Cars! Smoking!

T: Yes, very good! Cars, factories, what else? What other things can you think of?

S4: Power companies!

T: Yes, very good! Power companies, power stations… So, let's look at the textbook, page 65, first paragraph, it says: *Waste gases released by motor vehicles, power stations and factories are the main sources of air pollution in Hong Kong*. So, now, you know the main sources of air pollution in Hong Kong, do you? The cars, the power stations and factories, they give out waste gases, dirty gases, and so these dirty gases pollute our air and make people sick, right?

The above-reconstructed classroom exchanges (based on many years of classroom observation) are readily recognizable by teachers as a common pedagogic strategy in rendering the school academic texts accessible and interesting to students. It illustrates how teachers are engaged in the linguistic, interactive processes of 'unpacking' academic texts for students in their daily teaching. When the students' English proficiency is very basic and even English paraphrasing (as shown above) might not help the unpacking of academic texts, the teacher might draw on L1/local language resources to assist with the unpacking process as shown in the reconstructed dialogue below (English translations of the Cantonese utterances are placed in pointed brackets immediately after the utterances):

T: Why do we have air pollution in Hong Kong?

Ss: [no response]

T: [slowly] So, why do we have air pollution in Hong Kong? What are the things that pollute the air?

Ss: [no response]

T: Air pollution, 咩係 <what is> air pollution呀 <question particle>?

S1: 空氣<air>…

T: 空氣咩呢<air what>?

S2: 空氣污染<air pollution>!

T: Yes,空氣污染<air pollution>,即係<that is>air pollution。咁點解會有<so why is there>air pollution呢<question particle>? 咩野會做成<what will lead to> air pollution呢<question particle>?個<the> source係咩呢<is what>?

S3: 汽車D廢氣<cars' waste gas>!

T: 係喇<yes>,汽車D廢氣係其中一個源頭<cars' waste gas is one of the sources>,其中一個<one of the>source。仲有D咩<what are the other> sources呢<question particle>?

S4: 工廠D廢氣… 車D廢氣… 食煙… <factories' waste gas… cars' waste gas… smoking…>

T: 工廠D廢氣點用英文講<factories' waste gas, how to say it in English>? 工廠係<factory is>…

S4: Factory!

T: 係喇<yes>, factory。咁廢氣呢<then how about waste gas>?

S5: air…

T: No, not air. 廢氣唔係叫做<waste gas is not called> air,係<it's>waste gases。Waste gases, 即係廢氣<that is waste gases>。

S5: 哦 (Yes)…

T: 哦 (Yes), 咁即係咩呢<so, what does that mean>? 除咗<apart from>waste gases,仲有咩野其他源頭呀<what are the other sources>?

S6: 空氣污染嘅源頭有汽車D廢氣、工廠D廢氣同食煙D廢氣<The sources of air pollution are car waste gas, factory waste gas and smoking's waste gas> 。

T: Right. Any other sources?… No? No other sources? 無其他源頭嗱<No other sources>? OK, so, let's look at the textbook, page 65, first paragraph, it says: *Waste gases released by motor vehicles, power stations and factories are the main sources of air pollution in Hong Kong*. 嗱,睇吓呢句<Okay, look at this sentence> *Waste gases released by motor vehicles, power stations and factories*... motor vehicles 同<and>factories你地都講啱咗<you are all correct about>,但無講到<but you haven't talked about> power stations喎<still>。咁咩係<So, what are>power stations呀<question particle>? What is a power station?

S7: 係地鐵站<It's subway station>!

T: 唔係地鐵站<It's not subway station>,地鐵站係<subway station is> MTR station,你答啱一半啫<You're only half correct>。咩係<What is>power station呀<question particle>? 仲有D咩<Are there any other> station呀<question particle>? 唔係車站呀吓<Remember it's not a train station>?

S7: 發電站<Power station>!

T: 係喇<Yes>,right! 係發電站<It's power station>。Very good! Power station就即係發電站喇<is power station>。咁究竟咩野會做成<So, what will lead to> air pollution嘅sources呢<air pollution's sources>? Look at the textbook again, *Waste gases released by motor vehicles, power stations and factories are the main sources of air pollution in Hong Kong*. So now you know the meaning of this sentence, right? Now you know the main sources of air pollution in Hong Kong, do you? The cars, the power stations and factories, they give out waste gases, dirty gases, and so these dirty gases pollute our air and make people sick, right? 咁呢D空氣污染嘅源頭就整到我地病喇 <So, these air pollution sources make us sick>…

In the above-reconstructed classroom exchanges, I illustrate how the teacher uses both L1 everyday language and examples and L1 formal technical language (e.g. waste gases, sources of air pollution) to unpack the L2 academic text for his students. Teachers can also enhance their ability of unpacking science texts for

students using visuals (Kress et al. 2001) and graphic organizers (more on this in Chap. 5). While this pedagogical practice can help students to access the content of the academic subject, it cannot help students to 'repack' this content back in an acceptable academic written form for subsequent formal assignments and assessments. In this context, Maton's (2013, 2014) Legitimation Code Theory (LCT), which is being widely used in research and teaching, provides very useful insights. From LCT the terms 'semantic gravity' and 'semantic density' capture well the pedagogical pattern often found in a content classroom. According to Maton (2013):

> ***semantic gravity*** (SG) refers to the degree to which meaning relates to its context. Semantic gravity may be relatively stronger (+) or weaker (−) along a continuum of strengths. The stronger the semantic gravity (SG+), the more meaning is dependent on its context; the weaker the gravity (SG−), the less dependent meaning is on its context. …
>
> ***semantic density*** (SD) refers to the degree of condensation of meaning within socio-cultural practices whether these comprise symbols, terms, concepts, phrases, expressions, gestures, clothing, etc. Semantic density may be relatively stronger (+) or weaker (−) along a continuum of strengths. The stronger the semantic density (SD+), the more meanings are condensed within practices; the weaker the semantic density (SD−), the less meanings are condensed. (Maton 2013, p. 11)

In a sense, SG and SD can be seen as a much more technical and abstract theoretical modelling of a cluster of phenomena which have been loosely characterized by the terms of BICS and CALP by Jim Cummins (see Chap. 2). BICS can be said to represent the minus end of SD while CALP represents the plus end of SD. Likewise, Jim Cummins' notion of context embeddedness can be said to represent the plus end of SG. Figure 4.3 shows the inverse relationship of SD and SG; that is, the higher the SG (the greater the contextualization), the lower the SD (the less dense the information content that is packed into the language—BICS), and vice versa.

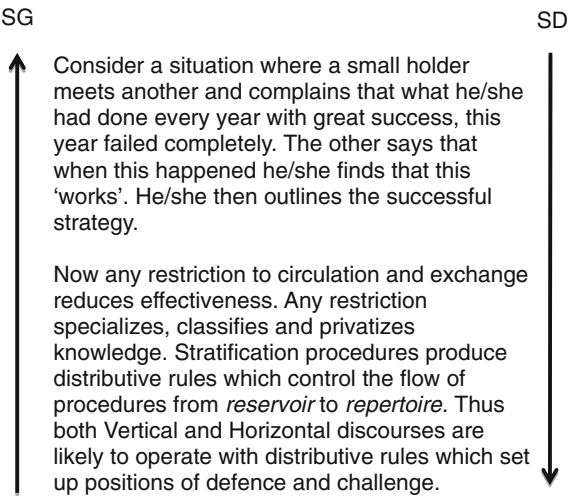


Fig. 4.3 The inverse relationship between semantic gravity and semantic density (from Martin 2012, Slide 61; reproduced here by permission of Professor Jim Martin)

SG and SD are variables that are quantifiable and representable in charts and graphs (Maton 2013, 2014). Based on these concepts, a 'semantic profile' (Maton 2013, 2014) can be charted out to represent SG and SD in relation to the temporal progression of the lesson and the pedagogical functions of 'unpacking' and 'repacking'. Figure 4.4 below shows an example of a 'semantic wave' (which is one kind of semantic profile) in relation to lesson progress.

To illustrate how a semantic profile can help us capture what is happening in the classroom, let us look at the lesson excerpt provided by Maton (2013, p. 15); the teacher is explaining the technical term 'cilia':

> **T**: Okay B (student's name) what are the 'cilia'. What was it? No? A (student's name) do you know what cilia is? No? D? Someone must know what they are…
>
> **Sf**: Hairs
>
> **Sm**: The little hairs?
>
> **T**: The little hairs. And basically, they beat in an upward motion from inside your body out through to your nose. [Teacher is waving arms up]. So, they beat up and they take the pathogens away with them. And, guys, I don't know if I've ever told you this but when you smoke cigarettes, the tar actually causes your cilia to, because it's so heavy, to drop, and so your cilia don't work probably after that because they're too heavy they've dropped, so they can't beat the pathogens out of your body! So that's one of the reasons that smoking's bad as well. Okay! Alright write this down under description!

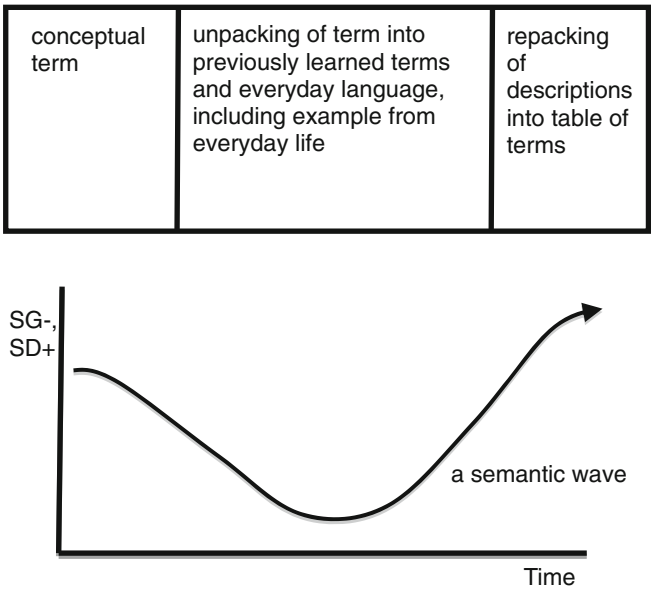


Fig. 4.4 A semantic wave in relation to pedagogical functions of unpacking and repacking (reproduced by permission of Professor Karl Maton; www.legitimationcodetheory.com)

And then, the teacher writes on the board:

Cilia	Hair-like projections from cells lining the air passages	Move with a wavelike motion to move pathogens from the lungs until it can be swallowed into the acid of the stomach

Maton (2013, p. 15)

A semantic wave (which is one kind of semantic profile) thus captures well the different phases of the lesson where semantically dense academic content (and language) is unpacked into everyday language and examples, which are then repacked into semantically dense academic language, as the teacher writes the dense language on the board (as shown above). This pattern (i.e. a semantic wave) is, however, rarely found in lessons as teachers usually just unpack technical terms for their students without helping students to repack everyday language into technical language again. It seems that a lot of theoretical and pedagogical mileage can be gained from the LCT concepts (semantic gravity, semantic density, semantic profiles), as opposed to the less technical and less precise notions of BICS and CALP even though initially BICS and CALP might be terms more easily accessible to teachers. A lot of educational research has been done using the LCT concepts (For more information on LCT and application of LCT concepts in research studies on teaching, please visit the LCT website—http://www.legitimationcodetheory.com/ and the LCT research forum—https://groups.yahoo.com/neo/groups/LCTheory/info.

To summarize the above discussion, it is important to have both unpacking and repacking phases systematically built into the pedagogical process of teaching a topic. More often than not, however, there is only an unpacking phase but not a corresponding repacking phase, with the teacher helping students to comprehend the semantically dense academic language but *not* helping them to produce a similar kind of language—hence a pedagogical disconnect.

4.4 Disconnect Four: Disconnects Among Different Research Traditions

The last kind of disconnect is that between different research traditions bearing on the theory and practice of LAC, academic literacies and CLIL. Here, I want to outline three very important traditions and show how the relative lack of cross-fertilization among these traditions is not helping the development of sound theory and practice in LAC, academic literacies and CLIL.

The first tradition is the English for Specific Purposes/English for Academic Purposes (ESP/EAP) research tradition on academic writing. It is strong on analysis

of the structure of specific genres, especially in the analysis of academic research articles (RA) at tertiary level. The ESP/EAP focuses on postsecondary/tertiary levels and the adult learners in academic and professional settings, for example, the ESL international students learning how to do English academic writing for their different disciplines in the university in North America or different parts of the world. The second tradition is the Sydney School genre-based pedagogy, which is derived from systemic functional linguistics (SFL) which focuses on analysis of language as systems of semiotic resources for making meaning and construing reality in context. This tradition is strong in both macro, top-down analysis of the schematic structure of academic genres, and micro, bottom-up analysis of lexico-grammatical features of academic language. This tradition has focused on developing theoretical and pedagogical frameworks for guiding and understanding the teaching and learning of academic genres by both L1 and ESL/indigenous students in the schools in Australia and many parts of the world. The third tradition is the New Rhetoric School based in the US Genre scholars in the New Rhetoric School focus on the 'situational contexts in which genres occur than on their forms and have placed special emphases on the social purposes, or actions, that these genres fulfil within these situations' (e.g. Bazerman 1994; Coe 1994; Devitt 1993; Freedman and Medway 1994). Like the ESP/EAP tradition, their work mainly focuses on postsecondary-/tertiary-level students. This school has originated from the important body of North American scholarship concerned with rhetoric and compositional studies mostly in L1 English teaching in the university (known as English composition courses).

One can say there is a neat division of labour among these three traditions: e.g. the ESP/EAP and New Rhetoric School focus mainly on tertiary levels and the Sydney School focuses mainly on primary and secondary school levels. However, the relative lack of mutual illumination and crossover has not helped the development of theory and practice pertinent to the work of LAC, academic literacies and CLIL. For instance, the very notion of genre is defined (slightly) differently under these three traditions and the terminologies used in genre analysis differ from one another. Furthermore, they have different emphases in their pedagogical recommendations. For instance, while the New Rhetoric School recommends against explicit teaching of genres, both ESP/EAP and the Sydney School affirm the benefits of explicit teaching of genres. This said, the past few years have witnessed encouraging signs of interactions among the three traditions (e.g. In Ottawa in 2012, there was a genre studies conference attended by key scholars from all three traditions).

In this chapter, four major disconnects which have implications for LAC, academic literacies and CLIL researchers and practitioners were outlined. In the next three chapters, these disconnects will be revisited and possible strategies to overcome each of them will be proposed and discussed with examples.

For copyright issues, these sentences have undergone some modifications.

Chapter Summary Points

- Intracurricular disconnects: vertical disconnects, horizontal disconnects,
- Intercurricular disconnects,
- Pedagogical disconnects,
- Genres across the curriculum,
- Different research traditions: ESP/EAP, Sydney School genre-based pedagogy, New Rhetoric School.

End-of-Chapter Discussion Questions

1. Can you summarize all the subcategories of the four different kinds of disconnects that have been identified in this chapter? To what extent do you agree with them, and is there any other disconnecting problem in bilingual education that you have found worth noting? Before proceeding to the next chapter, do you think there can be some strategies to tackle some of these problems posed by the author?
2. Why is the triadic 'answer-checking' practice commonly found in classrooms? How can the teacher make what counts as 'knowing' in the classroom match the 'knowing' expected of students in the assignment and assessment tasks through everyday classroom interaction?
3. Record one of your lessons and try to analyse a small episode of it. Is the classroom interaction taking place in the common triadic IRF discourse format? Does it work effectively? If yes, why so? If not, how can you improve it?

References

Bazerman, C. (1994). Systems of genres and the enactment of social intentions. In A. Freedman & P. Medway (Eds.), *Genre and the new rhetoric* (pp. 79–101). London: Taylor & Francis.

Coe, R. M. (1994). "An arousing and fulfillment of desires": The rhetoric of genre in the process era-and beyond. In A. Freedman & P. Medway (Eds.), *Genre and the new rhetoric* (pp. 181–190). London: Taylor & Francis.

Devitt, A. J. (1993). Generalizing about genre: New conceptions of an old concept. *College Composition and Communication, 44*(3), 573–586.

Freebody, P. (2013). School knowledge in talk and writing: Taking 'when learners know' seriously. *Linguistics and Education, 24*(1), 64–74.

Freedman, A., & Medway, P. (1994). *Genre and the new rhetoric*. London: Taylor & Francis.

Heap, J. L. (1985). Discourse in the production of classroom knowledge: Reading lessons. *Curriculum Inquiry, 15*(3), 245–279.

Hong Kong Curriculum Development Council. (1998). *Hong Kong syllabuses for secondary schools (secondary 1–3)—Science*. Education Development, Hong Kong: Issued by the Curriculum Development Council.

Hong Kong Examinations and Assessment Authority. (2013). *Hong Kong diploma of secondary education (DSE) integrated science exam paper (2013)*. Hong Kong: Hong Kong Government Printer.

Kress, G., Jewitt, C., Ogborn, J., & Tsatsarelis, C. (2001). *Multimodal teaching and learning: The rhetorics of the science classroom*. London: Continuum.

Lemke, J. L. (1990). *Talking science*: *Language, learning, and values*. Norwood, NJ: Ablex Publishing Corporation.

Lemke, J. L. (2010). Transmedia traversals: Marketing meaning and identity. In A. Baldry & E. Montagna (Eds.), *Interdisciplinary perspectives on multimodality: Theory and practice.* Proceedings of the Third International Conference on Multimodality. Campobasso: Palladino.

Lin, A. M. Y. (1996). *Doing-English-lessons in secondary schools in Hong Kong: A sociocultural and discourse-analytic study.* Unpublished doctoral dissertation, University of Toronto, Canada.

Lin, A. M. Y. (2000). Resistance and creativity in English reading lessons in Hong Kong. *Language, Culture and Curriculum, 12*(3), 285–296.

Lin, A. M. Y. (2007). What's the use of 'triadic dialogue'? Activity theory, conversation analysis and analysis of pedagogical practices. *Pedagogies, 2*(2), 77–94.

Martin, J. R. (2012). *Embedded literacy: knowledge as meaning* [PowerPoint slides]. Seminar delivered at the Faculty of Education, University of Hong Kong, March 9, 2012, Hong Kong.

Maton, K. (2013). Making semantic waves: A key to cumulative knowledge-building. *Linguistics and Education, 24*(1), 8–22.

Maton, K. (2014). Building powerful knowledge: The significance of semantic waves. In E. Rata, & B. Barrett (Eds.), *The future of Knowledge and the Curriculum* (pp. 181–197) London: Palgrave Macmillan.

Mehan, H. (1979). *Learning lessons*. London: Harvard University Press.

Sinclair, J., & Coulthard, M. (1975). *Towards an analysis of discourse*. Oxford: Oxford University Press.

Chapter 5
Curriculum Mapping and Bridging Pedagogies

Chapter Overview
In this chapter, the curricular and pedagogical disconnects identified in Chap. 4 will be addressed through a discussion of some possible ways of doing curriculum mapping and bridging pedagogy in LAC and CLIL contexts. The focus will be on how content teachers and language teachers can collaborate to conduct needs analysis and systematic planning of the curriculum and pedagogy to address the needs identified.

5.1 Identifying the Language Demands of Academic Subjects

To overcome the intra- and intercurricular disconnects identified in Chap. 4, teachers and curriculum planners need to identify the language demands of different academic subjects and conduct both horizontal and vertical curriculum mappings of the language needs of students both within an academic subject and across different subjects. While this might sound like a straightforward task, accomplishment of this task requires expertise in both the academic subject areas and the linguistic analysis of academic genres and texts. In fact, not only language teachers but also content teachers need to have 'knowledge about language' and learn to use 'visible pedagogy' with 'cultural sensitivity' for them to be effective teachers helping students to master content in an L2 or in English as an additional language (EAL). 'Knowledge about language', 'visible pedagogy' and 'cultural sensitivity' are among the key principles informing learning in Teaching English to Speakers of Other Languages (TESOL) and EAL contexts, as Mahboob and Tilakaratna point out in the *TESOL White Paper* released by the TESOL International Organization in 2012. This

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places a high demand on the content teacher to understand the language demands of their own subjects. Likewise, language teachers need to become more 'knowledge aware'—e.g. to be aware of the specific language features, styles and registers used in different academic disciplines. Helping EAL students to cope with learning content in an L2 thus requires close collaboration between content teachers and language teachers. As Gibbons (2009) puts it:

> In summary, effective learning environments for English language learners requires the following conditions:
>
> - Teachers understand the language demands of their own subject (or of the content areas they teach) and are aware of how language is used in the subject.
> - Subject content and language are authentically integrated in a well-designed and academically rigorous programme.
> - Teachers are aware of the best conditions under which a second language is learned.
> - Teachers hold high expectations of what is possible.
> - Teachers know a range of language-based strategies that provide support for English language learners (Gibbons 2009, p. 153)

In the same vein, Derewianka (2011) summarizes three core principles of genre-based pedagogy; to her, genre-based pedagogy:

- identifies the language demands of the various curriculum areas;
- explicitly teaches students the genres needed for success in schooling;
- is concerned with deep learning of content together with learning the language of the content area. (Derewianka 2011: p. 1)

The key words which capture the above guiding principles are: *awareness of language demands*, *authentic integration of content and language*, *high expectations and high support*, designing *explicit and visible pedagogy*. Both content teachers and language teachers can further elaborate these principles with the common meta-language and theoretical framework provided by the Genre Egg (see Chap. 3, Fig. 3.4). Below I shall organize the discussion of LAC/CLIL curriculum mapping along the above guiding principles together with the meta-linguistic resources provided by the Genre Egg.

5.1.1 *Identifying and Mapping the Language Demands of an Academic Unit of Work*

The phrase 'language demands' is actually a shorthand to encompass the multiple layers and systems of language resources (e.g. as visualized in the Genre Egg) ranging from genre schematic structuring (e.g. stages and phases in an explanation text), to language functions (e.g. expressing cause and effect), to lexico-grammatical resources (e.g. nominalization) that students need to master in order to participate successfully in a diverse range of academic learning tasks and activities as confident speakers, listeners, readers and writers. Figure 5.1 shows Derewianka's (1990) mapping of the language demands of different learning

activities (entailed by different student roles/identities) in a 3-week unit of work in the subject area of geology in a class of Grade 2 Australian children (Derewianka 1990, p. 201). In the innermost circle, the key vocabulary necessary for the children to build their knowledge of geology in this unit is listed, moving students from everyday common-sense words to the discipline-specific technical words which are organized into different taxonomies (i.e. building the 'field'). In the middle circle of Fig. 5.1, the role relationships ('tenor') between teacher and students are mapped out, moving students gradually from the everyday role of 'rock collectors' to the more discipline-specific roles of observers, recorders, researchers, scientists and authors, while the teacher's roles shift among coexplorer, coordinator, demonstrator-expert, consultant and so on. In the outermost circle, the different

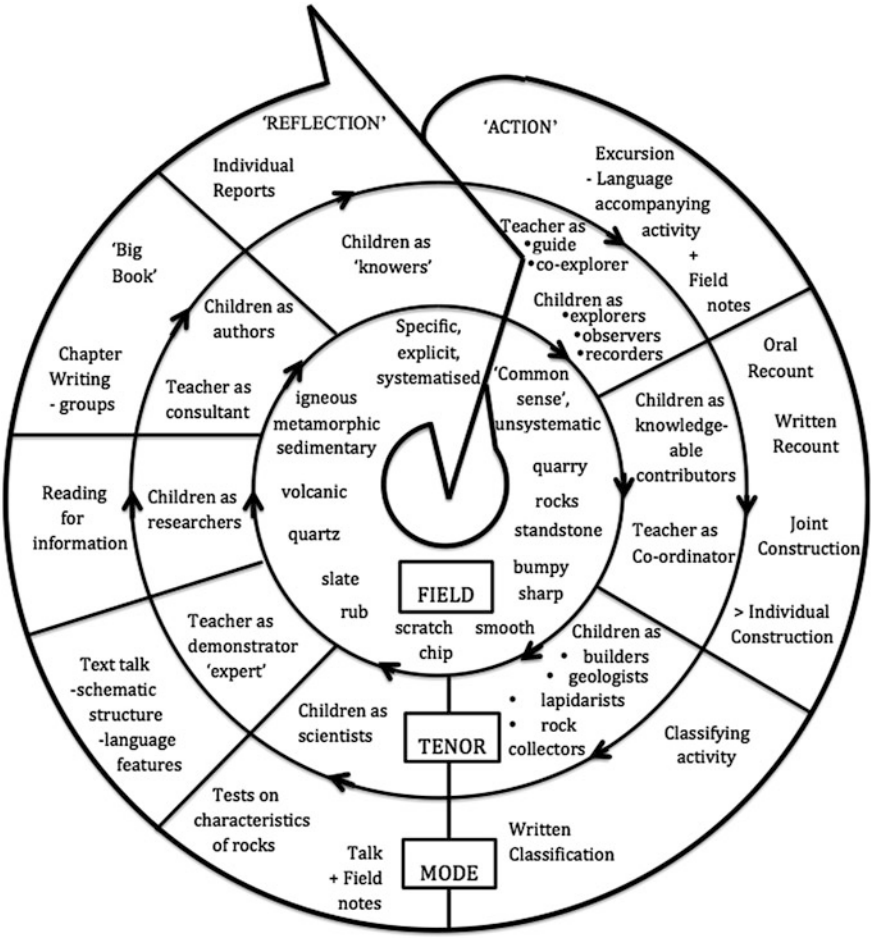


Fig. 5.1 Mapping the language demands of a unit of work in geology (From Derewianka 1990, p. 201, Fig. 12.2 'Diagrammatic description of a 3-week unit of work'; reproduced by permission of Dr. Beverly Derewianka and John Murray Press, an imprint of Hodder and Stoughton)

modes of communication are mapped out, moving students gradually along the mode continuum of field notes, oral and written recounts to more formal academic genres such as information report.

The strength of Derewianka's (1990) approach lies in seeing students as active agents of learning taking up different roles and identities (e.g. as explorers, observers, recorders, knowledge contributors, researchers and authors) under the guidance of teachers. Content learning is seen as accomplished *not* by rote memorization of 'model answers' given out by teachers in the worksheet answer-checking practice that frequently characterizes classrooms, especially in East Asian contexts where examination pressure tends to drive teaching and learning practices. Rather, learning is seen as accomplished largely through guided interactions with teachers and peers in the context of shared experience (Painter 1996, 1999; Rose and Martin 2012).

Using the Genre Egg framework (see Chap. 3) to identify the language demands of this unit of work, we can map out the key language resources that students need to master in order to successfully take up the different student roles and identities in the unit of work. For instance, using a table like Table 5.1, we can plan the different important elements in a unit of work in geology. Table 5.1 presents a unit plan specifying the content learning goals, teaching and learning activities, student roles and identities, key vocabulary, language functions and language patterns useful in realizing these functions, as well as the genres students need to understand and produce when doing the activities in this unit. With a table like this, teachers and curriculum designers can ensure that both the content learning and language learning aspects of a unit of work will be considered in the process of lesson planning.

Using a similar approach, content teachers/specialists and language teachers/specialists can collaborate in curriculum design and planning to overcome the curricular disconnects discussed in Chap. 4. For example, using the above

Table 5.1 LAC/CLIL curriculum mapping for a unit of work in geology

Content learning goals/topics	Classification of rocks
Teaching/learning activities (TLAs)	Observing and recording; hammering test; classifying activity
Student roles/identities	Rock collector; scientist; observer, reporter, experimenter, classifier
Key vocab	Quartz, volcanic, sedimentary, metaphoric, igneous rocks
Language functions (+language patterns realizing them)	Comparing and contrasting (e.g. 'Igneous rock is hard while sedimentary rock is soft.'); classifying (e.g. 'Scientists group rocks into three main types: igneous, sedimentary and metaphoric.'); exemplifying (e.g. 'Marble is an example of metaphoric rock.'); defining (e.g. 'Metaphoric rocks are rocks which have been changed by heat and pressure.'; 'Rocks that have been changed by heat and pressure are called metaphoric rocks.')
Genres (understand + produce)	Field notes, oral recount, written recount, 'big book' (information report on different kinds of rocks)

approach we can do curriculum mapping for a unit of work on how to design a 'fair test' in Grade 7 science. 'Fair test' is an important topic in the junior secondary science curriculum. A 'fair test' is a difficult technical concept for many students as it is not what we are used to doing in our everyday common-sense world. A 'fair test' is a test carried out under 'fair conditions'. For example, if the aim of the experiment is to test the hypothesis that a bigger candle gives a hotter flame and thus heats up water faster, then in the experiment the 'independent variable' is the size of the candle, and the 'dependent variables' are the temperature of the flame and the time needed to heat up water. To test this hypothesis, the experiment must be conducted under a set of 'fair' conditions. These include ensuring that possible 'intervening variables' such as the amount of water will be kept the same (the technical phrase is 'kept constant'). Using a table like Table 5.2, the science teacher and the language teacher can collaborate and work together to plan a unit of work on how to conduct a fair test. Table 5.2 lists out all the important content learning and language learning aspects of this unit of work. These aspects include the content learning goal (how to design a fair test), the teaching and learning activities (e.g. evaluating an experimental design and redesigning an experiment), student roles/identities (e.g. as an observer, recorder, hypothesizer, evaluator and experiment redesigner), key vocabulary (e.g. fair test, independent variable, dependent variable and controlled variables), language functions and language patterns to realize them (e.g. hypothesizing, giving instructions and evaluating) and the target genres to understand and produce during the teaching and learning activities (e.g. graphic organizers, data logging tables and procedural texts). With a curriculum mapping table like that in Tables 5.1 and 5.2, content teachers and language teachers can have a common tool to identify the language demands of the content learning on the one hand, and to systematically design and build language support into the content lesson on the other.

The two experimental redesign tasks developed by a science teacher (Ms. Cheung) in this unit of work in a Hong Kong school are shown in Figs. 5.2 and 5.3. In Fig. 5.2, the teacher first sets out a scenario with a story figure (Jay) in a short paragraph and then presents a hypothesis in a sentence ('He thinks that a bigger

Table 5.2 LAC/CLIL curriculum mapping for a unit of work in Grade 7 integrated science

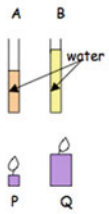
Content learning goals/topics	How to design a 'fair test'
Teaching/learning activities	Evaluating an experimental design; redesigning an experiment: 'burning candles', 'tissue absorption'
Student roles/identities	Scientist: experimenter, observer, recorder, hypothesizer, evaluator, experiment re-/designer
Key vocab	Fair test, independent variable, dependent variable, controlled variables (variables to be kept constant)
Language functions (+language patterns realizing them)	Hypothesizing; giving instructions; comparing and contrasting; expressing cause and effect; evaluating
Genres (understand + produce)	Using a graphic organizer (to show the relationships of the key elements in a fair test); using a graph/table to record and visualize observed experimental results

Light up my life !!

Jay finds that burning candles gives out heat (熱). He wonders whether the size of the candles affects the temperature of the flames. So he does an investigation on it.

He thinks that a bigger candle gives a hotter flame.

Add some water into 2 boiling tubes A and B.
Measure the temperature of the water in both tubes.
Use a smaller candle to heat tube A.
Use a bigger candle to heat tube B.
Measure the temperature of the water in both tubes after heating for 5 minutes.
The temperature of water rises 10°C in tube A and 8°C in tube B respectively.



Jay told his science teacher that a bigger candle did not give a hotter flame.
Jay's teacher told him that there were some mistakes in the experiment.

1. Do you agree with his teacher?
   _____
2. If yes, state the mistakes.
   _____
   _____

3. Improve(改進) the experimental design of the investigation.

Aim: To show that a bigger candle gives a hotter flame.

Material: _____
_____

Procedure:

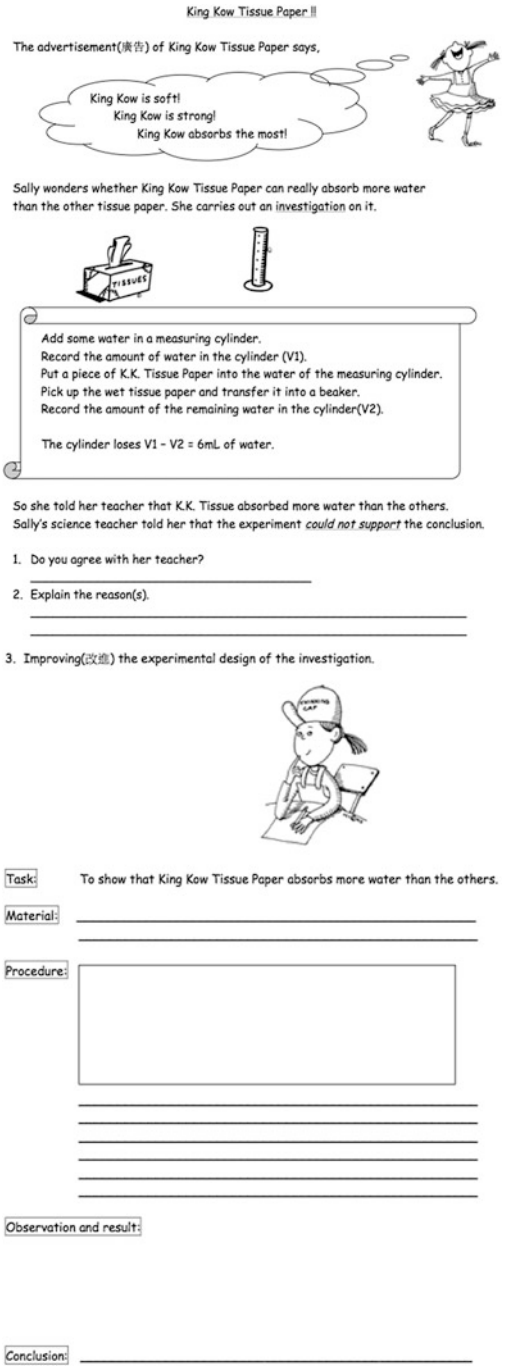
_____
_____
_____
_____
_____
_____

Observation and result:

Conclusion: _____

Fig. 5.2 Experiment redesign task: burning candles (reproduced by permission of Ms. CHEUNG Tung-ping, Munsang College, Kowloon, Hong Kong)

Fig. 5.3 Experiment redesign task: Tissue paper absorption (reproduced by permission of Ms. CHEUNG Tung-ping, Munsang College, Kowloon, Hong Kong)


King Kow Tissue Paper !!

The advertisement(廣告) of King Kow Tissue Paper says,

King Kow is soft!
King Kow is strong!
King Kow absorbs the most!

Sally wonders whether King Kow Tissue Paper can really absorb more water than the other tissue paper. She carries out an investigation on it.

Add some water in a measuring cylinder.
Record the amount of water in the cylinder (V1).
Put a piece of K.K. Tissue Paper into the water of the measuring cylinder.
Pick up the wet tissue paper and transfer it into a beaker.
Record the amount of the remaining water in the cylinder(V2).

The cylinder loses V1 – V2 = 6mL of water.

So she told her teacher that K.K. Tissue absorbed more water than the others.
Sally's science teacher told her that the experiment *could not support* the conclusion.

1. Do you agree with her teacher?
   _____
2. Explain the reason(s).
   _____
   _____
3. Improving(改進) the experimental design of the investigation.

Task: To show that King Kow Tissue Paper absorbs more water than the others.

Material: _____
_____

Procedure:

_____
_____
_____
_____
_____
_____

Observation and result:

Conclusion: _____

candle gives a hotter flame'). We notice that she has modified the science experimental design genre a bit to make it more interesting to the students to start with as it now resembles the daily life genres of stories and recounts. We also notice that the teacher has provided a Chinese (students' L1) translation of the L2 English term 'heat' in brackets to assist the students in grasping the meaning of this key term. Then the experimental procedure is provided using a list of imperative sentences. Alongside the linguistic text, the teacher uses attractive visuals (e.g. images of candles and test tubes) both to increase the interest level of the task and to illustrate some of the key information communicated in the linguistic text. The experimental procedure has some built-in errors so that this test is not a 'fair test'. The story scenario continues by having Jay's teacher telling Jay that his experiment has some mistakes in it. Then Ms. Cheung's students are invited to express their views and analysis in short-sentence responses. ('Do you agree with his teacher?' 'If yes, state the mistakes.') Following this, Ms. Cheung's students are invited to suggest ways to improve the experimental design of the investigation. In both tasksheets (see Figs. 5.2 and 5.3), we can see that the teacher provides ample language support to her students by having the genre structure of an experiment design clearly laid out for the students (like a writing template). There are five stages in the experiment design genre and each is shown under a clear heading in the tasksheets provided to the students to scaffold their rewriting of the experimental design: Aim, Material, Procedure, Observation and Result, Conclusion. In the design of these tasksheets, we can see that the science teacher, Ms. Cheung, has deliberately integrated language support into this task: students are assisted by the teacher and the tasksheets in completing the science experimental redesign writing task using the appropriate genre stages and key vocabulary provided in the tasksheets. For example, Jay's procedure is faulty only in terms of its content logic; it nonetheless contains the key vocabulary and appropriate sentence patterns (e.g. imperative sentences starting with action verbs, 'Add…', 'Measure…') for students to rewrite the experimental procedural steps. Students doing the experimental redesign writing task can easily borrow these language patterns and use them in their own writing in the new experimental design. In Fig. 5.3, a different story scenario with a different character, Sally, is used to contextualize the science experimental redesign task in an appealing story-like context. The task structure is parallel to that in Fig. 5.1. It is a parallel task used by Ms. Cheung to provide more practice to her students to experience how a non-fair test can be redesigned to make it a fair test. We notice that although both tasksheets start with a story-like scenario, the ultimate writing that the students need to produce is in the more formal science experimental design genre. In this way, we see how Ms. Cheung provides ample language support to her students as they move from a more everyday life genre (story, recount) to a more formal school genre (experimental design).

Doing curriculum mapping on units of work covering the whole subject curriculum for the same year level and across different year levels takes a lot of time and analysis and most important of all, continuous discussion and collaboration of both subject specialists and language specialists. However, the pay-offs are definitely worth the effort as such horizontal and vertical curriculum mapping will help

increase both content and language teachers' awareness of the diverse range of language and cognitive demands of different curricular activities and tasks in the student's learning trajectory across the years spanning different subjects. Curriculum planners and teachers can ensure that similar language/cognitive demands are recycled progressively in a curriculum spiral to reinforce and consolidate different kinds of language functions, genres and academic vocabulary in the different academic subject curriculums as well as the language curriculums at the same year level and across different year levels. For instance, Table 5.3 shows the collaborative curriculum mapping done by Ms. Cheung (Science teacher) and Mr. Kan (English teacher) out of their own initiative prior to their contact with the researchers. Ms. Cheung (a science teacher) and Mr. Kan (an English teacher) collaborated in their school to provide students with language support for their science learning in the students' L2, English. They sat down together and discussed the ways in which the topics taught in the integrated science (I.S.) lessons by Ms. Cheung could be coordinated with the topics taught in the English language lessons by Mr. Kan across two school years (Secondary 1 and Secondary 2; equivalent to Grade 7 and Grade 8). They came up with a curriculum mapping table (see Table 5.3).

In the left column of their curriculum mapping table under 'Topics' are listed topics selected by both teachers as the topics under which both teachers can provide coordinated support to students in their respective lessons. In the column under 'integrated science subject' are listed the subtopics and activities that Ms. Cheung will engage students in under the main topic. In the column under 'English language subject' are listed the subtopics and activities that Mr. Kan will engage students in under the same main topic as Ms. Cheung's. And these two teachers synchronize the teaching of these topics so that for example when Ms. Cheung is teaching students to do experiments on 'burning candles' and 'melting ice' under the main topic of 'Observation', Mr. Kan will be engaging the same students (in his English language lessons) in observation activities that involve using the five senses. Language arts activities that engage students in observing and describing their family members will be used. Other English language resources such as those useful for doing quantitative and qualitative data descriptions are introduced. Some language resources useful in describing different stages (e.g. before, during and after the change) are also introduced.

When the researchers (my colleagues and myself) first came into contact of Ms. Cheung and Mr. Kan's work in 2010, we were impressed by the amount of LAC work that they had already been doing. We also found in their experience an interesting example of the benefits of mapping the language and cognitive demands of different activities and tasks. Ms. Cheung found that many students in her Secondary 2 (Grade 8) I.S. class had difficulty using the Particle Theory to explain an observed phenomenon (e.g. 'When water is heated, it expands. It is because the water particles…'). She thus discussed with Mr. Kan, the English teacher teaching the English language subject to the same class of students. Mr. Kan subsequently included in his curriculum plan a topic on using an 'internal' theory (about someone's feelings) to explain an external, observed event (e.g. 'When he is hit, he

Table 5.3 An example of some initial cross-curricular mapping across junior secondary integrated science and English language subjects

	Topics	Integrated science subject		English language subject	
Sec 1	Observation	Burning candle Melting ice		Observation activities—use 5 senses, Composition (my family) Quantitative & qualitative In stages (before, during, after the change)	
	Procedure writing	Imperatives • Diagram → sentences • Quizzes • Write laboratory reports (same theme) • Rewrite laboratory reports		Imperatives— Diagram → sentences Quizzes Cooking recipe Running nose Linking words (Sequencing)—firstly, secondly, then, lastly, …	
	Result and discussion	Result—description, table, graph Discussion—evaluation and reflection		Tenses Fact—present tense Result and reflection—past tense Evaluation and improvement—future tense Modal verbs Evaluation and improvement (could, might, would, should, …)	
	Hypothesis and conclusion	Writing the task, aim, conclusion		Sentence pattern and passive voice	
	Cause and effect	External	Internal	External	Internal
		When water is heated, it expands	Particle theory	When he is hit, he cries.	Feeling
	Concept map	Reading articles—concept map, flow chart		Reading articles—concept map Comprehension	
Sec 2	Observation	Gases test Acid—egg in vinegar Space travel—film show (Apollo 13)		Revision—quantitative and qualitative In stages Describe a person and a scene Adjectives Use of dictionary and thesaurus	
	Comparative (learning skill)	Learning a new concept Compare 2 concepts (similarities, differences) Oxygen, Carbon dioxide Burning, respiration, Breathing, respiration, Respiration, photosynthesis		Comparative	

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cries. It is because he feels sad when…'). Students can thus experience using a similar cognitive/linguistic function (i.e. using a theory to explain an observed event) in both the I.S. subject and the English language subject. These findings are grounded in the close collaboration between the content teacher and the language teacher and will be beneficial to the students. If each teacher works alone with the students without this sharing of their observations of students' needs, then there will not be these concerted curricular and pedagogical efforts in helping the students to tackle the academic task of explaining an observed phenomenon in an experiment. The science teacher will be tackling this alone while the English teacher will not be aware of the cross-curricular language needs of the students.

Application Scenario 5.1
In Table 5.3, we see some initial work by Ms. Cheung (Science teacher) and Mr. Kan (English language teacher) on mapping the curricular topics and language demands across the I.S. subject and the English subject. Can you take one item (e.g. comparative) from the table and elaborate the cross-curricular mapping between I.S. and English using the Gene Egg as a framework to bring out the language demands in more detail. You can use a similar curriculum mapping approach as illustrated in Table 5.1.

5.2 The Teaching/Learning Cycle

Identifying the language demands of different academic subjects and doing curriculum mapping can help us address the question of *what* to teach; however, we still need to address the question of *how* to teach. For instance, we need to design scaffolding pedagogies to explicitly teach the genres and the language resources useful for participation in the teaching and learning activities in different subject areas. In this section, I shall introduce the scaffolding pedagogy called the teaching/learning cycle (TLC) (Rothery 1994; Rose and Martin 2012).

Figure 5.4 shows Rothery's (1994) original conceptualization of the TLC. The TLC is built on the pedagogical principle that teachers should prepare students for the academic reading and writing tasks *before* asking them to do these tasks on their own. This is especially important in the light of the pedagogical disconnects discussed in Chap. 3: e.g. typically, students are asked to do a writing task in an academic subject without adequate prior preparation. For instance, in the science, history, geography or social studies curriculums at senior secondary levels, students are required to write descriptive, explanation, expository or discussion texts in order to answer examination questions (see Sect. 4.1 in Chap. 4; see also Task 1).

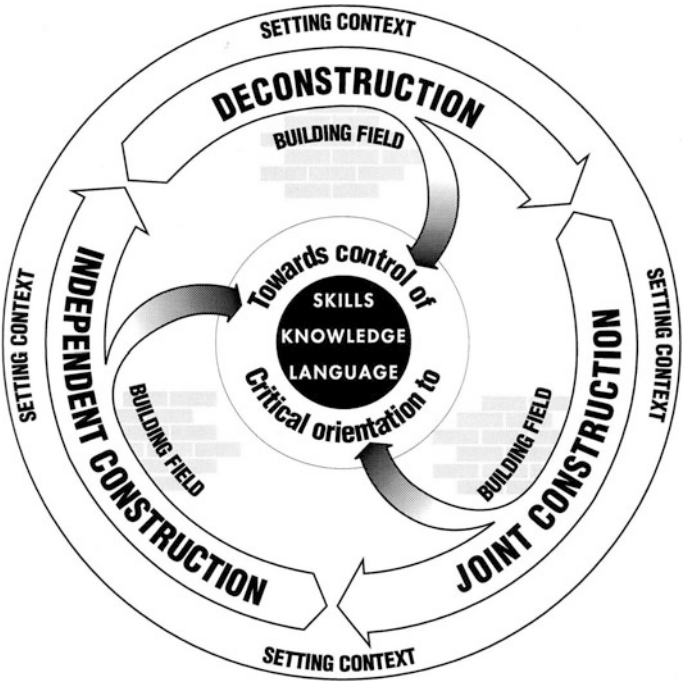


Fig. 5.4 Teaching/learning cycle (Image from Martin and Matthiessen 2014, Fig. 9.6, p. 149; reproduced by permission of Springer)

Task 1 (for Grade 7 students)

Explain why the candle goes out.

_____

_____

In order to prepare students for successful communication in these academic genres (e.g. explanation texts and expository texts), the TLC would prove useful as it adequately prepares students for a writing task through three successive stages:

1. Teacher modelling a text (joint deconstruction and analysis of a text),
2. Teacher–student jointly constructing a text and
3. Student independently constructing a text.

Teaching can start at any one of these stages, and whichever stage is introduced first the teacher should offer maximum scaffolding to the students. Gradually there should be a shift of responsibility from teacher support (e.g. joint construction) to learners taking responsibility for their own learning (e.g. independent construction). In many LAC/CLIL contexts, where students are learning English as a foreign (EFL) or additional language (EAL) and are using it as the medium for learning content, there needs to be even greater support in the modelling of a text from a given genre (e.g. exposition, explanation and description) and in joint construction. These two stages are repeated several times using a variety of texts and activities which model the target genre.

In the joint analysis (or deconstruction) of a text, the teacher engages the students in discussing the main communicative purpose and main ideas of a text and how the writer organizes these ideas systematically through different stages in order to achieve the main communicative purpose. The focus is on guiding students to notice the global genre structure of the text and to see how the academic content (i.e. *field*) unfolds through the different stages of the genre. Figure 5.5 shows an analysis of a descriptive report from Grade 4 science (see also Chap. 2).

The main communicative purpose of this text is to provide a description of flowering plants (which is a subject-specific technical term), and thus this text is an example of the genre called *descriptive report*. Even though it is a short text, the academic content (i.e. the field) unfolds through the two main stages of the genre: Introduction and Description. Within the Description stage, there is a substage (called *phase*, see Chap. 3): Giving Examples. There can be more than one Description in a descriptive report although this short descriptive report has just

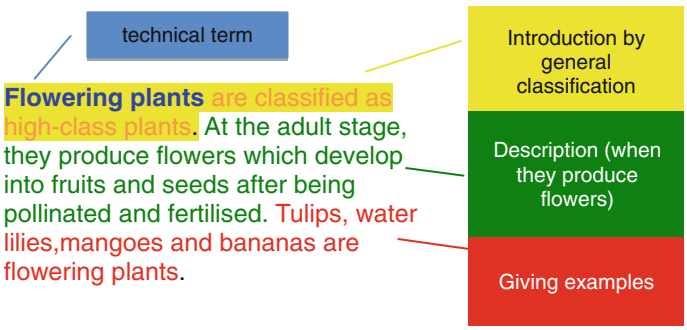


Fig. 5.5 Modelling analysis/Deconstruction of a descriptive text

Table 5.4 Joint note-making from a text

Introduction	Flowering plants	—A kind of high-class plants
Description	Adult stage	—Produce flowers → pollination + fertilization → fruits + seeds
-giving examples		—Tulips, water lilies, mangoes and bananas

one. When the teacher jointly reads the text with the students, the teacher does the 'deconstruction' or analysis of the text together with the students by drawing the students' attention to these global genre stages of the text.

Then the teacher can direct students' attention to the main idea of each stage of the text. For instance, in the Introduction stage, the writer presents the main topic of the text (flowering plants) by classifying them or putting them into a general category of plants (high-class plants). This is a usual way of introducing the topic in descriptive reports. As the teacher guides the students to read to the second stage (Description stage), the teacher summarizes the main idea of this stage for the students: when will flowering plants produce flowers? As the teacher reads the last part of the text with the students, the teacher can summarize the main idea of this last phase: giving examples of flowering plants. In this way, the teacher models analysing the general structuring of information in the descriptive report genre through reading and analysing an example text of such a genre together with students.

During this first joint deconstruction lesson stage, the teacher can jointly make notes with the students on the main ideas of the text using a simple graphic organizer or a table. Table 5.4 shows a simple note-making table that the teacher and students can use to make notes while reading the text together:

After the first stage of joint analysis and joint note-making, the teacher can engage students in the joint construction of a new descriptive report based on the notes made in the previous stage. The teacher can ask a student to be the 'scribe' at the blackboard, while he/she works with the class to come up with new wordings for each stage of the new descriptive report and produce a new text together. Below is a possible lesson conversation involving the teacher and students in the joint production of a new text:

Lesson Conversation Example 5.1: Teacher and Students Co-constructing a Text

T: Okay, let's try to write a new descriptive report using the notes we've just made. Who wants to be the scribe? Winnie, can you be our scribe? {Winnie comes out to the blackboard}

T: First of all, in the first paragraph, what should we have? Just now we have analysed a descriptive report together, do you remember, what do we have in the first stage of a descriptive report? {T pointing to the word INTRODUCTION in the table of notes made on the board.}

S1: Introduction!

T: Yes, Introduction. We shall introduce the topic. What is the topic? {T pointing to the relevant words in the notes on the board}

S2: Flowering plants.

T: Yes, flowering plants. We can introduce flowering plants by classifying them. Which general class do flowering plants belong to? Flowering plants belong to the category of …. of what? {T pointing to the relevant words in the notes on the board}

S3: High-class…

T: Yes, high class, high class plants. Flowering plants belong to the category of high-class plants. Let's write this down. Winnie, please help us write this down on the board: Flowering plants belong to the category of high-class plants.

{As Winnie is trying to write this down, she stops before the word, 'category'}

T: Okay, what's the spelling of category? Who can help? How to spell category? Look at the text we've just read and it's there.

Ss: c-a-t-e-g-o-r-y

T: Very good! Yes, c-a-t-e-g-o-r-y category.

{Winnie continues to write out the sentence on the board}

T: Very good! Thank you, Winnie. Okay, after introducing the topic by classifying it, what's the next stage in a descriptive report?

{no response}

T: Look back at the notes we've just made. {T pointing to the relevant words in the notes on the board}

Ss: Description

T: Yes, very good! Description. When do flowering plants produce flowers?

S5: Adult, adult…

T: Yes, excellent! Adult stage… How can we say this? During the adult stage, during, we can use during, like, during recess time, during holidays, now, it's during the adult stage… who can spell during for me?

S6: d-u-r-i-n-g

T: Thank you! During, let's spell it together for Winnie: d-u-r-i-n-g

{Winnie writes on the board: during}

T: We're starting a new sentence, so we should use capital letter 'D'.

{Winnie corrects it on the board}

T: Very good! During the adult stage, what happens? {T pointing to the relevant words in the notes on the board}

S7: Produce flowers

T: Yes, during the adult stage what produce flowers? {T pointing to the relevant words in the notes on the board}

Ss: Flowering plants

T: Yes, can you give me the whole sentence: During the adult stage…

S8: Flowering plants produce flowers…

T: Yes! During the adult stage, flowering plants produce flowers. {T gesturing Winnie to write this on the board; Winnie stops at the word, produce; T asks the class to spell the word together; Winnie continues to finish writing the sentence on the board}

T: Thank you Winnie! Now what happens next? What happens to the flowers? Can they turn into fruits and seeds?

{No response}

T: Okay, look at the notes we've just made. {T pointing to the relevant words in the notes on the board}

S9: pollination

S10: fertilisation

T: Very good! After pollination and fertilisation, flowers turn into fruits and seeds.

T: What can be the next sentence in the Description then?

S11: turn into…

T: Yes, after pollination and fertilisation, flowers turn into fruits and seeds.

{T gestures Winnie to write the sentence on the board. Winnie hesitates. T asks the class to spell out the word pollination together, then the word fertilisation together; Winnie writes the words on the board}

T: Thank you so much Winnie! Wonderful job! Now, we have come to the last part of our descriptive report. What should we have now? {T pointing to the relevant words in the notes on the board}

S12: Examples

T: Excellent, we can give examples of the flowering plants, right? Now, who can remember the examples, look at the notes we've made. {T pointing to the relevant words in the notes on the board}

Ss: tulips, water lilies, mangoes

T: Very good! How should we start the sentence to give examples?

S13: For example

T: Yes, for example, tulips, water lilies, mangoes, bananas are flowering plants.

S14: sunflower!

S15: hibiscus!

T: Oh, yes, thank you! Winnie, have you got all of these examples? {Winnie writes the last sentence: For example, tulips….; she stops at some words and the T repeats the practice of asking the class to spell out the words for her; finally she completes the sentence on the board}

T: Excellent job, Winnie! Well-done class! Let's write down this new descriptive report in your note-book.

{T gives some time to the class to copy the text from the board onto their notebooks}

The new text co-constructed by the teacher and students looks like the following:

Flowering Plants belong to the category of high-class plants. During the adult stage, flowering plants produce flowers. After pollination and fertilisation, flowers turn into fruits and seeds. For example, tulips, water lilies, mangoes, bananas, sunflowers are flowering plants.

In the above lesson conversation, the students are engaged by the teacher in co-constructing a new text based on the notes that they have made during the first stage of text analysis. In this second stage of joint reconstruction, the teacher provides ample language scaffolding to students as they jointly reconstruct a new text based on the notes made, with the teacher constantly pointing at the notes made previously on the board to provide clues to the students to answer his questions as they jointly reconstruct the text based on the notes. The new text looks very similar to the original text in terms of content but new wordings are used. Students feel a sense of accomplishment during the joint reconstruction process, even if they may be heavily guided and scaffolded by the teacher. This joint reconstruction process can be repeated several times with a few more text examples before the students are asked to independently write their own texts as assignments. In this way, the students are prepared for the writing task (e.g. to write a descriptive report) through the three stages of the TLC.

The TLC thus can help overcome the pedagogical disconnect discussed in Chap. 4. Through the three stages of the TLC, students are guided by the teacher to *unpack* an academic text and to make summary notes (joint deconstruction stage) and then they are scaffolded by the teacher to *repackage* (*or repack*) the notes into a new text (in the same genre) with new wordings both elicited from the students and provided by the teacher (joint reconstruction stage) before they are asked to construct their own text on their own (independent construction stage).

However, if the students' English proficiency is even more basic (as is often the case in EFL/EAL contexts), there is the need to provide even more language support to the students before they can participate in the joint reconstruction and independent construction stages. We shall need to design bridging pedagogies that

cater for these students. We shall look at how this can be done by further analysing the different components of a 'task'.

5.3 Conceptualizing the Task in CLIL

So far 'activities' and 'tasks' have been used in this chapter interchangeably as if they are the same; however, it is worthwhile at this point to differentiate between the two. Tasks are, in general, more goal-directed and have a specific structure. Rose and Martin (2012) analyse the structure of a frequent classroom oral task given by the teacher to students and characterize it as having a 3-part structure: Focus-Task-Evaluate (Fig. 5.6).

To illustrate this task structure, let us look at the 3 different classroom exchanges in Fig. 5.7.

In all the 3 teacher–student exchanges in Fig. 5.7, the task is for students to propose answers to the teacher's questions. Realistically, only the brightest students would attempt to answer the teacher's questions, with the majority of the students not being prepared or scaffolded by the teacher to propose answers to the question. They often either offer incorrect answers that do not get affirmed by the teacher or remain silent, and this kind of experience is often frustrating to the students, as Graham Nuthall points out in his 2005 article, 'The cultural myths and realities of classroom teaching and learning':

Fig. 5.6 Structure of an oral task (From Rose 2013, Slide 15; reproduced by permission of Dr. David Rose)

Teacher	Focus	*Ok, what do all living things have in common?*
Students	Propose	*Same structure*
Teacher	Evaluate	*That's right.*
Teacher	Focus	*Ok, what do all living things have in common?*
Students	Propose	*They're animals*
Teacher	Evaluate	*Well, all kingdoms of life are made of cells.*
Teacher	Focus	*Ok, what do all living things have in common?*
Students	Propose	*They're alive*
Teacher	Evaluate	*That's true, but there's something more important.*

Fig. 5.7 The three-part structure of an oral task: classroom examples (From Rose 2013, Slide 16; reproduced by permission of Dr. David Rose)

The teacher is largely cut off from information about what individual students are learning… They are sustained, however, by the commonly held belief that if students are engaged most of the time in appropriate activities, some kind of learning will be taking place… Teachers depend on the responses of a small number of students as indicators …of what most of the class knows and understands (Nuthall 2005, pp. 919–920; cited in Rose 2013, Slide 20).

Rose thus proposes that we should add a 'Prepare' stage and an 'Elaborate' stage to the task structure as shown in Fig. 5.8.

The teacher–student exchanges corresponding to the different stages of the task structure will likewise be expanded, as illustrated in Fig. 5.9 (the teacher is engaging students in a detailed reading of a biology text).

In the Prepare stage, the teacher provides positional cues and read out the relevant sentence from the text. (*The first sentence describes where the cytoplasm is* '*Cytoplasm is the part of the cell inside the cell membrane but outside the nucleus.*') In this way, students are assisted in finding in the text the answer to the teacher's next question. As students are helped and prepared in this way, more students are likely to be able to get the correct response and more students can have the positive experience of getting affirmed in the teacher–student exchanges. In the Elaborate stage, the teacher can provide more useful information to the students. (*The cytoplasm is the gray part inside the membrane but outside the nucleus.*)

Rose and Martin (2012) propose that in the Prepare stage there can be less expansion (e.g. focusing on literal or inferential meanings of the text) while in the Elaborate stage there can be more expansion (e.g. focusing on inferential or interpretive meanings), as illustrated in the teacher–student exchanges in Fig. 5.10. In this exchange, the teacher is engaging the students in a detailed reading of an excerpt from the story *Fantastic Mr. Fox* by Roald Dahl.

In the above teacher–student exchanges, we see that students are being prepared by the teacher to answer the subsequent question through the provision of positional cues in the text or an advance notice of what the next stretch of text is about. (e.g. '*Then it tells us how he could see*'.) The questions asked by the teacher are also often literal or factual ones (e.g. requiring students to identify certain words or phrases from the text). The more complex information is provided by the teacher in the Elaborate stage. While this task structure seems to work well to enable more students to answer the teacher's questions and to get affirmed, this kind of practice, however, might fall short of Gibbons (2009)'s suggestion that teachers should offer high-challenge tasks with high support. The support here is strong but the task

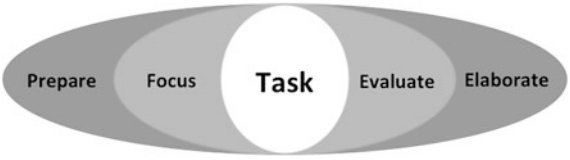


Fig. 5.8 The expanded structure of an oral task (From Rose 2013, Slide 19; reproduced by permission of Dr. David Rose)

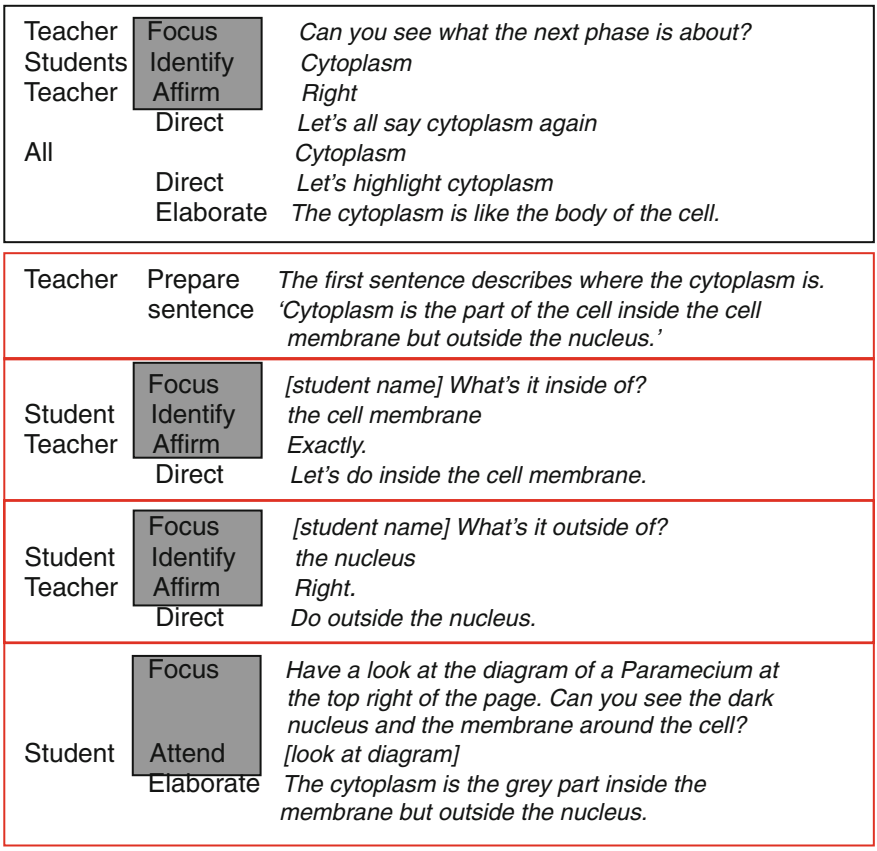


Fig. 5.9 The expanded structure of an oral task: classroom examples (From Rose 2013, Slide 21; reproduced by permission of Dr. David Rose)

might not be challenging enough. However, when students' L2 proficiency is really very basic, Rose's detailed reading approach does seem to offer an important bridging strategy to gradually expand students' repertoire of L2 resources in a safe, affirming, participatory and non-threatening environment. Through this detailed reading approach, even students with very small amounts of L2 resources can experience the success of being able to answer the teacher's questions; they can also be affirmed and guided to notice how accomplished writers mobilize the language resources to accomplish different rhetorical functions and communicative purposes in a text.

In Rose and Martin's (2012) Reading to Learn (R2L) Curriculum Cycles (Fig. 5.11), Rothery (1994)'s TLC has been expanded to include cycles of joint rewriting (of sentences, short paragraphs) and independent rewriting. This approach is especially useful in EFL/EAL contexts, where students' English resources can be very basic, as opposed to ESL contexts, where ESL students might not have a lot of

Teacher	Prepare	*The sentence starts with two words that mean at the same time.*
	Focus	*[student name]. Can you see those two words?*
Student	Identify	***Just then***
Teacher	Affirm	*Exactly.*
	Direct	*Let's highlight **Just then**.*
	Elaborate	*Just then means just when Mr Fox took his last careful look around.*
Teacher	Prepare	*Then it tells us how he could see*
	Focus	*[student name]. Can you see **what his eyes were like?***
Student	Identify	***Sharp night-eyes**.*
Teacher	Affirm	*Excellent.*
	Direct	*Highlight **Sharp night-eyes**.*
	Elaborate	*Foxes have special eyes that can see at night.*

Fig. 5.10 Expansion in the Elaborate stage: classroom example (From Rose 2013, Slide 39; reproduced by permission of Dr. David Rose)

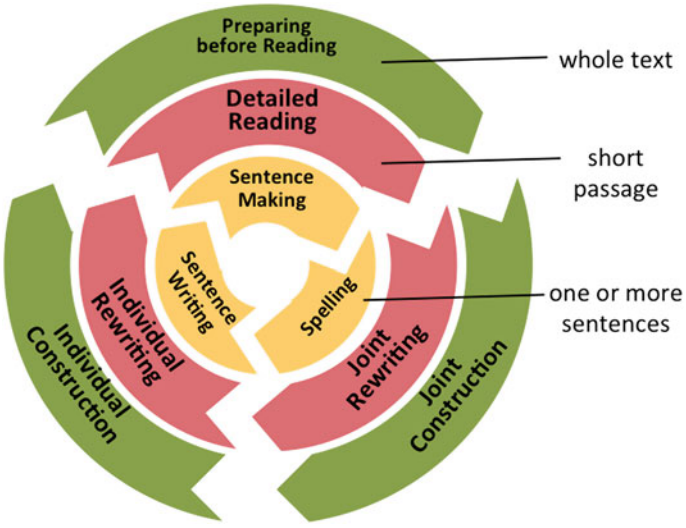


Fig. 5.11 The Reading to Learn (R2L) Curriculum Cycles (From Rose 2013, Slide 9; reproduced by permission of Dr. David Rose)

English academic language resources but might still have well-developed repertoires of everyday spoken English resources, which can serve as a bridge (see the rainbow diagram in Fig. 5.12). In EFL/EAL contexts considerably more bridging resources are needed. This will be discussed in the next section.

Fig. 5.12 Lin's 'Rainbow Diagram' (Adapted from Lin 2012, p. 93, Fig. 5.2 'Bridging multiple resources—ultimate goal: Expanded repertoire'; reproduced by permission of Multilingual Matters)

5.4 Designing Bridging Materials in CLIL: L1, Local Languages and Multimodalities as Resources

Jim Cummins' L1–L2 interdependence theory and notions of BICS (Basic Interpersonal Communication Skills) and CALP (Cognitive Academic Language Proficiency) in bilingual education (Cummins 1991) (see Chap. 2) have informed us on the important role that L1 or local languages and literacies can play in LAC and CLIL. In particular, it has informed Gibbons's (1993, 2002, 2008, 2009) pedagogy of scaffolding and bridging ESL students' academic literacy development through *rich tasks* and *high support—i.e. learning in the challenge zone*. Gibbons' observation that many ESL literacy curriculums have been characterized by low-level mechanical drills and intellectually unchallenging tasks is also very true of the situation in many Hong Kong schools (Lin 1999, 2000). For instance, a preliminary analysis of the I.S. English textbooks commonly used in schools in Hong Kong shows that the textbook language is truncated and made up of almost point-form text and provides little modelling of coherent text types found in the science discipline (e.g. descriptive reports and explanatory texts). Students are provided with mainly simplified English language in these textbooks (i.e. serving the unpacking

function, but there is little exposure to well-written coherent academic texts; i.e. no support for repacking).

Thus, instead of dumbing down the curriculum, we need to develop bridging materials, which can draw on Gibbons (2009)'s pedagogy of designed scaffolding and bridging. Gibbons has proposed very useful principles regarding how teachers can design scaffolding and bridging in content-based ESL programmes and these principles are summarized below:

1. Programmes build on students' prior knowledge and their current language skills (both their L1/local languages and L2), while at the same time embracing new content and language goals
2. Clear and explicit programme goals are shared with the students
3. Tasks are sequenced so that each task serves as the 'building blocks' for the subsequent task
4. A variety of organizational structures is used (pair work, group work, individual work, teacher-directed whole-class work)
5. The curriculum is *amplified*, not simplified: Teachers use 'message abundancy' (i.e. key ideas are presented in many different ways, including rhetoric strategies and genres, visuals and images, as well as academic social practices such as classroom/laboratory inquiry practices) (Gibbons 2009, pp. 152–158)

Thus, in designing *high-challenge, high-support* materials, we need to draw on all the resources available to the students. Figure 5.12 (see Lin, 2012, 2013a, 2013b) is a graphical representation of the different kinds of resources that can be drawn upon to scaffold students' learning of academic content and academic written registers. These resources include the following:

- L2 academic oral registers,
- L2 everyday registers,
- L1 (or local) academic written registers,
- L1 (or local) academic oral registers,
- L1 (or local) everyday registers, and
- Multimodalities (e.g. audiovisuals, images, diagrams, concept maps, graphic organizers, demonstrations, role-play, actions and gestures).

5.4.1 An Example of Using L1 or Local Language as a Bridging Resource: The Bilingual Notes Approach

There are different ways of designing lesson materials with built-in language support. In some LAC/CLIL contexts where the students share a common L1 or local language and have some foundation in L1/local language academic literacy, carefully designed written presentation of bilingual academic content can help to scaffold students' L2 academic learning. For instance, in the bilingual notes approach developed by a team of science teachers in a secondary school in Hong

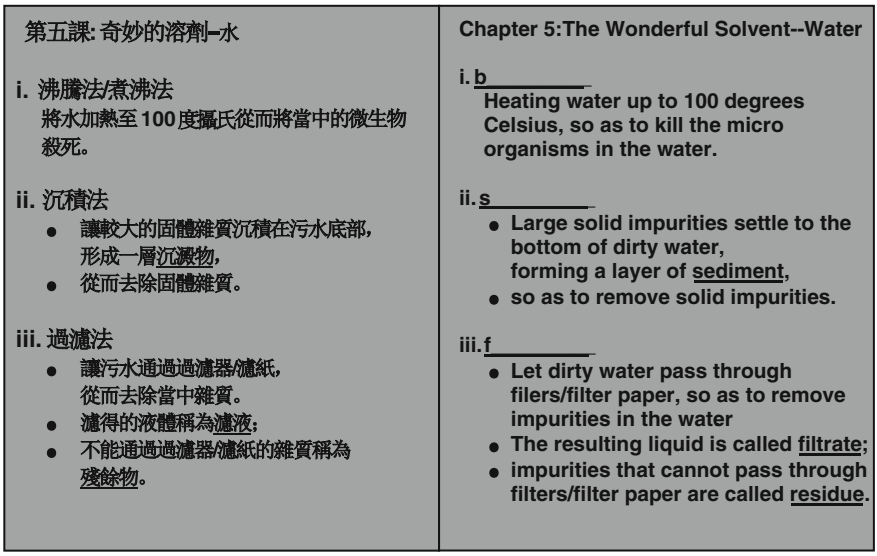


Fig. 5.13 The bilingual notes approach (cited in Lin 2013b, p. 529; reproduced by permission of Mr. CHEUNG Kwok-wa and Mr. CHOO-KAN Kwok-wing)

Kong, the academic content is presented bilingually (in Chinese and English) side-by-side on the same page to facilitate easy cross-referencing by the students (Fig. 5.13).

The teachers have developed a set of systematic principles in their design of this bilingual bridging approach. These principles have been summarized by the teachers as follows:

1. The students' existing needs and academic abilities are first understood and considered in the design of the materials.
2. The aims of the bridging approach are explained to students at the beginning of the programme.
3. In proceeding with this bridging approach, the students' familiar languages (spoken Cantonese and written Chinese) are used to present the content at the beginning of the programme, and then later in the programme some English is gradually introduced: first at the level of vocabulary, then at the sentence level, followed by short paragraphs and short texts.
4. The introduction of English texts is fully contextualised and students are led to use English to achieve a specific task (e.g. bilingual quizzes).
5. Teachers in the language panels collaborate with teachers in the content subject panels in the design of the programme.
6. Teachers need to have confidence in the programme in order to persist in carrying it out systematically and gradually. (Source: Mr. Cheung and Mr. Choo; cited in Lin 2013b, pp. 530–531)

According to the teachers, as many of their students understand that English is needed for their future academic studies, the students are willing to put in the extra

effort to gradually learn the academic English vocabulary and sentence patterns for the various topics. To provide further incentives for learning academic English, some assignments are designed with about 20 English multiple-choice questions (Fig. 5.14 shows some of these questions) and one to two bilingual short questions. In certain assignments, the multiple-choice questions are also bilingual and graded according to the level of difficulty. The contents and style of the bilingual assignments, quizzes and tests follow those of the bilingual notes (see Fig. 5.13). Students are thus encouraged to complete the short questions in English by referring to the bilingual notes (Lin 2013b).

As the students gradually gain more L2 academic resources, the bilingual notes approach can be gradually phased out but some language support can still be built into the lesson materials through the provision of L1 or local language equivalents of difficult L2 terms as well as the use of multimodalities (e.g. visuals, symbols, images, graphic organizers and mind maps), which will be discussed below.

5.4.2 *The Multimodalities–Entextualization Cycle (MEC)*

Another set of useful bridging strategies involves shifting between different kinds of textual and multimodal mediation of academic content/experience (Lin 2012, 2013a, b, 2015a, b). The core processes behind the use of these strategies are diagrammatically represented in Fig. 5.15. It consists of three core processes, which are explained as follows:

Core Process 1:
Create a rich experiential context to arouse students' interest, and immerse the students in the content topic field using multimodalities (e.g. visuals, images, YouTube videos, diagrams, demonstrations, actions, inquiry/discovery activities and experiments)
Core Process 2:
Engage the students in reading and note-making tasks that require some systematic 'sorting out' or re-/presentation of the experience gained from the above using different kinds/combinations of everyday L1/local language/L2 spoken/written texts and multimodalities (e.g. (bilingual) notes, graphic organizers, mind maps, visuals, diagrams, pictures, oral description, story-boards and comics)
Core Process 3:
Engage students in *entextualizing* the experience using L1/local language/L2 (spoken/written) academic genres (e.g. experimental design) with language scaffolds provided (e.g. key vocab, sentence-generating tables, writing and speaking templates)

3Chem_0708_Assignment_1/ p.1

F.3 Chemistry 2007-2008
Assignment 1: Unit 1 - Safety in Laboratory
Unit 2 - Matter

Class: _____ ( ) Date: _____

Name: _____ Marks/Grade: _____ / 40

Part 1: Multiple Choice Questions
Choose only ONE answer for each of the following questions.
Put a 'V' into the corresponding box.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A.			V		V		V				V				V					
B.									V	V				V				V	V	
C.	V			V		V		V									V			
D.		V										V	V			V				V

1. You are NOT allowed to enter a school laboratory unless
   A. a monitor is present.
   B. a school prefect is present.
   C. a teacher is present.
   D. a technician is present. C

2. If you pour some chemicals onto your hand accidentally, you should
   A. wash the hand with plenty of acid.
   B. wash the hand with plenty of alkali.
   C. wash the hand with plenty of salt solution.
   D. wash the hand with plenty of water. D

3. Which hazard warning label would you put on a bottle of concentrated hydrochloric acid?
   A. corrosive
   B. irritant
   C. oxidizing
   D. toxic A

4. Which hazard warning label would you put on a bottle of hydrogen peroxide (雙氧水)?
   A. corrosive
   B. irritant
   C. oxidizing
   D. toxic C

Fig. 5.14 Excerpts from an assignment (cited in Lin 2013b, p. 533; reproduced by permission of Mr. Cheung and Mr. Choo)

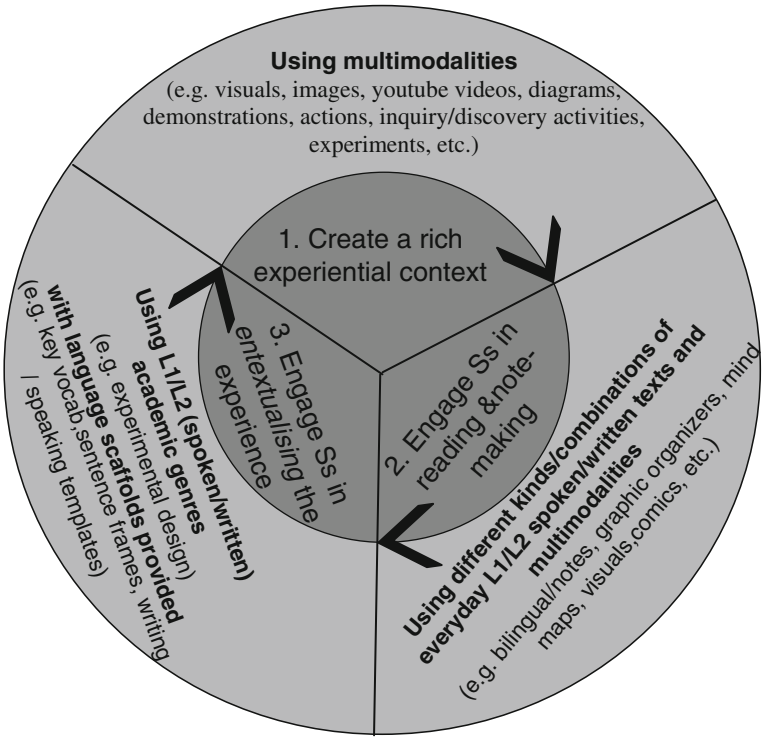


Fig. 5.15 Multimodalities–Entextualization Cycle (MEC) (Key: *Ss* students)

These three core processes form a curriculum cycle called the Multimodalities–Entextualization Cycle (MEC) (Lin 2015a, b) (Fig. 5.15). An example of Core Process 1 can be seen in Activity 1 in the Unit of Work ('What is a Scientific Investigation') in Appendix A. Examples of Core Process 2 can be seen in Activities 2–4. Examples of Core Process 3 can be seen in Activities 4–5.

The MEC can be reiterated until the target LAC/CLIL goals have been achieved; the amount of L1/local languages used can vary depending on the needs of your students (e.g. in the Unit of Work in Appendix A, the amount of L1/local language use is well-controlled but it can be expanded depending on the L2 proficiency of students in a particular context). Furthermore, the TLC and R2L cycles discussed above can also be inserted into the MEC at any point deemed appropriate (e.g. between processes 1 and 2, or 2 and 3, or 3 and 1). While the MEC (Lin 2015a, b) is still in its conceptualization and piloting stage, more curricular studies in the future will provide us with more information on how the MEC can be further refined, elaborated and adapted by teachers to suit the needs of students in diverse multilingual and multicultural contexts.

Application Scenario 5.2 Designing Bridging Materials: Building in language support

Suppose you are designing a CLIL unit of work on photosynthesis for a Grade 8 class. Work with a collaborating teacher (if you are a content teacher, work with a language teacher, and vice versa) to incorporate an MEC in your unit. You can also embed a TLC or R2L cycle in the MEC. The material below is taken from the website of *Science and Plants for Schools (SAPS)*, where you can find teaching resources on many science topics including the topic of photosynthesis for high school students.

The story of photosynthesis

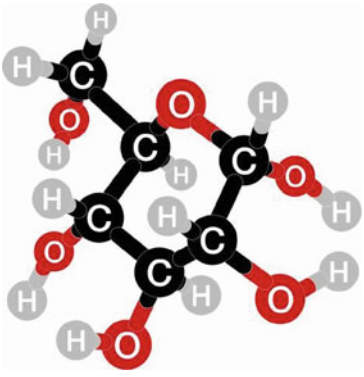
Take a look at how plants make their food.
We know that the food plants made from photosynthesis are called CARBOHYDRATES.

If we look at the word,
CARBOHYDRATE,
we can tell quite a lot about it.

Carbohydrates contain the atoms CARBON, HYDROGEN and OXYGEN
So, which part of the word means that it contains carbon?
And which part of the word means that it contains hydrogen?

Now, can you suggest what the letters 'ATE' mean when placed on the end of a chemical name?

The diagram below is a chemical picture of one carbohydrate. Count how many carbon, hydrogen and oxygen atoms this chemical has…



(*Source* http://www.saps.org.uk/secondary/teaching-resources/134-photosynthesis-a-survival-guide-teaching-resources; copyright © Dr. Debbie Eldridge; reproduced here by permission of Dr. Debbie Eldridge)

5.5 Scaffolding via Classroom Talk

Apart from designing materials that incorporate language support and multimodalities to assist students' learning, an important bridging strategy is to provide scaffolding via classroom talk in conjunction with specially designed bridging materials. Scaffolding via classroom talk can be provided at a minimum level through the provision of L1/local language annotations of key L2 vocabulary, as illustrated in the following lesson excerpt from a Grade 9 mathematics lesson in a Hong Kong school. The teacher, Ms. Sitt, is explaining a mathematical operation that requires the understanding of the key lexical phrase: replace… by…

18:40 … replace Tangent Θ by 2.

Look at the board.
replace Tangent Θ by 2. (*T repeats*)
replace by 代替咗佢, okay?

18:56 For this second way, what have they done here, Alice?

And then? What happens on the third line?… What have they done here? How about the fourth line? What have they done?…
… to replace the…

20:22 Okay, Alice, one more question.

Why do they have to replace it?
(Tavares 2015, pp. 328–331)

The teacher annotates the key lexical phrase ('to replace by…') using the students' more familiar language (the Cantonese phase 代替咗佢 means 'to replace by…'). In addition, she uses the *syllabification* strategy to help students 'chop up' multisyllabic words such as 'numerator', 'denominator' into different syllables in order to aid their learning of these key words in mathematics (see Plate 5.1). By skillfully interweaving a focus on the language aspects into her math lesson, the teacher builds in language support via classroom talk (Tavares 2015).

Scaffolding via classroom talk can go beyond the minimal level of annotating key vocabulary. If students have a very basic L2 proficiency and yet owing to education policy issues, there is a strong desire for parents to put their children into L2 medium programmes, and then classroom scaffolding using L1 or local languages needs to be systematically planned into the structure of a learning task. Figure 5.16 shows the orbital structure of a learning task.

In the 'Prepare' phase of the learning task, L1 can be used to help students prepare for the task. Similarly, in the 'Elaborate' phase of the activity, L1/local language can also be used to help students apply what is learnt in new contexts. I shall use the example in Sect. 5.2 above to illustrate this point.

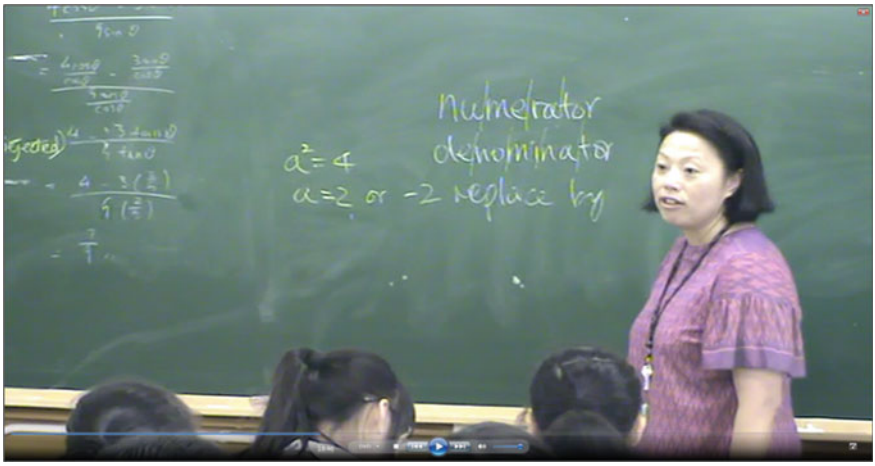


Plate 5.1 Syllabification strategy used by Ms. Sitt (reproduced here by permission of Ms. Winnie Sitt)

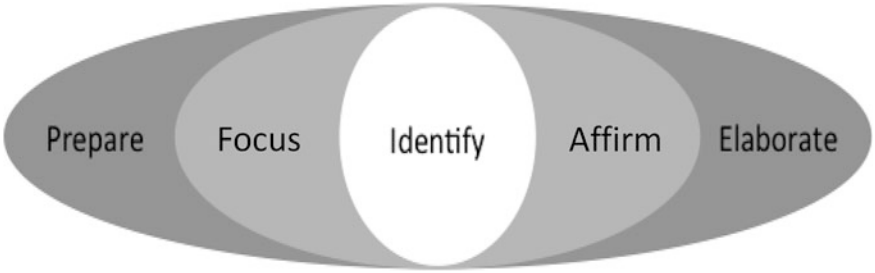


Fig. 5.16 Design principle: Orbital structure of a learning task (From Rose 2013, Slide 38; reproduced by permission of Dr. David Rose)

5.5.1 The Prepare Phase

In preparing students to read the descriptive report, the teacher needs to arouse students' interest in learning about flowering plants. This is called the Prepare phase in Rose's structure of a learning task. In this phase, a lot of strategies can be used: showing students pictures or videos of different kinds of flowering plants, or getting students to actually observe and examine a real flowering plant in the school garden (if this is available and feasible), or telling the life story of a flowering plant using the first person perspective (using personification: e.g. I'm a papaya tree… I grew up in Bangkok…). In this phase, L1/local language can be used to stimulate students' interest and background knowledge about the topic. Students can brainstorm

all their knowledge about flowering plants using L1/local languages (e.g. they might know the names of some flowering plants in their L1/local languages) and the teacher can help them translate some of these words into L2.

5.5.2 The Elaborate Phase

In the *Elaborate* phase, i.e. the final phase of the learning task, L1/local languages can also be used to apply what has been learnt in new contexts. For instance, students can be encouraged to produce an info-poster on flowering plants. In this phase, the teacher can use L1/local languages to explain how to make an info-poster using an e-tool (e.g. comic life, toondoo and glogster) or how to organize and lay out different kinds of information about flowering plants in the poster. Furthermore, L1/local languages can be used to help students gain awareness of some new language patterns useful in creating new sentences for the poster; for instance, how to design a catchy heading for the poster.

In the *Focus*, *Task* (which can be *Propose* or *Identify* or other kind of work), and *Affirm* phases of the learning task, while L2 is maintained as the main language, L1/local language can be used systematically and judiciously to provide annotations of key vocabulary (as shown in Ms. Sitt's example above) and multimodalities can also be used to assist the students to accomplish the task (e.g. teacher pointing to the relevant parts of a graphic organizer, a table, or a diagram to provide the position cues of the relevant words/content).

Application Scenario 5.3 Plan a unit of work that incorporates language support using L1/local language(s) and multimodalities
Re-design a unit of work from your current academic subject curriculum and explore ways of incorporating language support and multimodalities into the materials. Then plan for the systematic use of L1/local language(s) in the different phases of the unit of the work, e.g. in the Preparation and Elaboration phases of the learning activities. As you are doing this, bear in mind the language proficiency levels of your class of students and try to visualize the different kinds of scaffolding they would need in order to participate successfully in the learning activities.

Summary Points

- Curriculum mapping and cross-curricular collaboration are good strategies to overcome the intercurricular disconnects discussed in Chap. 4.
- Bridging pedagogies can be designed through redesigning the traditional curriculum genres; some such examples include: TLC, Read-to-Learn (R2L) Cycle; and Multimodalities–Entextualization Cycle (MEC); these

redesigned curriculum genres aim at building systematic language support into the content lesson.
- Re-conceptualizing the structure of the task: building in a 'Prepare' phase before inviting students to respond, this will enable more students to experience a sense of success with the task.
- The Bilingual Notes Approach as an example of how L1/local language and resources can be systematically and judiciously used to provide support to students as they try to learn content in an L2; L1/local languages/resources can also be built into the 'Prepare' phase and the 'Elaborate' phase of the task structure.

End-of-Chapter Discussion Questions

1. Can you briefly describe how to do note-making in the 'Deconstruction' (text analysis) stage in order for the teacher to effectively guide students through the joint reconstruction stage? For example, how are the words in Table 5.4 finally selected and laid out by the teacher for students to write down on their notebooks in preparation for the next stage of co-construction? Can there be other ways of doing this?
2. The teacher–student exchange sequence with the 'Prepare' and 'Elaborate' stages can help to ensure that every student gets useful information and receives affirmation apart from the best students. If this is the case, how can we make the top students feel challenged under this framework?
3. It has been said that students in many East Asian contexts are often too shy to speak up. If this is true, how can we engage more students in brainstorming in the joint construction stage?
4. The author discusses how L1/local language(s) and multimodal resources can be used in the teacher–student exchanges in the 'Deconstruction' stage of the TLC. How can these resources be effectively used in the 'joint construction' stage as well in order to encourage more student contribution?
5. From your understanding of the key issues discussed in this chapter, can you explain in your own words the relationships among the terms 'activity', 'task', 'classroom talk' and 'teacher–student exchange'?

References

Cummins, J. (1991). Conversational and academic language proficiency in bilingual contexts. In J. H. Hulstijn & J. F. Matter (Eds.), *Reading in two languages* (pp. 75–89). Amsterdam: AILA.

Derewianka, B. (1990). Rocks in the head: Children and the language of geology. In R. Carter (Ed.), *Knowledge about language and the curriculum: The LINC reader* (pp. 197–215). London: Hodder & Stoughton.

Derewianka, B. (2011). *A new grammar companion for teachers* (2nd ed.). NWS: Primary English Teaching Association.

Gibbons, P. (1993). *Learning to learn in a second language*. Portsmouth, NH: Heinemann.

Gibbons, P. (2002). *Scaffolding language, scaffolding learning: Teaching second language learners in the mainstream classroom*. Portsmouth, NH: Heinemann.

Gibbons, P. (2008). "It was taught good and I learned a lot": Intellectual practices and ESL learners in the middle years. *Australian Journal of Language and Literacy, 31*(2), 155–173.

Gibbons, P. (2009). *English learners, academic literacy, and thinking: Learning in the challenge zone*. Portsmouth, NH: Heinemann.

Hong Kong Examinations and Assessment Authority. (2013). *Hong Kong diploma of secondary education (DSE) Integrated Science Exam Paper (2013)*. Hong Kong: Hong Kong Government Printer.

Lin, A. M. Y. (1999). Doing-English-lessons in the reproduction or transformation of social worlds? *TESOL Quarterly, 33*(3), 393–412.

Lin, A. M. Y. (2000). Resistance and creativity in English reading lessons in Hong Kong. *Language, Culture and Curriculum, 12*(3), 285–296.

Lin, A. M. Y. (2012). Multilingual and multimodal resources in L2 English content classrooms. In C. Leung & B. Street (Eds.), *'English'—A changing medium for Education* (pp. 79–103). Bristol: Multilingual Matters.

Lin, A. M. Y. (2013a). Classroom code-switching: Three decades of research. *Applied Linguistics Review, 4*(1), 195–218. doi:10.1515/applirev-2013-0009.

Lin, A. M. Y. (2013b). Towards paradigmatic change in TESOL methodologies: Building plurilingual pedagogies from the ground up. *TESOL Quarterly, 47*(3), 521–545.

Lin, A. M. Y. (2015a). Conceptualizing the potential role of L1 in content and language integrated learning (CLIL). *Language, Culture and Curriculum, 28*(1), 74–89.

Lin, A. M. Y. (2015b). Egalitarian bi/multilingualism and trans-semiotizing in a global world. In W. E. Wright, S. Boun, & O. García (Eds.), *The handbook of bilingual and multilingual education* (pp. 19–37). West Sussex, UK: Wiley Blackwell.

Lin, A. M. Y., & Cheung, T. C. L. (2011). *A 4-step literacy approach to developing language across the curriculum*. Teachers' workshop given at Munsang College, January 18, 2011, Hong Kong.

Mahboob, A., & Tilakaratna, N. (2012). A principles-based approach for English language teaching policies and practices [White Paper]. Retrieved from TESOL International Association website: https://www.tesol.org/docs/pdf/a-principles-based-approach-for-english-language-teaching-policies-and-practices-.pdf?sfvrsn=0

Martin, J. R., & Matthiessen, C. M. I. M. (2014). Modelling and mentoring: Teaching and learning from home to school. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 137–163). Dordrecht: Springer.

Nuthall, G. A. (2005). The cultural myths and realities of classroom teaching and learning: a personal journey. *Teachers College Record, 107*(5), 895–934.

Painter, C. (1996). The development of language as a resource for thinking: a linguistic view of learning. In R. Hasan & G. Williams (Eds.), *Literacy in society* (pp. 50–85). London: Longman.

Painter, C. (1999). *Learning through language in early childhood*. London: Cassell.

Rose, D. (2012). *Designing curriculum genres* [PowerPoint slides]. Seminar delivered at the Faculty of Education, The University of Hong Kong, August 23, 2012, Hong Kong.

Rose, D. (2013). *The potential of Detailed Reading for second language literacy* [PowerPoint slides]. Seminar delivered at the Faculty of Education, The University of Hong Kong, January 22, 2013, Hong Kong.

Rose, D., & Martin, J. R. (2012). *Learning to write, reading to learn: Genre, knowledge and pedagogy in the Sydney School*. Sheffield, UK: Equinox.

Rothery, J. (1994). *Exploring literacy in school English (Write it right resources for literacy and learning)*. Sydney: Metropolitan East Disadvantaged Schools Program. Republished 2008, Sydney: Adult Migrant Education Service.

Tavares, N. J. (2015). How strategic use of L1 in an L2-medium mathematics classroom facilitates L2 interaction and comprehension. *International Journal of Bilingual Education and Bilingualism, 18*(3), 315–335.

Chapter 6
Assessment Issues

Chapter Overview
In this chapter, the general disconnect between what students are exposed to and what is assessed is addressed by focusing on how teachers can design content assessment tasks with academic language awareness. For example, teachers can use the Genre Egg (Fig. 3.4 in Chap. 3) to inform the planning and design of both formative and summative assessment in content subjects. How to cater for learner diversity with a differentiated approach to materials development is also discussed. Finally, how to prepare students for high-stakes examinations in different academic subjects is explored with examples from genre-based pedagogies.

6.1 Balancing Content and Language in CLIL Assessment

In Chap. 4, we discussed the various kinds of curricular and pedagogical disconnects which result in preparing students inadequately for their ultimate high-stakes assessment tasks. Typically, in many EFL/EAL contexts where students' English proficiency is basic and yet English is used as the medium of instruction (MOI) nonetheless (see Chap. 8 for a critical discussion of the 'access paradox' in the context of the global domination of English), very often the curriculum materials (e.g. textbooks, worksheets, exercises, assessment 'tasks') are characterized by what can be called a 'keyword approach' to content learning. Figure 6.1 shows an example of this common type of content learning tasks. It includes labelling, matching, and fill-in-the-blanks. Students in many junior secondary schools in Hong Kong are very much habituated to this type of content lesson tasks, and they are ill-prepared for the kind of much more challenging essay-type questions at the end of their secondary school career, like the one shown in Chap. 4.

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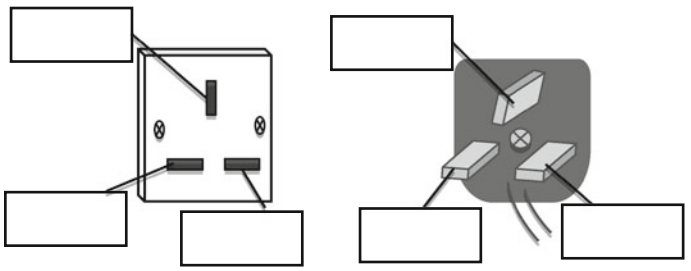
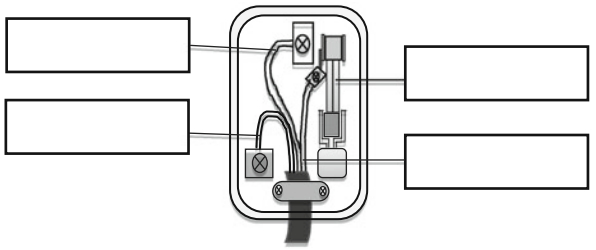
Questions

1 Label the mains socket and the three-pin plug shown below (6 marks)



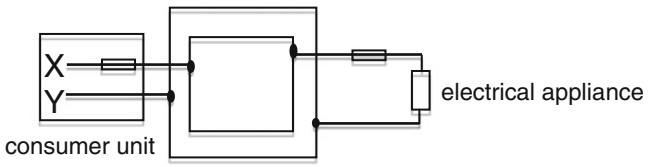
2 a Label the three-pin plug shown below



b Complete the table below

Wire	Colour of wire
Earth	
Live	
Neutral	

3 The diagram below shows the kinds of circus used at home.



a Name this type of circuit

Fig. 6.1 Common 'Keyword' type of tasks found in junior secondary content lesson materials in many English as an additional language (EAL) contexts

Teachers in EFL/EAL contexts are thus faced with this common dilemma: in order not to frustrate the junior secondary students, many of the content assessment tasks are simplified to the point of requiring only keyword responses. However, ultimately students need to face the reality of high-stakes challenging tasks in public examinations at senior secondary levels. Also, teachers teaching at primary and junior secondary levels are often disconnected from teachers teaching at senior secondary levels, and there are various kinds of curricular and pedagogical disconnects as discussed in Chap. 4. Thus, the dumbing down of assessment tasks will not help prepare students for subsequent challenges in their learning pathways.

To overcome these disconnects, it is important for teachers and curriculum planners to develop or adapt existing formative assessment tasks with academic language awareness and with systematic scaffolding built into the tasks. A formative assessment task is different from a summative assessment task in that summative assessment focuses on testing students' knowledge and skills, while formative assessment or *assessment as learning* focuses on helping students to learn through designing productive assessment tasks with built-in scaffolding and learning opportunities (Black et al. 2007; Carless 2011). Teachers need to recognize the fact that incorporating scaffolding elements into a formative assessment task is not 'cheating' as scaffolding helps to bring out the potential of the students (Coyle et al. 2010). As Mahboob and Szenes (2010)'s study convincingly shows, international students who are not using the dominant standard variety of English to write their answers consistently received lower grades. Mahboob and Szenes point out that:

> … traditional and progressivist advocates of liberal multicultural education emphasise individual merit and motivation, equal opportunities and access to education and resources of society – as long as one works hard. However, the skills to produce written academic texts – the genres of power and access – are not equally available to students from minority, immigrant or marginalised groups (Mahboob and Szenes 2010, p. 350)

It is therefore important that teachers and curriculum planners provide ample language support in formative assessment tasks in their lessons and help their students to gradually master the language resources essential to writing appropriate responses to assessment questions. A distinction should be made between formative assessment tasks which take *assessment-as-learning opportunities* rather than merely testing. In this chapter, the perspective of *assessment as learning* underlies the recommendation that language support be built into content assessment tasks. This assessment-as-learning approach will gradually enable students to master the academic literacies to tackle the summative assessment tasks (e.g. in high-stakes public examinations) where language support is withdrawn. In what follows I shall first address some frequently asked questions in LAC/CLIL assessment contexts and then discuss how content assessment tasks can be designed with built-in scaffolding.

Some frequently asked questions in CLIL assessment usually include the following:

1. Do we assess language or content first?
2. Do we sometimes assess one and not the other? If so, which and when, why and how?

3. When do we assess?
4. How do we assess?
   (Summarized from Coyle et al. 2010, pp. 114–115)

The first two questions have to do with the overarching question of *what* to assess and the balancing between content and language in CLIL assessment. This can be addressed by considering what we set in the curriculum as learning outcomes, which should include both content learning outcomes and language learning outcomes. The content learning outcomes of different academic subjects are usually formulated drawing on some form of the Bloomian knowledge taxonomy (Bloom 1956) and can be broadly classified into those having to do with *recall* of information/concepts/theories, *application* of concepts/theories in novel contexts and *analysis* of novel problems using the concepts/theories/knowledge[1]. A task of the recall type focuses on getting students to reproduce information that they have memorized. It does not require them to apply the information, theories or concepts to solve a problem. In contrast, tasks of the apply type and analysis type do. The boundary between apply and analysis is, however, not always clear-cut, and it is best to consider them as lying on a continuum.

As for the language learning outcomes, they are not the same as those set in the language subject (although there should be some overlap, see Table 5.1 and discussion on curriculum mapping in Chap. 5). The language learning outcomes in LAC/CLIL curriculums should be specific kinds of academic language resources that are useful for deep learning of the academic content. Using the Genre Egg (Fig. 3.4 in Chap. 3) as a framework to understand the different layers of academic language resources, we can set our language learning outcomes accordingly, e.g. vocab level/sentence level/academic functions level/genre (text type) level (see Tables 5.1 and 5.2 in Chap. 5 for some examples of these different levels of language resources in a unit of work). We can further specify whether receptive (e.g. listening and reading) or productive (e.g. speaking and writing) aspects of these different layers of language resources are to be assessed.

It is, however, important *not* to see the content and language as two totally independent dimensions of the student's competence to be assessed, if we accept Halliday's proposal to see the language and content as two sides of the same coin—i.e. content (or our hypothesizing about and conceptualization of 'reality') cannot be separated from language or the kind of semiotic (i.e. meaning-making) resources we use to construe (i.e. construct and organize/classify) content (see discussion in Chap. 3). However, language is only one kind of semiotic resources (though often the main kind), and so it is possible to adjust the balance between the assessment of content and language with the incorporation of multimodalities (e.g. visuals, symbols, mind maps, and graphic organizers) into the design of assessment tasks.

The third and fourth questions have to do with *when* and *how* to assess. Assessment can be done informally, for example, in classroom lessons by questioning and giving feedback (see Sects. 5.2 and 5.4 in Chap. 5). It can be done more formally at the end of a lesson, unit, topic, school term or year. How to assess is usually related to the primary purpose of assessment: Is it assessment *of* learning

Table 6.1 Grid for identifying and planning the content demands and language demands of LAC/CLIL assessment tasks

Content demands Language demands productive (P)/receptive (R)	**Recall**	**Application**	**Analysis**
Vocabulary P/R	#1	#2	#3
Sentence patterns P/R	#4	#5	#6
Text types P/R	#7	#8	#9

(i.e. summative assessment, such as tests and examinations), assessment *for* learning or assessment *as* learning? (i.e. formative assessment, such as worksheets, projects, portfolio assignments) (Stiggins 2005; Black et al. 2007; Berry 2008; Carless 2011). Summative assessment usually involves individual work, whereas formative assessment usually also involves collaborative, pair or group work.

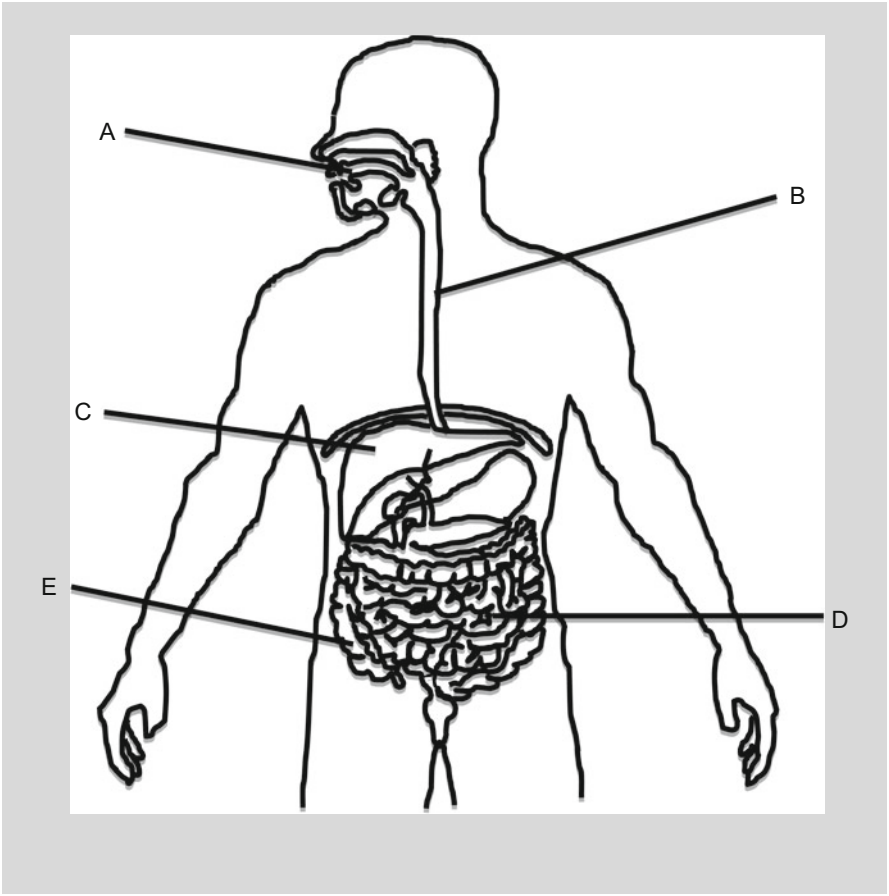
Drawing on the content outcomes taxonomy of recall/apply/analysis and the academic language awareness framework of the Genre Egg (vocab/sentences/functions/genres), my colleagues and I (Lin et al. 2013) have developed an analytical grid to help teachers to analyse the content demands and language demands of a LAC/CLIL assessment task (Table 6.1).

Using this simple 3 × 3 matrix, teachers can evaluate their existing (e.g. textbook) assessment tasks in terms of the kinds of content demands and language demands of the tasks. In the following paragraphs, each grid in the 3 × 3 matrix will be explained and illustrated with an example. The material presented below draws on a CLIL assessment paper that my colleague and I have worked on (see Lo and Lin 2014).

6.1.1 Grid 1: Recall-Vocabulary

One typical way to check students' grasp of key concepts and technical terms is to ask students to label a diagram, as shown in question type 1 below. For this type of task, students only need to recall the key terms corresponding to the appropriate parts of the diagram, and hence, the task belongs to the 'Recall-Vocabulary' grid. If some words are provided for students to choose from, the task will involve receptive skills; otherwise, students have to produce the words on their own, and the task will involve productive skills instead.

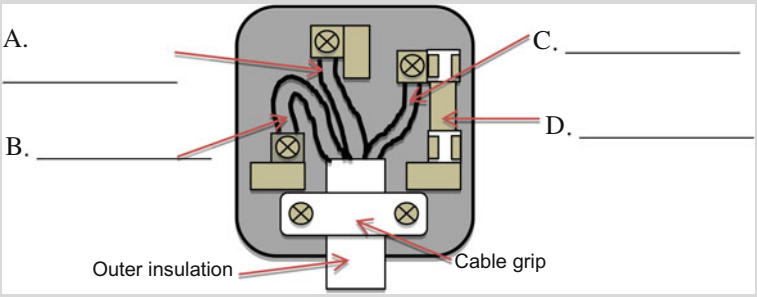
Question type 1
Name the structures labelled A to E in the diagram showing the human digestive system.



6.1.2 *Grid 2: Application-Vocabulary*

Question type 2 shows another diagram labelling task. What makes question type 2 more cognitively challenging when compared with question type 1? You will see that the example task under question type 2 requires students to understand the ways in which the three-pin plug is designed and represented visually in the diagram (as being seen through from the outside) in order to identify the three pins correctly. This requires some interpretation and application skills instead of just a direct factual recall.

Question type 2
The diagram shows a correctly wired three-pin plug. Label its key features A to D.



6.1.3 Grid 3: Analysis-Vocabulary

Can students perform high-order thinking skills by writing words only? Question type 3 shows one possible way of doing so. In this task, students have to compare and contrast the different aspects of breathed and unbreathed air. This is a cognitively demanding task even though in terms of language demands what they have to write down is simply 'more' and 'less' or 'higher' and 'lower', and these language items are already given to them in the table. In this way, students with basic L2 English proficiency can still be scaffolded linguistically to attempt a higher order thinking task. In terms of the content demands, they need to analyse the different characteristics of breathed air and unbreathed air.

Question type 3
Differences between unbreathed air and breathed air.

	Unbreathed air	**Breathed air**
Oxygen content	More	Less
Carbon dioxide content	1	2
Water vapour content	3	4
Temperature	5	6
Nitrogen	7	8

6.1.4 Grid 4: Recall-Sentence

Under the category of 'sentence', students will be required to read questions and/or write their answers in sentences. Quite a lot of typical question types belong to this

category, and it depends on the level of cognitive demands to further differentiate the tasks. For example, question type 4a shows a multiple-choice question which asks students to identify the main function of a substance. This basically requires students to recall the information that they have learned. In terms of language demands, students are required to comprehend sentences on the topic.

Question type 4a
What does the major element *phosphorus* do for the plant body?

(A) It is used for the production of pigments in the leaves.
(B) It is for prevention of chlorosis.
(C) It is vital for the functioning of enzymes in the stem.
(D) It is a component of DNA in plant cells.

Question type 4a is a 'Recall-Sentence' task, mainly involving receptive sentence reading skills. On the other hand, when students are answering question type 4b below, they have to describe what they have seen in one or two sentences. So question type 4b involves production skills as well.

Question type 4b
Put an egg into a beaker of tap water and then into a beaker of vinegar. Describe what you see.

_____
_____

6.1.5 Grid 5: Application-Sentence

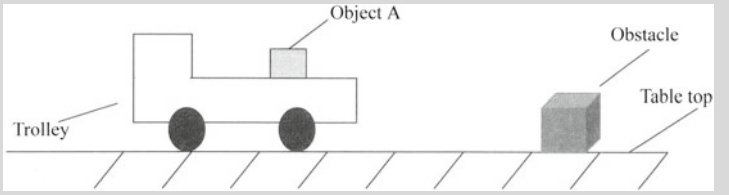
Question type 5 is a multiple-choice question requiring students to read the information given and choose the correct answer. In order to do so, students need to apply their knowledge of the relationship among wave speed, wavelength and frequency. So the question type 5a is 'Application-Sentence' involving receptive skills (as students need to understand the question sentence).

Question type 5a
The wavelength and velocity of a wave are 2 m and 200 m/s, respectively, what is the frequency of the wave?

(A) 100 Hz
(B) 300 Hz
(C) 50 Hz
(D) 25 Hz.

On the other hand, when students are required to explain some phenomena by applying what they have learned, such as an application of Newton's law of motion in question type 5b, their linguistic productive skills are needed.

Question type 5b
The following example illustrates a principle of motion in physics:



Assuming that the surfaces between Object A and the trolley are frictionless,

(i) Will Object A move if the trolley starts to move forward? _____

If yes, will Object A move forward or backward? _____
If no, why? _____

(ii) What will happen to Object A when the trolley hits the obstacle?
_____

6.1.6 Grid 6: Analysis-Sentence

To tackle question type 6, students need to not only apply their knowledge of genetics and blood-type profiles of parents and children, but also synthesize the given information to deduce the correct answer. So the question is an 'Analysis-Sentence' type and involves receptive sentence comprehension skills. If students are further asked to justify their answers, production (sentence or text) skills will also be involved.

Question type 6
A man with blood group B marries a woman with blood group A. Their first child is of blood type O. What can be determined about the blood types of any future children that this couple may have?

(A) All their future children will be of blood group A.
(B) Half of their future children will be of blood group AB.
(C) The next child they have may be of blood group A.
(D) It is not possible for their future children to be of blood group B.

6.1.7 Grid 7: Recall-Text

Under this category of tasks, students are required to tackle text-based questions. Usually, they are asked to read a piece of information (e.g. in the form of a short text), and then, they have to answer some questions related to the text.

Question type 7
In a physics paper in a high-stakes public examination in Hong Kong, one question includes a piece of text describing 'bungee jumping'. The first part of that question asks the students to describe the acceleration of the bungee jumper during the first downward fall to the lowest point. Here, the cognitive demand does not look high, but it is linguistically challenging, as students have to understand the text and describe the process in a text. Hence, this task involves both receptive and productive language skills. One may wonder why this task belongs to the 'text' level instead of 'sentence' level. This is because when students attempt to describe the process, it is expected that they will organize their ideas in a coherent way, with temporal sequencing connectives such as *first, then, next, finally and during*. This is then beyond the sentence writing level. The question described above is thus an example of question type 7.

6.1.8 Grid 8: Application-Text

Under the category of Application-Text, students are usually required to apply what they have learned about a concept (e.g. movement of the earth's crust) to formulate an explanation for a phenomenon (e.g. Why are marine fossils found in high mountains?). Students then need to express their answer in a short coherent text.

Question type 8
Why are marine fossils found in high mountains?
_____
_____
_____

6.1.9 Grid 9: Analysis-Text

Under the category of Analysis-Text, students can be asked to design and carry out an experiment and then write up a laboratory report on the experiment. Students have to draw on their knowledge of the topic and scientific investigation to design the experiment on their own. They also need to explain the results and draw some conclusions. All these require higher order thinking skills. Therefore, this question type falls into the most challenging grid in terms of both cognitive and linguistic demands. For instance, in the science papers of the Hong Kong Diploma of Secondary Education (DSE) public examination, the last question is usually an essay-type question, which expects students to write a piece of coherent text based on a given topic (e.g. discuss the impact of generating electricity with fossil fuels or nuclear energy on the environment). Explanation, discussion and evaluation are usually involved.

Question type 9
Fruits are known to contain reducing sugars. However, do different fruits contain the same amount of reducing sugars? Design and carry out a simple investigation to compare the amount of reducing sugars in two types of fruits of your own choice.

Hints:

(a) Benedict's solution can be used to test for reducing sugars.
(b) 1 M glucose solution can be used as a standard solution in your test.
(c) The apparatus useful for this investigation includes measuring cylinder, test tube, water bath, mortar and pestles

Write down the steps of your investigation:

_____
_____
_____
_____

Record your experimental results:

_____
_____
_____
_____

State your conclusions:

_____
_____

In the above section, we have explained the content demands and the linguistic demands of 9 broad types of assessment tasks using the 3 × 3 CLIL assessment design matrix provided in Table 6.1. This matrix will serve as a useful tool when

teachers and curriculum planners want to ensure that their curricula include an even distribution of different task types both across different curricula at the same level and across different levels (i.e. to achieve both horizontal and vertical curricular coherence, see discussion in Chap. 4). Now are you ready to apply this assessment design matrix to analyse the different content demands and language demands of different assessment task types?

Question A
Sequencing Task:
Think about how the two words in the following line are related. Then add words to the blanks to continue the sequence.

mouth, _____ , stomach, _____ , _____

Question B
Analogy Task:
The first two words are related in a certain way. Analyse how they are related and then complete the blanks in the similarly related pairs of words in the line below.

fly	: flycatcher
_____	: lion
grass	: _____
_____	: spider

Question C
Read the following text about a place called 4th-Dimensional Land and answer the question below:

We live in a world with 3 dimensions: length, width and height. However, before Mr. Martyn came to the Sarasas Ektra School, he had dreamt of living in a place called 4-Dimensional Land. In 4-Dimensional Land, people travel freely back and forth along the time dimension. Time is the 4th dimension in 4-Dimensional Land. The other three dimensions are just like those in our world: length, width and height.

Question: Can you imagine a place with only 2 dimensions? Let's call this place Flatland. Please draw what people would look like in Flatland. Then please write a short paragraph to describe what people would look like in Flatland.

Question D
What steps would you follow to find the area of a rectangle? If you know the formula for finding the area of a rectangle, please feel free to use it in your description. Write sentences below, describing your answer.

Fig. 6.2 Assessment tasks for analysis using the CLIL assessment design matrix (*Acknowledgements*: Questions A and B are task types inspired by ideas found in A. Fredericks (1991). *Science Brainstretchers: Creative Problem-solving Activities in Science*. Culver City: Good Year Books. Questions C and D are task types codesigned by the author and Mr. Martyn Krügel, teacher of the Sarasas Ektra Bilingual School, Thailand)

Application Scenario 6.1: Identifying and Varying the Content and Language Demands of Tasks

Using the CLIL assessment design matrix in Table 6.1, analyse the content demands and language demands of the different assessment tasks (Questions A–D) in Fig. 6.2:

Which one has both high content and language (hC + hL) demands?
Which one has both low content and language demands (lC + lL)?
Which one has high content demands but low language demands (hC + lL)?
Which one has low content demands but high language demands (lC + hL)?
Can you think of ways to adapt the hC + hL task into: (a) lC + hL and (b) hC + lL?

It is worth noting that some of the questions in Fig. 6.2 do not impose very high linguistic demand on students, but they may assess different levels of cognitive skills. As long as the teachers explain the instructions clearly, students should understand how to attempt those questions. This may give some new ideas for content subject teachers working with English language learners (ELLs) or English as Additional Language (EAL) students who have a basic L2 proficiency. This brings us to the topic in the next section: how to build in scaffolding elements in a formative assessment task.

6.2 Designing Formative Assessment Tasks with Scaffolding

It is possible to design assessment tasks with built-in scaffolding so as to achieve *the high-challenge, high-support principle* of bridging pedagogy that Gibbons (2009) proposes (see Chap. 5). Instead of being presented with dumbed-down tasks, students can be led gradually towards higher levels of performance through carefully designed tasks with built-in language and cognitive support. In what follows, two such strategies will be discussed: (i) designing *parallel tasks* and (ii) providing '*sentence-generating powerhouses/tables*'.

One strategy of providing both content and language scaffolding to students is to design parallel tasks. Parallel tasks operate on the principle of *repetition with variation*. In the first task, a lot of content and language resources are provided (serving as an example); in the second task, which resembles the first task except for some variation, students can draw on both content ideas and language patterns from the first task to accomplish the second task.

For example, let us revisit the burning candles task first mentioned in Chap. 5 (Fig. 5.2—experiment redesign task: burning candles). The burning candles task

was designed by Ms. Cheung, a Grade 7 integrated science teacher in a Hong Kong school. In the first task, the students are presented with an experimental design which contains a problem (an important variable, the amount of water, is not controlled). In the first task, both the content and language of an experimental design are provided to the students. The cognitive/content demand is that of *apply + analysis,* students need to apply the concept of the 'fair test' and analyse the flaw in the design of the experiment. A 'fair test' is a difficult technical concept for many students as it is not what we are used to doing in our everyday common-sense world. A 'fair test' is a test carried out under 'fair conditions' (for more details see Sect. 5.1 in Chap. 5). To help students to express the flaw in the experimental design, some useful sentences (or sentence-generating boxes) can be provided to the students; for example:

There was ***more*** ____X____ in tube B ***than*** tube A.
There should be ***the same amount of*** ___X___ in tube B and tube A.

When students redesign the experiment (i.e. doing the parallel task), the writing frame in the parallel task sheet provides writing scaffolding in terms of the genre structure (how to organize information in an experimental design), the relevant functions and sentence patterns (e.g. how to write the experimental procedure using imperative sentences, see Fig. 6.3) and key vocabulary (e.g. words useful in writing the experimental design).

To provide further language support to students (e.g. in a class of basic L2 proficiency students), teachers can provide further *sentence-generating tables* to assist students in generating appropriate sentences to write up the section on observation and results; for example:

The temperature of water *rose* ___ °C in tube A and ___ °C in tube B, *respectively*.
The water temperature in tube A *rose* ___ °C and the water temperature in tube B *rose* ___ °C.
The *water temperature rise* in tube B *is higher than* the water temperature rise in tube A *by* ___ °C.
The *water temperature rise* in tube B *is higher than* that in tube A *by* ___ °C.

In the same vein, useful sentence-generating powerhouses can be provided to students to assist them in writing the conclusion section:

A bigger candle *thus* __ gives/does not give a hotter flame.
A bigger candle *therefore* __ gives/does not give a hotter flame.

Diagrams				
	add	5 g *of solid A*	into	a test tube/ test tube P
	drop	5 cm^3 *of solution B*		a boiling tube
	transfer	5 drops of liquid C		a beaker
	put	5 pieces of solid D		a flask
	pour (liquid)			test tubes P & *Q* respectively

	stir		
	shake		
	filter	the solution	
	boil	the mixture	
	heat		until it melts
	cool		until it freezes

	observe	the change			
	measure	the volume the length the temperature the mass	of	the solid the solution substance B	
		the time		it takes	to change to fall to boil

Fig. 6.3 Sentence-generating tables designed by a science teacher to help students generate sentences for writing the experimental procedure (reproduced by permission of Ms. CHEUNG Tung-ping, Munsang College, Kowloon, Hong Kong)

A hotter flame *is thus/therefore given by* a bigger candle.
A hotter fame *is thus/therefore* <u>*not*</u> *given by* a bigger candle.

In this way, science teachers can help students to use the logical connectives, *thus/therefore*, to show that the conclusion follows logically from the preceding section on observation/results and that the writing template is not just a form for students to fill in but both a cognitive and language scaffold to help students present

experimental information leading to a logical conclusion. A usual pitfall associated with the use of writing templates is for teachers and students to treat the template as merely a *form* to fill in or as a fill-in-the-blanks type of exercise without treating it as a scaffold to generate a logical presentation of information supporting an argument or leading to a logical conclusion. A genre structure presented merely as a writing template becomes 'dead' if it is not seen as *a strategy* to help students to use writing to achieve a communicative goal or social purpose (e.g. to build an argument and to persuade people about one's position).

Similarly, a usual pitfall associated with sentence-generating tables is to use them merely as grammatical drills taken out of context. These sentence-generating tables are much more meaningful to the students when they are provided *just in need* and *just in time* (e.g. in the middle of completing a task) when students need them as potential resources to express the meanings required by the task in hand (as shown above).

In this way, parallel tasks can provide both cognitive and language scaffolding to students, and although there is *repetition*, there is also important *variation* (Lemke 1990) so that it is not perceived as boring (i.e. offering little cognitive challenge) as students need to identify the problem in the first task and think of things to improve in the second similar but somewhat different task.

In-task sentence-generating tables are especially useful in helping students to *repack* meanings presented in notes, visuals and graphic organizers into appropriate academic language required by academic tasks. In Chap. 5, we have discussed the use of the *Multimodalities–Entextualization Cycle* (*MEC*) as a bridging pedagogy. Using the above parallel task as an example, we can further extend it by embedding an MEC in it. For example, in the Discussion/Reflection Section, we can include a table on the different variables in a fair test (as exemplified in the burning candles experiment):

Then, we can provide some sentence-generating tables to help the students to *entextualize* the information contained in Table 6.2 (i.e. expressing/recoding the information from notes, visuals, mind maps and graphic organizers in appropriate academic language):

In this experiment,		
the independent variable	is	candle size;
the dependent variable	is	water temperature;
the controlled variables	are	the amount of time used to heat tube A and tube B,
		and the amount of water in tube A and tube B.

Table 6.2 Tabulating different kinds of variables in a fair test

Variables	Independent variable (the variable to be changed)	Dependent variable (the variable to be measured)	Controlled variables (variables to be kept constant)
1. Candle size			
2. Rise in water temperature in each tube			
3. Amount of water in each tube			
4. Amount of time in heating each tube			

6.3 Building Student Confidence and Capacities in Tackling High-Stakes Assessments

While we can design formative assessment tasks with both cognitive and language scaffolding built into them, high-stakes public examination tasks are not formative tasks and they usually do not offer such scaffolding. Teachers need to help students tackle such challenging tasks well before the examination so that by the time students need to attend these high-stakes (public or national) examinations, they will have developed confidence and capacities to tackle them independently.

One approach to tackling these high-stakes examination tasks can be summarized in a 3-step acronym: *APPS* (Lin and Cheung, 2012), as described below:

APPS (as a set of strategies that students can use to tackle examination *tasks):*
AP: Analysing the Prompts
P: Planning
S: Scaffolding.

1. Analysing the Prompts

The first step is to analyse the question prompts in high-stakes examinations. As in many such examinations, the questions are formulated in recurrent types of formats and wordings and it is thus productive to analyse these recurrent wordings together with students. For example, in a question in the integrated science paper in the Hong Kong Diploma of Secondary Education (DSE) examination in 2012, students are asked to describe two measures that are used in nuclear power plants to ensure the safe use of nuclear energy ('Describe…'). They are also asked to discuss whether using nuclear energy is better than using fossil fuels for generating electricity with reference to the impact of nuclear energy and fossil fuels on the

environment ('… and discuss…') (to see the entire question, please consult 'Hong Kong DSE Examination—Integrated Science Paper, Question 11', published by the Hong Kong Examinations and Assessment Authority 2013).

We can underline the two key words in the question prompt: describe and discuss. *Describe* (*Describe two measures*…) indicates to us that a description text is required; likewise, the keyword *discuss* indicates to us that a discussion text is required. The response to this question should thus consist of two parts: Part 1: a description of the two measures taken in nuclear power plants to ensure the safe use of nuclear energy; Part 2: a discussion of the different sides/angles on the thesis/position: *Using nuclear energy is better than using fossil fuels for generating electricity.* Thus, the response should be written in a *macro-genre* (Martin and Rose 2012) consisting first of a *description* and then of a *discussion*.

2. *Planning*

The next step is to plan the response to the question. Here, we can use the Multimodalities–Entextualization Cycle (MEC) (see Chap. 5) to help us do so. For instance, in an examination preparation practice stage, teachers can model the use of a graphic organizer (or a simple table) to brainstorm and chart out together with students (i.e. joint construction) a map of the key ideas and the logical relationships among them. With repeated practice of joint/guided construction, students will learn how to independently brainstorm ideas and make notes for a response in summative assessment situations (e.g. in a high-stakes public examination) (see Table 6.3).

Many students might have a more visual learning style, and visual graphic organizers/mind maps might be more helpful to them. Students can, for example, be asked to work in groups or pairs to generate a visual mind map to brainstorm the ideas before making a table of notes.

3. *Scaffolding*

The next step in the MEC is to *entextualize* the ideas/notes in the visuals and graphic organizers into a coherent piece of academic writing. This entails scaffolding students to write using the appropriate academic genre conventions to achieve their communicative purposes, e.g. to describe (description text) and then to persuade (discussion text). Here, we can adapt David Rose's Reading to Learn (R2L) Cycles (see Chap. 5) to provide scaffolding to students. In particular, we can use the joint construction stage from the cycle to co-construct the response to the examination question with students. First of all, in order to use the table of ideas (Table 6.3) as a table for guiding students to write in the appropriate genre, we need to add the necessary genre element, *Introduction*, to the table (see Table 6.4).

Then, the teacher can engage students in a lesson conversation (e.g. Lesson Conversation 5.1 in Chap. 5) to jointly construct the essay from the table of notes (see Lesson Conversation Example 6.1).

Table 6.3 Using a table to brainstorm ideas and make notes for the response

Genre	Stages	Key terms
Describe	Measures–during normal operation:	(a) Control rods (in the reactor) → control nuclear fission rate → control energy release rate (b) Pressurized water: circulated → cools the reactor
	Measures–during emergency:	(a) Radioactive water: sealed in concrete containers and buried underground → prevent leakage (b) All control rods: inserted to the reactor → shut it down
Discuss	Controversial issue:	Nuclear energy ≫ fossil fuels → generate electricity?
	Side 1 position: supporting details	More environmentally friendly because: (a) burning fossil fuels → air pollutants; e.g. SO_2, nitrogen oxides → air pollution, acid rain → harms vegetation, human health versus nuclear energy: no air pollutants during nuclear fission (b) Burning fossil fuels → carbon dioxide → greenhouse effect → global warming versus no greenhouse gases during nuclear fission
	Side 2 position: supporting details	Nuclear wastes disposal, accidents → leakage of radioactive substances → serious, long-lasting damage to environment because: (a) Some radioactive substances: long half-lives; e.g. Cs-134: 30 years → persist in the environment for a long time → accumulate along the food chain → harm consumers at higher trophic levels; (b) Organisms nearby: exposed to radiation → fetal diseases; e.g. trauma/develop abnormal features
	Conclusion	Nuclear energy ≫ fossil fuels (during energy production) but need safety measures to prevent leakage/accidents, or else: serious, long-term impact on the environment

Table 6.4 Adding notes for writing an introduction to the essay

Introduction	– Outline the major topic/issue	Fossil fuels running out → nuclear energy: powerful alternative energy source; but safety and environmental concerns
	– Give an overview of the structure of the essay	First, safety measures will be described Then, different views on nuclear energy use and its environmental impact will be discussed
Describe	…	…
Discuss	…	…

Lesson Conversation Example 6.1: **Teacher Guiding Students to Co-construct a Text from Notes**

T: Okay, let's try to write a response to the exam question using the notes we've just made. Who wants to be the scribe? Jessica, can you be our scribe? {Jessica comes out to the blackboard}
T: First of all, look at our notes table, {T pointing at the Introduction in the table of notes made on the board} in the first paragraph, what should we have?
S1: Introduction!
T: Yes, Introduction. In the beginning of our essay, we shall introduce the topic. Now, for this essay, we have a controversial topic, that is, a difficult issue, what is the issue, what is it? {T pointing to the relevant words in the notes on the board}
S2: fossil fuels running out…
T: Yes, the fossil fuels are running out… As the fossil fuels are running out in this world, what can be an alternative energy source {T pointing to the relevant words in the notes on the board}
S3: Nuclear energy!
T: Very good, nuclear energy. Okay, we can start the Introduction of our essay by outlining the main topic or issue. We can start by writing: As fossil fuels are running out in this world, nuclear energy can be a powerful alternative energy source {T pointing to the relevant words in the notes on the board} {T gesturing Jessica to write down the sentence}{Jessica finishes writing the sentence}
T: Very good! Thank you, Jessica.
T: As fossil fuels are running out in this world, nuclear energy can be a powerful alternative energy source {T points to and reads out the words of the sentence that Jessica has just written}. However, there is a problem about nuclear energy, what is it? {T pointing to the relevant words in the notes on the board}
S4: Safety! Safety!
T: Excellent! There are concerns about its safety and what? {T pointing to the relevant words in the notes on the board}
Ss: Environment! Environment!
T: Yes, very good, and its impact on the environment. What is the whole sentence now? There are concerns about its safety and impact on the environment.
{Jessica writes the sentence on the board}{As Jessica is writing, other students are also writing the sentence in their own notebook}
T: Oh, we need to add 'However' here {T pointing to the beginning of the sentence that Jessica has written on the board}. As fossil fuels are running out in this world, nuclear energy can be a powerful alternative energy source. HOWEVER {T stressing the word}, there are concerns about its safety and impact on the environment.
T: Why do we need to add the LINKING WORD, 'HOWEVER'? {T writes on the board: 'linking word' → However} Why?
{No response from the students}
T: It is used to show a different view, right? It's like saying: Yes, … BUT… Yes, nuclear energy can be good, BUT it has problems. When we write formal essays like exam essays, we often use 'However', when we speak, we often say 'but'.
T: Okay, in the Introduction, after outlining the topic, we need to give an overall idea about the essay so that the readers can have a bird's eye-view of our essay {T pointing to the relevant words 'Give an overview…' in the notes on the board}, what can we write in the next sentence then to give an overview? {T pointing to the relevant words 'First, safety measures…' in the notes on the board}
T: Andy, can you try?
Andy: First… safety measures… will be… described.

T: Very good! We can write: In this essay, some nuclear energy safety measures will first be described. {T gesturing Jessica to write the sentence on the board}
T: Then, what will be discussed? April, can you try? Then, what will be discussed? {T pointing to the relevant words in the notes on the board}
April: Then, different views on… nuclear energy use… and its… environmental impact… will be discussed. {April reads out the notes on the board as the T points to the notes word by word to guide her}
T: Excellent, April! Now, class, we have written our Introduction, let's read our Introduction together {T leads the whole class to read out the first paragraph that Jessica has written on the board}
T: Very good! Now, after introducing the topic and giving an overview of the essay, what should we do next, Martin? {T pointing to the relevant words in the notes on the board}
Martin: Describe.
T: Very good, Martin! We have now moved onto the next stage of the essay. In this stage, we shall DESCRIBE the safety measures for nuclear energy. Let's have a new scribe for this new stage of the Essay. Thank you very much Jessica, you've done a wonderful job! Now, Jason, can you be our next scribe? {Jessica goes back to her seat, and Jason comes out}
T: To start the stage Description, we need a topic sentence to introduce the topic of safety measures, we can say: Regarding the safety issue, scientists have developed some measures to ensure the safety of nuclear energy.
{T writes the words: 'Regarding', 'scientists', 'developed' on the board, and gestures Jason to write the whole sentence to start a new paragraph}
{Jason then finishes writing the sentence on the board after referring to the notes on the board several times to find the spellings of words; T guides him by pointing to the relevant words in the notes}
T: Well-done Jason! Now, the next sentence: During normal operation, what are used to control the rate of nuclear fission? William, can you try? {T pointing to the relevant words in the notes table on the board}
William: control rods…
T: Yes, control rods in the reactor are used to… to do what?
William: to control nuclear fission rate
T: Yes, to control the nuclear fission rate, can you give me the whole sentence? During normal… {T pointing to the relevant words in the notes table on the board}
William: During normal operation, control rods… in the reactor… are used to… control… nuclear… fission… rate… {T pointing to the relevant words in the notes table on the board to guide William as he's trying to put the sentence together}
T: Yes, to control the nuclear fission rate.
T: Class, can you say the whole sentence for Jason to write it out?
Ss: During normal operation… control rods in the reactor…are used to… control the nuclear… fission… rate.
{T then writes a sentence-generating box on the board—see Table 6.5}
T: Okay, class, to finish writing the Description of safety measures, you can use this sentence-generating box to help us write sentences. For example, we can say: During normal operation, control rods in the reactor are used to control the nuclear fission rate, which in turn controls the energy release rate. And pressurized water is circulated to cool the reactor. {T pointing to the relevant words in the box as he speaks out the sentences}
T: Amy, can you make a sentence using the box? During emergency… {T pointing to the relevant words in the box to guide Amy}

Table 6.5 A sentence-generating table to scaffold students' writing

During…,	X	/be/	/V + ed/	to do Y.
normal operation,	control rods in the reactor	are	used	to control the nuclear fission rate, which in turn controls the energy release rate.
	pressurized water	is	circulated	to cool the reactor.
emergency,	radioactive water	is	sealed in containers and buried under-ground	to prevent leakage.
	all control rods	are	inserted into the reactor	to shut it down.

Amy: During emergency… radioactive …water is sealed in… containers and… buried… underground… to prevent… leakage.
T: Well-done Amy! Class, can you say the sentence together?
Ss: During emergency… radioactive …water is sealed in… containers and… buried… underground… to prevent… leakage.
T: Very good! What is the next safety measure during emergency, Eric? And…{T pointing to the relevant words in the box to guide Eric as he tries to make the sentence}
Eric: And… all the rods… are… inserted into the… reactor… to shut it down.
T: Excellent! Class, have you got the Description written? Jason, have you got the sentences written? {T gestures Jason and the class to write down the sentences to complete the Description}
{Jason finishes writing the Description on the board}
T: Thank you, Jason! Class, we have written the first part of our response to the exam question. Let's read it together {T guides the whole class to read the first part of the essay co-constructed; T stopping at times to highlight the different stages of the essay: Introduction, Description}
T: You've done a good job class. We have finished the first part of the essay. Now, let's write down this new text in your note-book. Also keep the notes table in your notebook and we shall finish writing the second part of the essay together in the next lesson.

We can see in Lesson Conversation 6.1 that the teacher is scaffolding students to write the essay by referring to the notes table on the board and by providing them with a sentence-generating box (Table 6.5) to generate useful sentences to do the writing. Throughout the text coconstruction (or guided writing) process, the teacher prepares students well to answer his questions by pointing to the relevant words in the notes table or in the sentence-generating box on the board. As ample preparation and scaffolding are provided, most students can respond to his questions successfully and get affirmed by the teacher. This kind of scaffolding is especially useful for EFL/EAL students with a basic or intermediate proficiency level. For more English-proficient students, the whole essay can be assigned as an independent

writing task, or the second part of the essay can be assigned after the first part has been jointly constructed.

In Lesson Conversation 6.1, some parts are underlined to indicate that these parts can be done in the students' familiar languages (e.g. L1 or local languages) if students' L2 proficiency is very basic and might not understand these parts if they are done entirely in L2. For example, in the following exchange, the teacher wants to explain why the logical linking word, 'however', needs to be added and this metalinguistic knowledge is crucial in students' future independent writing. The underlined parts can be spoken in the students' local or familiar language(s) to ensure students' understanding of the function and usage of 'however' in formal academic writing and to contrast it with the everyday, less formal, spoken usage of 'but':

> **T**: Oh, we need to add 'However' here {T pointing to the beginning of the sentence that Jessica has written on the board}. As fossil fuels are running out in this world, nuclear energy can be a powerful alternative energy source. HOWEVER {T stressing the word}, there are concerns about its safety and impact on the environment.
> **T**: Why do we need to add the LINKING WORD, 'HOWEVER'? {T writes on the board: "linking word" → However} Why?
> {No response from the students}
> **T**: It is used to show a different view, right? It's like saying: Yes, … BUT… Yes, nuclear energy can be good, BUT it has problems. When we write formal essays like exam essays, we often use 'However', when we speak, we often say 'but'.

These parts are located in the 'Elaborate' phase of the task structure (see Chap. 5—Sect. 5.3) and provide more information to the students. If this information can be made comprehensible to the students using their L1 or local, familiar language(s), it serves the scaffolding function, while L2 can be maintained or maximized for use in the core phases (i.e. 'Focus' and 'Task') of the task structure.

Application Scenario 6.2: Completing Lesson Conversation 6.1
Suppose you are a science teacher teaching a class of EFL/EAL students with basic English proficiency, can you complete the Design Lesson Conversation 6.1 to continue to scaffold students to write the rest of the essay? You might also need to design sentence-generating boxes to help students to generate some of the useful sentences for their writing. Remember, it is okay to 'design' lesson conversations as part of the lesson planning and of course all teachers know that there will be contingencies during the actual classroom conversations and teachers will not be speaking from scripts like actors/actresses. Nonetheless, having gone through the process of 'designing', a lesson conversation will considerably increase the teacher's confidence and fluency in carrying out the dialogue in the 'actual' classroom.

If there is not enough lesson time to do joint construction of the whole essay (as it is often the case in content subjects), the teacher can consider providing the second half of the essay to the students while highlighting important genre structure knowledge and logical connectors (linking words). Table 6.6 shows how the genre structure, notes and essay can be tabulated side by side to help students to grasp the textual features of the essay and to see how the notes in point form can be fleshed out into a coherent text through the use of logical connectors as well as topic sentences.

In Table 6.6, there are three columns. The leftmost column presents the different genre stages (and phases in the stages) that students can go through in organizing the ideas of a discussion essay logically and coherently. In the second column, students are shown the key notes (with key vocabulary and useful lexical phrases) which are needed to construct the key ideas that constitute the arguments of the essay. How these notes are fleshed out and realized in a coherent text is shown in the third column. This approach is designed to provide both top-down (genre structure) knowledge and bottom-up (lexico-grammatical—vocab/sentence patterns) knowledge to students regarding how a bunch of content ideas in note form can be *entextualized* into a coherent text. It exemplifies the integrated approach to language learning discussed in Chap. 3.

6.4 Designing Scaffolding for Tackling Assessment Genres Across the Curriculum

In the above sections, we have discussed how teachers can design materials with built-in scaffolding and also provide oral scaffolding in lesson conversations to guide students in a process of co-constructing a text (i.e. guided writing) based on notes and graphic organizers. These two kinds of scaffolding can prove very powerful if they are done consistently across different subjects in the curriculum. In Chap. 5, we have discussed some ideas on how to do curriculum mapping. In this section, I shall continue with the topic of curriculum mapping and specifically discuss how curriculum mapping in relation to assessment tasks across the curriculum will be particularly helpful for students.

In Chap. 4, we have identified different kinds of curricular and pedagogical disconnects. Scaffolding reading and writing in assessment genres across different academic subjects and across different levels will help us overcome these disconnects. Again, we can use the Genre Egg (Fig. 3.4 in Chap. 3) as an organizing framework to help us do curriculum mapping of the different assessment genres across different subjects. Table 6.7 shows some common assessment genres across different subjects and levels, while Tables 6.8 and 6.9 show some common language functions and general academic vocabulary useful across different academic subjects, respectively. To do this kind of assessment genres/functions/vocabulary

Table 6.6 A writing frame to guide students' construction of a discussion essay

Stages	Notes (key vocab/lexical phrases)	Full text
Introduction – Main topic – Essay overview	Fossil fuels running out → nuclear energy: powerful alternative energy source; but safety and environmental concerns First, safety measures will be described Then, different views on whether using nuclear energy is better than using fossil fuels for generating electricity will be discussed	*As fossil fuels in this world are running out, nuclear energy can be a powerful alternative energy source.* However, there are concerns about its safety and impact on the environment. In this essay, some nuclear energy safety measures will first be described. Then different views on whether using nuclear energy is better than using fossil fuels for generating electricity will be discussed.
Describe safety measures	During normal operation: (a) control rods (in the reactor) → control nuclear fission rate → control energy release rate (b) pressurized water: circulated → cools the reactor (c) radioactive water: sealed in concrete containers and buried underground → prevent leakage During emergency: all control rods: inserted to the reactor → shut it down	*Regarding the safety issue, scientists have developed some measures to ensure the safety of nuclear energy.* For example, during normal operation, control rods are used to control the rate of nuclear fission in the reactor which in turn controls the rate of energy release in the reactor. In addition, pressurized water is circulated to cool the reactor. Apart from these, radioactive water is sealed in concrete containers and buried deeply underground to prevent leakage. During emergency, all control rods will be inserted into the reactor to shut it down.
Discuss – Controversial issue Side 1 position – Supporting details	Nuclear energy ≫ fossil fuels → generate electricity? More environmentally friendly because: (a) burning fossil fuels → air pollutants; e.g. SO_2, nitrogen oxides → air pollution, acid rain → harms vegetation, human health versus nuclear energy: no air pollutants during nuclear fission (b) burning fossil fuels → carbon dioxide → greenhouse effect → global warming versus no greenhouse gases during nuclear fission	*Considering the impact on the environment, it is debatable whether using nuclear energy is better than using fossil fuels for generating electricity* On the one hand, generating electricity with nuclear power is more environmentally friendly for two reasons. First, burning fossil fuels generates air pollutants like SO_2 and nitrogen oxides. These pollutants may cause acid rain, which harms vegetation. In contrast, no air pollutants are produced in the process of nuclear fission, and so it is less likely to result in air pollution. Second, burning fossil fuels emits carbon dioxide, which is a greenhouse gas speeding up global warming. On the contrary, there is no emission of greenhouse gases during nuclear fission, and so using nuclear energy is more environmentally friendly.

(continued)

Table 6.6 (continued)

Stages	Notes (key vocab/lexical phrases)	Full text
Side 2 position – Supporting details	Nuclear wastes disposal, accidents → leakage of radioactive substances → serious, long-lasting damage to environment because: (a) some radioactive substances: long half-lives; e.g. Cs-134: 30 years → persist in the environment for a long time → accumulate along the food chain → harm consumers at higher trophic levels; (b) organisms nearby: exposed to radiation → fetal diseases; e.g. trauma/develop abnormal features.	On the other hand, if nuclear wastes are not disposed of properly or when there are accidents involving leakage of radioactive substances from the nuclear power plants, the negative impact of nuclear power on the environment will be much more severe and long-lasting than that of using fossil fuels for two reasons. First, some radioactive substances have very long half-lives (e.g. 30 years for Cs-134). This allows these substances to persist in the environment for a long time. They may be accumulated along the food chain and harm the consumers at the higher trophic levels. Second, organisms living nearby the source of leakage may be exposed to lethal doses of radiation. They may then suffer from fetal diseases (e.g. trauma) or develop abnormal features.
Conclusion	Nuclear energy ≫ fossil fuels (during energy production) But need safety measures to prevent leakage/accidents, or else: serious, long-term impact on the environment	To conclude, nuclear energy has the potential to alleviate the problem of energy shortage and it is more environmentally friendly than fossil fuels during the process of electricity generation. However, we have to take precautionary measures to ensure its safe use. Otherwise, leakage of radioactive wastes will result in irreversible long-term disasters to the environment

Key Topic sentences useful for introducing a topic or marking transition to a new topic are italicized; logical connectors (linking words) are underlined

Table 6.7 Some common assessment genres across different subjects and levels

	Math	**Science**	**Social studies**	**History**	**English**
Junior primary				Narrative	Narrative
Senior primary		Procedure		Recount	Recount Procedure
Junior secondary	Procedure	Description Explanation	Description	Description	
Senior secondary	Explanation	Discussion Exposition	Discussion Exposition	Discussion Exposition	

Table 6.8 Example of a language function that is useful across different subjects

Defining (language function) can be realized by sentence pattern 1			
Technical term	**Relating verb(s)**	**General class**	**Specific details**
Globalization	is/ means/	the process	by which countries or regions in different parts of the world become more integrated
Photosynthesis	refers to/ is defined as/…		by which solar energy is converted to chemical energy by green plants

Defining (language function) can also be realized by sentence pattern 2			
General class	**Specific details**	**Relating verb(s)**	**Technical term**
The process	by which countries or regions in different parts of the world become more integrated	is called/	globalization
	by which solar energy is converted to chemical energy by green plants	is referred to as/ is known as…	photosynthesis

Table 6.9 Some general academic vocabulary useful across different academic subjects

Verb form	**Noun form**	**Adjective form**
Analyse	Analysis	Analytical
Attain	Attainment	Attainable
Define	Definition	Defining/definable
Develop	Development	Developing/developed
Estimate	Estimation	Estimated
Increase	Increase	Increasing
Justify	Justification	Justifiable/justified/justifying
Maintain	Maintenance	Maintained/maintaining
Rely	Reliability	Reliable
Validate	Validity	Valid/validated

mapping across the curriculum, there are some practical steps that teachers can use the following:

1. Collect examples of the major assessment tasks in each academic subject both at the same level and across different levels (e.g. junior primary/senior primary/junior secondary/senior secondary); these assessment tasks can include semester-end examination questions and high-stakes public examination questions.
2. Analyse the language demands of these tasks using the Genre Egg, e.g. identify the genres and language functions (and useful sentence patterns realizing these functions) as well as key vocabulary, including the three types of academic vocabulary: field-specific vocabulary, general academic vocabulary and logical connectors (see Chap. 3).
3. Tabulate the common genres, functions (and useful sentence patterns) and vocabulary across the subjects (similar to what is done in Tables 6.7, 6.8 and 6.9)
4. Design cross-curricular materials to scaffold students' learning of these common genres, functions (with useful sentence patterns) and vocabulary items. These materials can include (but not limited to) parallel tasks with language and content support built into the tasks and sentence-generating tables.

Table 6.7 shows some common assessment genres found in different subject areas. For example, in junior and senior primary English, students usually need to write narratives (stories) and recounts for their assessment and assignment tasks. The same genres are also used in History assessment and assignment tasks. Likewise, description texts are usually required in assessment tasks in junior science, social studies and history subjects. If teachers teaching different subject areas can discuss both the common and different genres (text types) used in their assessment and assignment tasks, initiatives supporting students in learning these genres across the curriculum can be designed (see discussion in Chaps. 3 and 4).

Table 6.8 shows an example of a useful language function (defining) and two frequent sentence patterns that are used to realize this function in different subject areas. For example, in social studies, there are many subject-specific terms to define such as 'globalization'. In science, many technical terms need to be defined and these are usually built into assessment tasks (e.g. students are asked to define technical terms in tests and examinations). If teachers teaching different subject areas can identify a number of useful language functions across different subject areas (e.g. defining, exemplifying, expressing cause and effect, comparing and contrasting, see more details in Chap. 3), then the sentence patterns useful in realizing these different language functions can be taught to students across different subject areas—i.e. teaching language functions across the curriculum (I call these functions 'academic functions' in the Genre Egg because they are language functions useful for academic purposes). Students will find that these generic functions are useful for writing assessment and assignment tasks in many different

academic subjects and they will be able to make connections between what is learned and assessed across different subject areas.

Table 6.9 shows examples of some general academic words useful for writing assessment tasks across different subject areas. Each word is shown in its different grammatical forms (e.g. verb, noun, and adjective). If teachers across different subject areas can work together to identify a number of useful academic words and teach them in different forms in their respective subject contexts, then students will have repeated practice and explicit instruction on how to use these terms to write their assessment and assignment tasks.

Application Scenario 6.3: Identifying common genres, functions and academic vocabulary across different subjects and levels

In Table 6.7, some common assessment genres across different subjects and levels are listed. The table is not complete. Can you complete the table by referring to the curricular and assessment materials in your own school context?

In Tables 6.8 and 6.9, examples of some common language functions and academic vocabulary useful across different academic subjects are listed. Can you enrich these two tables by adding more common language functions and academic vocabulary found in different subjects (especially in assessment and assignment tasks) in your school?

It will be a more productive exercise if you can talk to colleagues from different subject areas and analyse and identify these different genres, functions and vocabulary together with them.

Note 1: I am indebted to my colleague in science education, Dr. Dennis Fung, who provides me with this framework.

Chapter Summary Points

- Formative assessment and assessment as learning are different from summative assessment. In formative assessment and assessment-as-learning tasks, language support and scaffolding are built into the assessment tasks (which are also used as classroom tasks) to help students learn as they are doing the tasks. With repeated practice through 'parallel tasks', students are gradually guided to develop both the confidence and the knowledge and skills to tackle summative tasks without language support/scaffolding.
- The 3 × 3 CLIL assessment design matrix can be used to analyse both the content demands and the language demands of assessment tasks in content subjects. It is a useful tool to assist teachers and curriculum designers in planning a good distribution of different kinds of task types across different subject areas and different levels to achieve both horizontal and vertical curricular coherence.

- 'APPS' is an acronym for a useful set of strategies that students can use to tackle summative assessment tasks in high-stakes examinations.
- Teachers can guide students in making notes and planning their writing in response to an assessment question. With repeated practice in teacher-guided writing (i.e. joint construction of text), students will gradually gain confidence and knowledge/skills in their own independent writing.
- Working with colleagues across different subject areas to identify the different assessment genres, functions and vocabulary across different curricula is a productive practice in planning LAC/CLIL initiatives to support students in tackling different assessment and assignment tasks across the curriculum.

End-of-Chapter Discussion Questions

1. Some subject teachers believe that language is simply a tool and the sophistication of academic language can be learned by students themselves. In addition, they may think that the amount of effort and time put into the task design with more language support seems to outweigh the gains. How could we ease the teachers' worries and troubles in the design of language support in assessment tasks and turn this into an interesting and rewarding process?
2. In your opinion, is the use of writing frames in the 'joint construction' a hindrance or help to students' writing development? At the sentence level, how do we help students repackage ('repack') the notes into academic language besides using the sentence frames? What other resources can you draw upon (e.g. in other chapters)? If students overuse the frames or the typical linking words, what can we do to remedy this?
3. What is a 'parallel task' and why is it useful? In your own teaching or learning experience, have you used any parallel tasks? In this chapter, examples of parallel tasks from the same subject area (Science) are discussed; do you think you can design parallel tasks across different subject areas? Can you use curriculum mapping (see Chap. 5) to explore how parallel tasks can be designed across different subjects (e.g. English and science)?
4. After doing the curriculum mapping and identifying the common assessment genres across subjects, how should these genres be arranged or sequenced for instruction by different subject teachers? For example, should English teachers take most of the responsibility for teaching all the common genres? How could different subject teachers work together effectively to teach similar genres across subjects? And how do we balance the amount of coverage on vocabulary, sentence patterns and language functions if we adopt the holistic framework?

References

Berry, R. (2008). *Assessment for learning*. Hong Kong: Hong Kong University Press.

Black, P. P. J., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2007). *Assessment for learning*. New York: Open University Press.

Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives: the classification of educational goals—Handbook 1: Cognitive domain*. New York: McKay.

Carless, D. (2011). *From testing to productive student learning: Implementing formative assessment in Confucian-heritage settings*. New York: Routledge.

Coyle, D., Hood, P., & Marsh, D. (2010). *CLIL: Content and language integrated learning*. Cambridge: Cambridge University Press.

Fredericks, A. (1991). *Science brainstretchers: Creative problem-solving activities in science*. Culver City: Good Year Books.

Gibbons, P. (2009). *English learners, academic literacy, and thinking: Learning in the challenge zone*. Portsmouth, NH: Heinemann.

Hong Kong Examinations and Assessment Authority. (2013). *Hong Kong diploma of secondary education (DSE) Integrated Science exam paper*. Hong Kong: Hong Kong Government Printer.

Lemke, J. L. (1990). *Talking science*: *Language, learning, and values*. Norwood, NJ: Ablex Publishing Corporation.

Lin, A. M. Y., & Cheung, T. (2012). *Training of resource persons in implementing LAC in EMI—Understanding LAC skills and strategies in different KLAs—Integrating perspectives* [PowerPoint slides]. In-service professional development programme for secondary school teachers. Hong Kong: The University of Hong Kong.

Lin, A. M. Y., Fung, D., Chan, S., & Lo, Y. Y. (2013). *Designing science assessment tasks with language awareness* [PowerPoint Slides]. Public Seminar. Hong Kong: The University of Hong Kong.

Lo, Y. Y., & Lin, A. M. Y. (2014). Designing assessment tasks with language awareness: Balancing cognitive and linguistic demands. *Assessment and Learning, 3*, 97–119.

Mahboob, A., & Szenes, E. (2010). Linguicism and racism in assessment practices in higher education. *Linguistics and the Human Sciences, 3*(3), 325–364.

Martin, J. R., & Rose, D. (2012). Genres and texts: Living in the real world. *Indonesian Journal of SFL, 1*(1), 1–21.

Stiggins, R. (2005). From formative assessment to assessment for learning: A path to success in standards-based schools. *Phi Delta Kappan, 87*(4), 324–328.

Chapter 7
Programming for Integration of Content and Language Learning

Chapter Overview
This chapter focuses on current approaches to and diverse conceptualizations of programme options for integrating content learning with language learning. This discussion is especially important against the background of rising trends of schools using an L2, L3 or AL (i.e. a second, third or additional language) for content instruction in at least some school subjects in many parts of Asia, Europe and worldwide. While LAC first arose in the 1970s in Britain as an approach to promoting the teaching of academic English across different school subjects in L1-English speaking contexts (Bullock 1975; Marland and Barnes 1977), content-based instruction (CBI) as an umbrella term encompassing different forms of bilingual education has arisen in contexts where L2, L3 or AL learning is an important goal. In this chapter I shall first discuss the theoretical issues underpinning different conceptualizations of how content learning and language learning can be integrated. Then I shall discuss the principles underlying diverse programme models and terms which both overlap and differ in some aspects. In order to help the reader to gain a handle on these diverse terms, I am proposing an analytical framework to classify and design existing and new programme models, while alerting the reader to the unresolved issues and debates in the research literature about the different meanings and definitions given to different programme labels by different people.

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7.1 Theoretical Issue: Isn't Content and Language Always Already Integrated?

From a functional linguistic point of view, language and content are always already integrated (Halliday 1993). Language is the primary semiotic (meaning-making) resource to construe (i.e. to construct and understand) content and so what do we mean when we talk about integrating content and language learning? The key to understanding this is to differentiate between *using* discipline-specific language to teach content on the one hand, and *teaching* discipline-specific language to talk about content on the other. That is, when we ask the question: how can we integrate content learning with language learning, our focus is a pedagogical one (Dalton-Puffer 2013) as well as a programme design one. It is important to link this discussion back to Mahboobian 3-dimensional framework of language variation discussed in Chap. 2. Of particular relevance here is the differentiation between domains of language use for everyday purposes and those domains for specialized (e.g. academic content) purposes. In English as second/foreign or additional language (ESL/EFL/EAL) lessons, students are largely learning how to use language in everyday domains. However, in academic content lessons students are learning content through specialized language use. This disconnection (see discussion in Chap. 4) needs to be addressed through paying special attention to questions of how language learning and content learning can be integrated across the curriculum.

Application Scenario 7.1: Buy One Get One Free?

Researchers have long reported on the challenges facing immersion programmes:

> Despite the well-documented and acclaimed benefits of immersion, these programmes do experience a number of challenges. Primary among them are documented deficiencies in the language proficiency acquired by immersion students. Since the 1970s, studies have shown that while immersion students acquire native-like receptive skills, their productive skills remain lacking. The language they acquire typically lacks grammatical accuracy, lexical specificity and variety, and is less complex and sociolinguistically less appropriate (Cammarata and Tedick 2012, p. 253).

Have you (or your friends) had experience in learning or teaching in immersion programmes (see Sect. 1.3 in Chap. 1)? If yes, does the above quote describe the experience of you (or some of your friends)? Why do you think many immersion students tend to lack productive skills in the immersion language or why there are still deficiencies in their L2 if they have been immersed in learning school content in L2 for many years? Why can't we 'buy one get one free': i.e. using a L2 to learn content ('buy one') and at the same time picking up the L2 ('get one free')?

Cammarata and Tedick (2012) thus talk about the need to reform the 'buy one get one free' belief about immersion education and urge immersion programme administrators and educators to consider active (both proactive and reactive) measures to achieve a good balance of instruction on both the content and language components in immersion programmes. This is especially important in many postcolonial contexts where there is a big divide between the local languages that students are familiar with and the more prestigious school languages (e.g. English) that students (and their parents) aspire to master for socioeconomic advancement. In these contexts, like Hong Kong (see discussion in Lin and Man 2009) and the Philippines (see discussion in Mahboob and Cruz 2013), many students are 'immersed' in English medium instruction (EMI) content lessons and yet their levels of mastery of English (as an additional language) are varied and often present challenges to learning academic content in English.

There is thus the need for more empirical research on issues in integrating content learning and language learning both at the conceptualization and curriculum design level and at the implementation and programme level. In Chap. 1 (Sect. 1.3), we have a brief overview of different programme models and different terminologies associated with them. In the following sections, we shall revisit these programme models and go deeper to analyse the theoretical principles underlying the design and implementation of different models.

7.2 Different Programming Approaches to Integrating Content Learning with Language Learning

CBI researchers have worked on analysing and classifying different types of programmes in terms of varying degrees of integration of content learning and language learning. For instance, Met (1999) uses two different poles (language-driven goals vs. content-driven goals) and the cline in-between these two poles to place different programmes at different points on the continuum depending on the extent to which they are driven by language learning goals or by content learning goals (Figs. 7.1 and 7.2).

While Met uses the dimension of content learning goals/language learning goals as the main criterion to classify existing programme models, Davison and Williams (2001) analyse different curriculum approaches to integrating language learning with content learning using a more complex classification system covering six key aspects, with the curriculum focus somewhat similar to Met's dimension of content-driven versus language-driven goals:

1. Curriculum focus
2. Theoretical model/approach
3. Teaching materials
4. Curriculum function (e.g. syllabus, unit, lesson, activity)
5. Programme type/student groupings

CONTENT-BASED LANGUAGE TEACHING: A CONTINUUM OF CONTENT AND LANGUAGE INTEGRATION	
Content-Driven	**Language-Driven**
Content is taught in L2.	Content is used to learn L2.
Content learning is priority.	Language learning is priority.
Language learning is secondary.	Content learning is incidental.
Content objectives determined by course goals or curriculum.	Language objectives determined by L2 course goals or curriculum.
Teachers must select language objectives.	Students evaluated on content to be integrated.
Students evaluated on content mastery.	Students evaluated on language skills/proficiency

Fig. 7.1 Met's continuum of content and language integration (From Met 1999, Fig. 1; reproduced by permission of National Foreign Language Centre and Dr. Myriam Met)

CONTENT-BASED LANGUAGE TEACHING: A CONTINUUM OF CONTENT AND LANGUAGE INTEGRATION					
Content-Driven			**Language-Driven**		
Total Immersion	Partial Immersion	Sheltered Courses	Adjunct Model	Theme-Based Courses	Language classes with frequent use of content for language practice

Fig. 7.2 Different programme models classified on Met's content-language continuum (From Met 1999, Fig. 2; reproduced by permission of National Foreign Language Centre and Dr. Myriam Met)

6. Teacher roles

Davison and Williams (2001)'s complex table attempts to classify different existing programme models according to the above six aspects. Their six criteria cover features at both curricular conceptualization level and implementation level. It seems that apart from considering the learning goals (or intended learning outcomes) of a programme, we also need to look at other aspects of different programmes. In other words, we need to draw on curriculum planning and programme design frameworks. In the next section, I shall outline a framework that I am developing to do curriculum planning, programme modelling and pedagogical design for integrating content learning with language learning. This framework builds on and extends existing work in the research literature (e.g. Met 1998, 1999; Davison and Williams 2001).

7.3 Developing a Framework for Classifying Programmes and Designing Curriculums with Different Degrees of Integration of Content Learning and Language Learning

How do we approach the task of programme and curriculum design for integrating content learning with language learning? First of all, we need to make important decisions on the programme learning goals (PLGs) to be achieved through teaching the courses in the programme. A programme can have as few as just one course or as many as a range of different courses depending on the scope and nature of the PLGs. For example, an MATESOL programme (Master of Arts in Teaching English to Speakers of Other Languages) typically has 8–10 courses covering different key aspects of the knowledge base and skill set deemed essential for TESOL professionals. Each course in turn has its course learning goals (CLGs), which contribute to the overall PLGs. In each course, there is a curriculum which consists of at least three interrelated components: **syllabus**, **pedagogy** and **assessment**. In what follows, I shall use the above-outlined programme and curriculum design framework as a starting point to discuss how we can conceptualize and explore different programme options in relation to the question of how to integrate content learning with language learning.

7.3.1 Mapping Out Programme Design Options for Integrating Content Learning with Language Learning

Both Met (1999) and Davison and Williams (2001) have tried to classify different existing programmes by using some forms of conceptual framework to map out different programme options and possibilities in relation to different ways of

integrating content learning with language learning. Building on and extending their work, the present framework starts with the first dimension of PLGs, which we can liken to Met's dimension of content-driven goals versus language-driven goals.

On this dimension, there can be a range of programme options depending on the extent to which the PLGs are driven by content learning goals and/or language learning goals. Figure 7.3 shows the programme options/possibilities mapped out on this dimension.

In Fig. 7.3, we can see that at the pole of content-driven PLGs, we have what I call '*bare submersion*' and '*bare immersion*' programmes, which *submerse* linguistic minority students and *immerse* linguistic majority students in L2 content instruction with minimal language support or explicit language instruction. For example, an immigrant or linguistic minority student who is learning the mainstream society language as an additional language is usually *submersed* in a mainstream programme—e.g. South Asian students learning Chinese as an

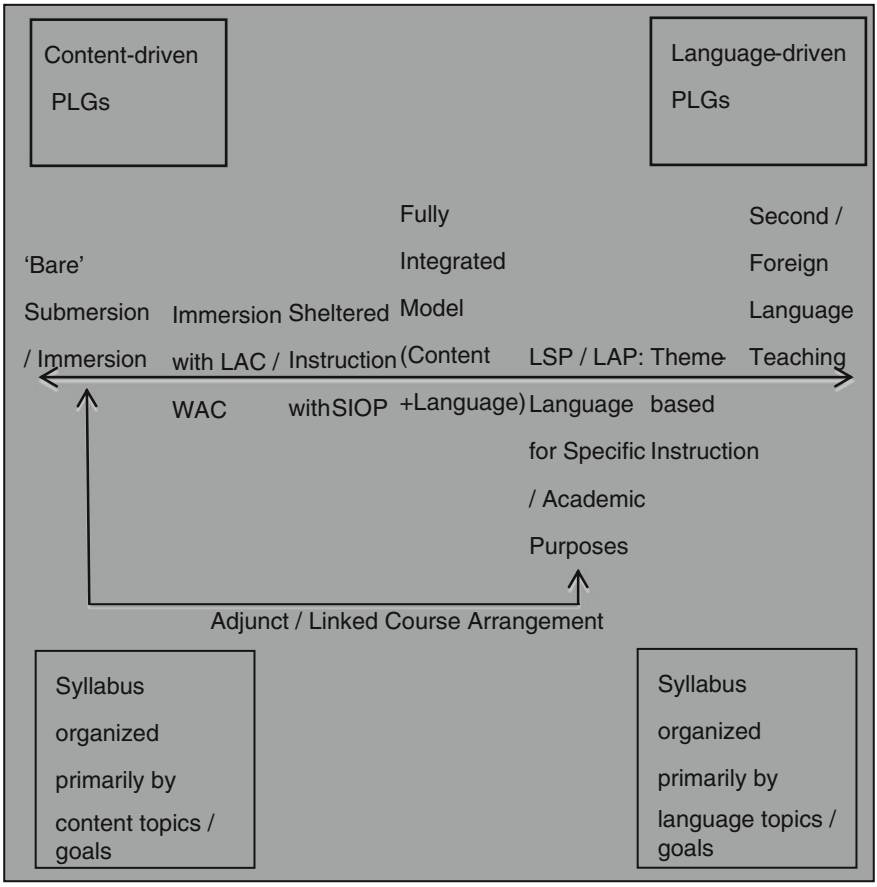

Fig. 7.3 Mapping out programme options according to Programme Learning Goals (PLGs) on a content-driven—language-driven continuum

additional language is usually submersed in a mainstream Chinese content classroom in Hong Kong. On the other hand, majority students can be immersed in a programme using an additional language that the students are learning as the medium of instruction—e.g. Chinese students immersed in an EMI programme in Hong Kong. However, one must point out that immersion and submersion programmes can vary a lot in their amount of provision for systematic explicit language support and instruction to students. Those with minimum language support I would call 'bare immersion' or 'bare submersion'. However, there are also many immersion and submersion programmes which I would describe as 'language aware' and provide for different degrees of integration of explicit language support and instruction. Many researchers studying immersion programmes have done a lot of work investigating effective ways of incorporating systematic language support and instruction. For example, the counter-balanced approach (Lyster 2007) advocates that immersion teachers (and CBI teachers in general) should develop different pedagogical techniques to selectively focus on form and function during instruction. Students should also be given ample opportunities for using language in content-based tasks designed to promote practising and proceduralization (or automization) of target language forms that might otherwise be avoided, misused or unnoticed in immersion classrooms (Genesee and Lindholm-Leary 2013). In Fig. 7.3 I call these programmes '*Immersion with LAC/WAC (Language Across the Curriculum/Writing Across the Curriculum)*'. Similarly, the sheltered instruction programme model incorporates explicit language learning goals and language support and instructional techniques alongside the content learning goals (SIOP—Sheltered Instruction Observation Protocol; see Echevarria et al. 2004).

At the other end of the continuum is second/foreign language education programmes which have language learning as their PLGs, with the use of some content topics (e.g. everyday situations such as going to the restaurant, giving directions, meeting new friends) mainly to contextualize language teaching/learning. Then there are the theme-based instruction programmes, which still have language learning as their main PLGs but use a great amount of coherent, often theme-based (content) topics (e.g. balanced diet; environmental protection) to contextualize language teaching/learning. Then there are the LSP (language for specific purposes) and LAP (language for academic purposes programmes) which are usually offered at postsecondary, tertiary institutions (e.g. colleges, universities) often by units outside of academic faculties/departments like the Language Centre or Centre for Academic Literacies. Courses in LSP/LAP programmes (e.g. business communication, research report writing) are usually taught by language specialists. At the middle of the continuum is my ideal, fully integrated programme model, which gives equal attention to both content-driven and language-driven PLGs with systematic, explicit language support and instruction systematically built into the programme. However, this fully integrated ideal model is not necessarily equivalent to programmes that currently go under the name of CLIL (content and language integrated learning), as researchers have shown that there is a great diversity of programmes that go under the name of CLIL. Many CLIL programmes do not seem to be very different from diverse forms of immersion programmes, which as

mentioned above can vary a lot in their provision of explicit language instruction and support (Cenoz et al. 2013; Cenoz 2015). CLIL programmes in practice can also vary a lot in terms of their balancing of content and language goals and might not approach the ideal of equal focus.

Finally, the Adjunct/Linked Course Model is an existing model which seems to approximate my ideal of a fully integrated programme model but the dual focus is dealt with in separate courses linked closely together. Under this model, students take a content course taught by a subject content teacher (similar to the arrangement in submersion or immersion programmes) but at the same time they also take an adjunct/linked language course which provides explicit instruction on the subject-specific language genres and features that are required to do the readings, write the assignments, participate in the discussions and do the presentations in the linked content course. The content teacher and the language teacher work closely together and the language course is tailored to prepare students for meeting the language demands of the content course. The adjunct/linked course is sometimes called a parallel or companion course in some institutions. The adjunct model is usually found in postsecondary (i.e. tertiary level) institutions, where a language teacher (usually in the Language Centre of the institution) works closely with a content teacher (usually a content specialist in an academic department) in developing the curriculum of the adjunct course.

We can see that at tertiary level, the Adjunct/Linked Course Model requires the planning and coordination at programme level. The programme director needs to convince the content teacher (usually a discipline-specific professor) and the language teacher (usually a language specialist in the Language Centre) to work closely on designing the adjunct syllabuses and teaching materials. The assessment structures of the linked course also need to be well coordinated in a way that gives weight to both content-driven and language-driven goals. For instance, if the content course assignment grading rubrics do not include some criteria related to linguistic clarity, style or well formedness, chances are that students will not invest efforts in the adjunct language course (usually taught by the Language Centre teaching staff) as the language courses usually do not count towards their overall grade point average (GPA) of their discipline major. In having both the content teacher and language teacher working closely together, it is also hoped that the content teacher will become more language aware in their content teaching, and the language specialist will become more content aware in their language teaching. It is also an increasing trend in tertiary institutions to set up units such as Centre for Excellence in Teaching and Learning (CETL) specifically catering for the professional development of content teachers. Apart from helping content teachers to acquire more pedagogical skills, language awareness is also increasingly a professional development goal.

In tertiary institutions, the Adjunct/Linked Course Model is usually used to achieve integration of content learning and language learning as it is difficult to have the same teacher who is both a content specialist (e.g. an engineering professor) and a language specialist. On the other hand, at K-12 (Kindergarten to Grade 12) levels, it is possible and actually ideal to have the same teacher (e.g. a language-aware content teacher) to achieve integration of content learning and language learning. In

many international schools, for instance, a 'homeroom' teacher (i.e. a teacher taking care of the class in the same classroom, which is called their 'home room', and spending most of the time with the same class teaching them a variety of subjects) is in a good position to integrate content teaching with language teaching. Teachers at the primary levels usually have credentials to teach multiple content subjects plus the second/foreign language subject. In such cases, if given adequate training in implementing integration of content and language learning, the same teacher can be an ideal teacher and the school administrators can have both content-driven and language-driven PLGs built into their school education programme. It is clear that school administrators and curriculum leaders (e.g. programme directors, department heads, subject coordinators) need to have professional development opportunities in the theory and practice of how to integrate content learning with language learning in order to design their programme options and possibilities and to exercise their leadership in getting their content and language colleagues to collaborate with each other. In other words, a whole-school or whole-programme approach is needed for efforts in integrating content learning with language learning to be successful as it often requires cross-discipline, cross-department collaboration.

7.3.2 *Charting Out Curriculum Design Principles for Integrating Content Learning with Language Learning*

After deciding on their programme model, then school administrators (e.g. programme directors) need to work with curriculum leaders (e.g. subject and language department heads, year coordinators, subject coordinators) to develop their curriculum that systematically integrates content and language learning. As mentioned above, a curriculum consists of at least three interrelated components: **syllabus**, **assessment** and **pedagogy**.

How do we design a syllabus that can integrate content learning with language learning? Met (1999) has indicated that a content-driven syllabus is organized by content topics while a language-driven syllabus is organized by language topics. What about a syllabus aiming at integration of content learning and language learning? How can a syllabus be organized by both content topics and language topics?

Researchers have approached this challenge of syllabus design via different routes. One route is to use curriculum mapping methods to map out the language demands of content topics (see Chap. 5). In this case, the syllabus is primarily organized by content topics and discipline-specific curriculum principles (e.g. which content topics should be taught first and which should be taught later according to the content topic difficulty or content pedagogical principles). At the same time, this syllabus is coordinated or intertwined with another, parallel syllabus which charts out the language demands of each unit of work in the content syllabus. Then teaching materials are developed to explicitly offer students guidance and support in learning the language resources required to successfully participate in the

teaching and learning activities evolving around the content topics. These mini-units of language support can be embedded in the units of content work in what is called *embedded literacy* (Martin 2013). The Disadvantaged Schools Programme (DSP) pioneered in Australian schools in the 1970s and 1980s follows this approach (Rose and Martin 2012). Ideally, the same teacher (i.e. the *2-in-1* teacher) teaches both kinds of units of work. However, it can be envisioned that in some cases, these two kinds of units can be taught by content and language teachers, respectively, who collaborate closely with each other (e.g. in some cases, both teachers can be in the same classroom and team teach a unit).

Similarly, at postsecondary/tertiary level with the Adjunct/Linked Course Model, the units of language work are developed to address the language demands of the content subject, only that the degree of embeddedness is probably much lower than that in the DSP, as the language units are often taught in a different course and by a different teacher—a language teacher.

The systematic planning of both content and language units of work in the syllabus ensures that students will get explicit instruction on the language aspects of the content work. Without such systematic planning at the level of syllabus design, language-aware content teachers can still always provide spontaneous guidance and support on the language aspects during a unit of content work. The degree of 'mini-ness' of the mini-units of language support work can also slide along a continuum. For example, some very 'mini'-units of work (e.g. a language practice task on how to decode Latin roots of science terms) can be designed and inserted into a unit of content work. In this way, the curriculum designers (ideally including the content and language specialists working closely together) can be flexible in designing multiple mini-units of language work that can be appropriately inserted (or embedded) into different stages of different units of content work to provide timely language support for a particular stage of content work. Curriculum design along these lines has been successfully pioneered and developed in *text-based syllabus design* by researchers (e.g. de Silva and Feez 2012).

However, syllabus planning and design is just one part of the curriculum design work and its success depends very much on the other part of curriculum design work: assessment design. In contexts where examination culture often drives syllabus design and pedagogy, it is important to include both content learning and language learning goals in the design of the assessment tasks and grading criteria. This is especially true in many East Asian contexts where there is a strong tendency for teachers, students and parents to demand instruction to follow strictly the assessment agenda. In these contexts, school administrators need to exercise their leadership to convince staff, parents and students about the long-term benefits of developing a solid foundation in academic literacies and CALP (i.e. the ability to read and write in appropriate subject-specific genres; see Chaps. 2 and 3) rather than just rote-memorizing chunks of academic content wordings for reproduction in examination halls. Indeed, many high-stakes public examinations are starting to develop task types that demand higher level thinking skills and cognitive academic language proficiency (e.g. in Singapore and Hong Kong, assessment reforms are underway). For instance, in the 2014 Diploma of Education (DSE, equivalent to

O-level) biology examination paper, candidates are asked to discuss the pros and cons of a controversial diet (which is rich in lean meat) as a means to lose weight and build muscle. Candidates need to write a discussion text discussing the pros and cons of this diet with reference to the nutritional needs and protein metabolism of the human body.

The above example shows the growing trend even in examination-driven cultures to discourage rote memorization of academic content but to encourage development of the capacity to speak, discuss, think, read and write in appropriate academic genres (see Chap. 6) in high-stakes public examinations. To achieve this goal, the traditional belief that a content teacher is 'just teaching content and not teaching language' cannot be upheld as without helping students to develop the capacity to speak, think, read, discuss, argue and write in appropriate academic language; academic content is often reduced to chunks of memorized formulas, diagrams and phrases revoiced or reproduced by students from the textbook or the teacher's notes. The rote-memorization approach might work marginally well at lower grade levels but as the student advances to senior secondary and tertiary levels, higher order thinking and argumentation requires mastery of the sophisticated semiotic resources to mediate and express the logic of the thinking and argumentation (see discussion in Chap. 6).

7.3.3 Developing Pedagogies for Integrating Content and Language Learning: Systematic Integration and Spontaneous Integration

Even if we have convinced content teachers that they are also responsible for teaching content-specific academic language, we are still confronted with the recurrent question of how content and language teaching can be integrated in classroom instruction. Will the teaching focus on content be diluted or weakened? How can a teacher insert or embed 'mini-language support units' into a content lesson? How can 'embedded literacy' be achieved in the content lesson? These are very concrete pedagogical issues. Content teachers without LAC and academic language awareness training might become uncertain or indifferent about their 'dual' roles as both academic content and academic language teachers. One traditional coping strategy that some immersion teachers have taken up is to do a straight up lecture (as many university professors or lecturers tend to do). Another strategy is to do a pseudo-interactive classroom discussion using the IRF discourse format (see Lin 2007; see also discussion in Chap. 5). In this case, the content teacher is usually doing most of the talking while eliciting short answers from students and interweaving these short answers into the teacher-centred 'discussion'. Both strategies give the impression of smooth content delivery but leave us unsure as to whether students have actually taken up the content or have been helped to talk, read, think, write and argue about the content topics.

In this regard, it is useful to differentiate between systematic planning of embedded language support and spontaneous embedding of language support during content teaching, or what Gibbons (2009) calls *design* scaffolding and *spontaneous* scaffolding. Let us revisit the 'burning candles' experiment example discussed in Chap. 5. By designing parallel tasks (e.g. redesigning the experiment), a Grade 7 science teacher is able to embed the teaching of the experimental report genre in her teaching of how to design a fair test. Figure 5.2 (in Chap. 5) shows the teacher's experimental redesign task with language support systematically built into it.

On the other hand, there can be spontaneous integration of language support in a content lesson. For instance, a Grade 9 mathematics teacher can briefly teach a syllabification strategy on the blackboard to illustrate how to pronounce the multisyllabic words, *numerator* and *denominator*, in the middle of her mathematics lesson (see Plate 5.1 in Chap. 5). I have also seen a Grade 9 physics teacher briefly explaining the word *media* as the plural form of *medium* in the middle of teaching about the different media that light can pass through. Sometimes the language guidance is given explicitly (like the two instances of providing language support by the mathematics teacher and physics teacher mentioned above). Sometimes the language support is given implicitly, as in the form of *recasts* that are often used by immersion teachers, although there is variation across contexts regarding the effectiveness of implicit recasts in helping immersion students to learn the specific language aspects (see Llinares and Lyster 2014). The recast strategy is also often used by caretakers when a child learns how to mean, as in Painter (1991)'s example of recasting her son's phrase '… the same *fast*' to '… the same *speed*' (see Chap. 3). Sometimes explicit corrective feedback or explicit language guidance might be more effective than just implicit recasts of the students' non-target-like structures. While more research is needed in this direction, the existing research has informed us that explicit guidance through interaction in the context of shared experience is important in helping students pick up both content and language (Rose and Martin 2012).

7.4 A Whole-Institute Approach to Programme and Curriculum Development

In answering the question how to integrate content learning with language learning, I have discussed the importance of approaching it from the programme and curriculum planning framework, starting with ensuring that both academic content learning goals and academic language learning goals are given due consideration in the process of designing the PLGs. Then integration can be considered when designing the syllabus, assessment and content of the courses in a programme. Different models (and degrees) of integration can be implemented depending on how feasible it is to embed language support into the programme (e.g. via adjunct,

linked courses) or into the course (e.g. via embedding of mini-language support units) or into the lesson (e.g. via systematic planning of tasks with built-in language support or spontaneous explicit language guidance). However, all these integration strategies and models cannot work without the contribution of the '*2-in-1*' teacher —teachers who have the awareness, confidence and capacity to perform the dual roles of academic content teaching and academic language teaching. If we split up the 2-in-1 teacher, it is possible to try out team teaching by both content and language teachers (e.g. in the adjunct/linked course model). All these require a whole-school approach and a whole- programme approach as well as the collaborative efforts of education administrators, curriculum leaders and teachers in both content areas and language areas in a school or postsecondary/tertiary institutions. Very often teachers in these two areas are compartmentalized or seldom have the chance to collaborate in an LAC programme or curriculum design that aims at exploring ways of integrating content learning with language learning. It is thus of paramount importance for education administrative leaders (e.g. programme directors, school principals) to exercise leadership and promote a whole-institute approach. Incentives also need to be provided for teachers from different disciplines (e.g. the content and the language areas) to collaborate in planning for integration of content learning with language learning. This task is not without its challenges. However, without such a holistic approach, efforts in integrating content learning with language learning will become piecemeal, sporadic and generally depend on the good will of one or two teachers and the effect cannot be sustained. Teacher preparation is thus an important area that will help to make integration of content and language learning a success by both raising awareness and building confidence and capacity to help more content teachers to become language aware and more language teachers to become content aware. That said, different programme models are potentially equally valuable depending on the specific sets of constraints and resources in different school or institutional contexts. So far, most research studies have investigated how language learning and content learning can best be integrated in immersion programmes (and recently also in programmes under the name of CLIL), but there is an overarching lack of research on non-immersion CBI programmes such as those using a theme-based approach in second or foreign language instruction (Tedick and Wesley 2015). Likewise, LAP, LSP (language for academic purposes, language for specific purposes) programmes and the Adjunct/Linked Course Model should also be explored in future research not only in postsecondary, tertiary contexts but also in K-12 school contexts.

Chapter Summary Points

- From a functional linguistic perspective, language and content are always already integrated, but when we talk about how to integrate content learning with language learning, the focus is a pedagogical one and a programme design one.

- In this chapter, an analytical framework is introduced for analysing existing programme models and designing future programme options for integrating content learning with language learning, taking into account the specific sets of constraints and resources of one's own unique school or institutional context.
- Developing pedagogies for integrating content learning with language learning: systematic integration and spontaneous integration.
- A whole-institute and whole-programme approach to integrating content learning with language learning.
- The Adjunct/Linked Course Model in postsecondary, tertiary contexts; possibility of its application to K-12 contexts.

End-of-Chapter Discussion Questions

1. In this chapter, three different conceptual frameworks mapping out different options and possibilities of integrating content and language learning/teaching are mentioned. Can you compare and contrast the present framework proposed by the author with the existing two by Met (1999) and Davison and Williams (2001)? How are they similar or different?
2. In postsecondary/tertiary settings, it may be difficult for language specialists in the Language Centres to become 'content aware', as the subject content is usually highly technical, and the discourse communities are highly professional. In your opinion, do you think it would be better to have discipline-specific 'in-house' language specialists (e.g. business language specialists housed in the business faculty, medical language specialists working in the medicine faculty, etc.) so as to facilitate collaboration, or is it possible to adopt the '2-in-1' model (one professor serving both roles) in the future?
3. In K-12 settings, if ideally the subject teachers can be trained into '2-in-1' teachers, what role should the traditional English teachers play? Do you think a traditional 'pure' language-driven English course (with very limited integration with subject content) can be completely replaced by the language component in the content classroom? Why? Why not? Use the Mahboobian 3-dimensional model of language variation (see Chap. 2) to analyse both the old and new roles of English language teachers in EAL contexts.
4. According to your own experience, do you think it is feasible in your own school context to adopt *the systematic integration model* such as an embedded literacy syllabus? Is it easier to just adopt *the spontaneous integration model*, under the pressure of the assessment agenda? What are the major difficulties? And how can you tackle these difficulties for the benefit of your students?

References

Bullock, A. (1975). *A language for life: Report of the committee of inquiry appointed by the secretary of state for education and science under the chairmanship of Sir Alan Bullock*. U.K.: HM Stationery Office.

Cammarata, L., & Tedick, D. J. (2012). Balancing content and language in instruction: The experience of immersion teachers. *The Modern Language Journal, 96*(2), 251–269.

Cenoz, J. (2015). Content-based instruction and content and language integrated learning: The same or different? *Language, Culture and Curriculum, 28*, 8–24.

Dalton-Puffer, C. (2013). A Construct of cognitive discourse functions for coneptualising content-language integration in CLIL and multilingual education. *European Journal of Applied Linguistics, 1*(2), 1–38.

Dalton-Puffer, C., Llinares, A., Lorenzo, F., & Nikula, T. (2014). "You can stand under my umbrella": Immersion, CLIL and bilingual education. A response to Cenoz, Genesee & Gorter (2013). *Applied Linguistics, 35*(2), 213–218.

Davison, C., & Williams, A. (2001). Integrating language and content: Unresolved issues. In B. Mohan, C. Leung, & C. Davison (Eds.), *English as a second language in the mainstream: Teaching, learning and identity* (pp. 51–70). Harlow England: Pearson Education.

de Silva, H., & Feez, S. (2012). *Text-based syllabus design*. Sydney: Phoenix Education.

Echevarria, J., Vogt, M. E., & Short, D. J. (2004). *Making content comprehensible for English language learners: The SIOP model* (2nd ed.). New York: Pearson.

Genesee, F., & Lindholm-Leary, K. (2013). Two case studies of content-based language education. *Journal of Immersion and Content-Based Language Education*, *1*, 3–33. doi:10.1075/jicb.1.1.02gen

Gibbons, P. (2009). *English learners, academic literacy, and thinking*: *Learning in the challenge zone*. Portsmouth, NH: Heinemann.

Halliday, M. A. K. (1993). Towards a language-based theory of learning. *Linguistics and Education, 5*(2), 93–116.

Lin, A. M. Y. (2007). What's the use of "triadic dialogue"?: Activity theory, conversation analysis, and analysis of pedagogical practices. *Pedagogies: An International Journal, 2*(2), 77–94.

Lin, A. M. Y., & Man, E. Y. F. (2009). *Bilingual education: Southeast Asian perspectives*. Hong Kong: Hong Kong University Press.

Llinares, A., & Lyster, R. (2014). The influence of context on patterns of corrective feedback and learner uptake: A comparison of CLIL and immersion classrooms. *The Language Learning Journal, 42*(2), 181–194.

Lyster, R. (2007). *Learning and teaching language through content. A counterbalanced approach*. Amsterdam: John Benjamins Publishing Company.

Mahboob, A., & Cruz, P. (2013). English and mother-tongue-based multilingual education: Language attitudes in the Philippines. *Asian Journal of English Language Studies, 1*, 1–19.

Marland, M., & Barnes, D. R. (1977). *Language across the curriculum: The implementation of the Bullock Report in the secondary school*. London: Heinemann Educational Books.

Martin, J. R. (2013). Embedded literacy: Knowledge as meaning. *Linguistics and Education, 24*(1), 23–37.

Met, M. (1998). Curriculum decision-making in content-based language teaching. In J. Cenoz & F. Genesee (Eds.), *Beyond bilingualism: Multilingualism and multilingual education* (pp. 35–63). Clevedon: Multilingual Matters.

Met. M. (1999, January). *Content-based instruction: Defining terms, making decisions.* NFLC Reports. Washington, DC: The National Foreign Language Center. Retrieved October 14, 2014, from http://www.carla.umn.edu/cobaltt/modules/principles/decisions.html

Painter, C. (1991). *Learning the mother tongue* (2nd ed.). Geelong, Vic: Deakin University Press.
Rose, D., & Martin, J. R. (2012). *Learning to write, reading to learn: Genre, knowledge and pedagogy in the Sydney school*. Sheffield (UK) and Bristol (USA): Equinox.
Tedick, D., & Wesley, P. (2015). A review of research on content-based foreign/second language education in US K-12 contexts. *Language, Culture and Curriculum, 28*, 25–40.

Chapter 8
Critical Perspectives

Chapter Overview
This chapter discusses the critical issues that have been raised by researchers and practitioners in the fields of EAP, academic literacies and genre-based pedagogies. All of these fields are closely related to the work of LAC and CLIL. I shall discuss why addressing critical perspectives is both necessary and important in developing the theory and practice of LAC and CLIL if we are committed to addressing issues of social justice, diversity and creativity while at the same time trying to help students to access the communicative conventions and genres of the powerful elite in academia and society.

8.1 Genre-Based Pedagogies: Promoting Writing Template Culture and Constraining Students' Voices and Creativity?

A frequent critique of genre-based pedagogies is that they might promote a kind of writing template culture (i.e. teaching writing templates to students) and inadvertently constrain students' development of creativity. This critique is supported by the theoretical point that genres are dynamic, fluid and ever changing and are thus very difficult to fully capture and describe. When genres are reified as text types and taught to students in a non-reflective, reductive manner, students might easily get the misconception that all that they are required to do is to follow the static text-type template and reproduce a text following the template. Also, students are likely to be confronted with new, unpredictable contexts where the kinds of text types that they have been taught might not be appropriate or adequate. While the above is a highly synoptic representation of the critique, it does point to the theoretical debate of what

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is more or less teachable/unteachable (or describable/un-describable) and the risk of over-simplifying complex communicative practices as simple teachable and learnable units. As Hyland (2007) puts it, proponents of genre-based approaches have to address 'the charge that genre instruction inhibits writers' self-expression and straightjackets creativity' (p. 152).

In response to this concern, we can consider the 'resource-oriented teaching' conceptualized in the Sydney School genre-based approaches (Martin 1994). Resource-oriented teaching emphasizes genre knowledge as resources and strategies for achieving one's communicative purposes rather than as prescriptions and rules for writing. For example, while the 'elemental genres' like report, procedure, explanation, recount and so on (see Chap. 3) are more predictable in terms of their rhetorical organization and linguistic features, students can also be introduced to the more dynamic 'macro-genres' and the strategies and resources for combining different elemental genres into macro-genres for achieving different communicative purposes. These strategies include elaboration, extension, enhancement and projection (for detailed examples, see Martin 1994; Martin and Rose 2008). A deep understanding and control of the elemental genres and the strategies for combining them will provide the building blocks (the resources) for creating more dynamic macro-genres. This can provide a useful counterbalance to reductive interpretations and implementations of genre-based pedagogies. Citing Bakhtin, Martin and Matthiessen (2014) have recently summarized their response to critique of genre-based pedagogies as follows:

> … creativity depends on mastery of the genre, that critique depends on mastery of the genres of critique and the genres that are being critiqued, and that managing multimodality depends on mastery of multimodal genres. Bakhtin voiced a similar position more than a generation before our re-iterations.
>
> 'The better our command of genres, the more freely we employ them, the more fully and clearly we reveal our own individuality in them… the more flexibly and precisely we reflect the unrepeatable situation of communication—in a word, the more perfectly we implement our free speech plan.' [Bakhtin 1986, p. 80]
>
> (Martin and Matthiessen 2014, p. 155)

After outlining above the major kinds of critique to genre-based pedagogies and some possible responses, in Sect. 8.2 below I shall discuss the 'access paradox', and in Sect. 8.3 I shall discuss critical pragmatic approaches as well as Hilary Janks' response to the 'access paradox' as possible strategies to overcome some of the difficult dilemmas captured in the notion of the 'access paradox'.

8.2 The 'Access Paradox' in the Context of Global Dominance of English

In the previous chapters, it is argued that one of the chief aims of LAC and CLIL is to help students access the target academic language and literacies, to master the necessary genres, registers and lexico-grammatical resources required to participate

and communicate successfully in the learning and assessment activities/tasks in different academic content subjects in educational settings. We can say that this is a pragmatic approach to academic literacies, EAP, LAC and CLIL—i.e. adopting the 'identify and induct' ('I & I') approach (see critique of this approach by Street 2004; Lea and Street 1998; Lillis and Scott 2007). Under this approach, we identify, describe and unpack the literacy conventions of academic disciplines and induct (apprentice) students into these conventions (e.g. genre structuring and associated linguistic features), without questioning the ideologies behind these conventions and in the process reifying and reproducing the domination of these conventions.

Critical perspectives, however, require us to consider the 'access paradox' and to confront ourselves with issues of linguistic domination, lack of discursive diversity and creativity, especially in the context of global domination of English, where LAC and CLIL programme models, which although can involve a whole range of languages other than English, are increasingly associated with promoting English as the target L2 in many contexts of the world. Put simply, the 'access paradox' (Lodge 1997, quoted in Janks 2004) states that if more people are provided with access to the dominant variety of the dominant languages, its dominance is perpetuated and reinforced. However, if students are denied access to this variety of languages, they continue to be marginalized in a society where this variety of languages is held up as a marker of distinction or as a gate-keeping requirement for access to higher education and/or high-end jobs, and hence there is this 'access paradox' confronting educators and researchers.

Closely related to the 'access paradox' is the critique that teaching genres of the powerful elite does not necessarily empower students from minority groups as mastery of the genres is necessary but not sufficient for them to access social mobility due to other sources of discrimination such as ethnicity, L1 background, gender, accent or simply skin colour (Luke 1996). Bourdieu's notion of the legitimate speaker is useful here. For instance, if a non-white speaker/writer in Australia produces an English text, the effect might not be the same as that produced by a white speaker/writer in a similar context. The non-white ethnic minority speaker/writer might still tend to be perceived as an imposter or an illegitimate speaker/writer of English (Bourdieu 1990). The argument is that just acquiring the dominant ways of speaking/using English is not necessarily a ticket to social mobility in contexts where racism still works in subtle ways against ethnic minorities (Luke 1996).

8.3 Critical Pragmatic Approaches to Academic Literacies and Hilary Janks' Discussion of the 'Access Paradox'

There have been different efforts by researchers and educators to integrate critical perspectives into their curriculum design and pedagogical practice. These can come under the umbrella term of *critical pragmatic approaches* to academic literacies. In particular, we shall look at the different proposals of Janks (2004), Harwood and Hadley (2004) and Lemke (1990).

Table 8.1 A critical approach to access to English language education (From Janks 2004, p. 35; reproduced here by permission of the Australian Association for the Teaching of English and Professor Hilary Janks)

Access without domination	Access without a theory of domination leads to the naturalization of powerful discourses without an understanding of how these powerful forms came to be powerful.
Domination without access	This maintains the exclusionary force of dominant discourses.
Access without diversity	This fails to recognize that difference fundamentally affects pathways to access involving issues of history, identity and value. It also limits the resources available for redesign.
Diversity without access	Diversity without access to powerful forms of language ghettoizes students and limits their futures.
Access without design	This maintains and reifies dominant forms without considering how they can be transformed.
Design without access	Runs the risk of whatever is designed remaining on the margins.

In an article on the access paradox, Janks (2004) provided a succinct analysis of how access can be provided together with raising critical awareness so that providing access to the dominant language variety/genres/registers does not contribute to reinforcing their dominance. Table 8.1 taken from Janks (2004) summarizes the different scenarios that can happen in an educational setting and their consequences.

In Table 8.1, we can see that apart from access, the three additional key notions are *diversity*, *design* and (critical awareness of) *domination*. If a curriculum can be designed that provides students with access to the dominant linguistic resources while at the same time alerting students that the dominant language varieties/genres/registers are dominant mainly because of their gate-keeping functions (e.g. in public examinations) and not because they are naturally or universally superior and that there can be diverse ways of meaning-making (e.g. everyday, non-academic genres) that are not inferior, the access paradox can be partially overcome. This echoes what Delpit (1988) proposes in her seminal article in *Harvard Education Review* regarding the issue of whether to teach 'Standard American English' to African American children. Delpit's approach is to explicitly engage African American students in a critical sociolinguistic discussion of the differences between their own familiar African American varieties of English and standard varieties of American English which are dominant in society. Students' own familiar home and community language resources are affirmed and built upon while access to the dominant language varieties in society is provided by engaging students in such projects as that of designing a bilingual dictionary contrasting their everyday community varieties of English with the school varieties of English. In design/diversity projects like this, it is possible to achieve both access and critical language awareness. Access to dominant resources can thus be provided without denigrating the students' own familiar language varieties/genres/registers from their homes and communities.

On the notion of *domination* Janks (2010) has recently further refined its explanation to allow for a more fluid, non-essentialized understanding of domination, drawing on Foucault (1978)'s notion of power as fluid and productive. After Foucault, Janks (2010) disagrees with the fixed and overarching conceptions of domination as a binary structure with dominators on one side and the dominated on the other, but interprets domination as taking manifold possible forms that can be exercised within society. Foucault emphasizes the central role of discourses which produce 'truth'. Foucault draws people's attention to the processes during which discourses are constituted and the way by which power constitutes discourses as knowledge—truth, and is then reinforced by truth. For example, in many modern nations, the official discourse of the standardized language as the 'proper form' of language is constituted as established knowledge ('truth'), and then this 'knowledge' is in turn used to reinforce the power of the state to spread the standardized language and to marginalize local languages as 'dialects'. To Foucault, power has a capillary form of existence that penetrates into every tiny aspect of people's daily life including their speaking, thinking and actions. Power shapes people's life by constituting (or producing) their subjectivities (i.e. their sense of self, their ways of speaking, thinking, acting, etc.) through the discourses that they inhabit (e.g. through the everyday 'common sense' discourses circulated in the media, by the government, or by schools or other institutions).

Janks (2010)'s critical literacy synthesis model thus proposes that different ways of doing critical literacy follow from different ways of conceptualizing the relationship between language and power by foregrounding one or other of the four key orientations: *domination, access, diversity* or *design*. These four orientations to critical literacy are crucially interdependent and should be integrated in practice. It has very important implications for the application of genre theory in education:

> Genre theory without creativity runs the risk of reifying existing genres; deconstruction without reconstruction or design reduces human agency; diversity without access ghettoises students. Domination without difference and diversity loses the ruptures that produce contestations and change. Reconstruction needs deconstruction in order to understand 'the manifold relationships of force that take shape and come into play in the machinery of production' (Foucault 1978, p. 94). We need to find ways of holding all of these elements in productive tension to achieve what is a shared goal of all critical literacy work: equity and social justice. We need to weave them together in complex moves from deconstruction to reconstruction to deconstruction, from access to deconstruction to redesign, from diversity to deconstruction to new forms of access. These different moves need to control and balance one another. (Janks 2010, p. 27)

The above discussion brings us to another set of key notions to summarize the tension between non-critical and critical approaches. Non-critical approaches can easily become *prescriptive*, *normative*, reifying and naturalizing certain language varieties/genres/registers as superior and teaching them as the only target models and norms. Critical approaches attempt to raise critical awareness of these issues, to respect *diversity* and *creativity*, and encourage re*designing* and transformation of disciplinary conventions and practices to embrace diversity of student backgrounds while striving to provide access to the dominant discourses and resources. Harwood

and Hadley (2004) further call this a *critical pragmatic approach*, i.e. balancing the critical and pragmatic perspectives. For instance, it has often been taught as a norm in academic research writing that personal pronouns should be avoided. Harwood and Hadley (2004) have designed a series of activities to engage tertiary students in critically discussing/redesigning this norm; below is a snapshot of a fragment of one of the activities:

> Activity 2
>
> Look at the following extracts from academic papers.
>
> (i) Why do you think they decide to use these particular pronouns?
>
> (ii) What would be the effect of substituting a different first person pronoun in place of the original one used?
>
> (p. 369)

Drawing on both qualitative textual analysis and corpus tools, students are engaged in analysing different practices regarding the use of personal pronouns in different subject areas. The purpose of these activities is to engage students in critically examining the different practices related to (either following or flouting) the norm (e.g. of avoiding personal pronouns in academic research writing). As Harwood and Hadley (2004) put it,

> Having begun to investigate the functions and frequency of personal pronouns and possessive adjectives in a selection of subjects across the academy, the class is now in a position to make an informed choice as to whether to accept or flout their discipline's conventions. (p. 371)

In a sense, the aim of critical pragmatic approaches is to enable students to become critical genre/discourse analysts themselves and to relativize the academic literacy norms in any discipline, helping students to become critically aware of multiplicity of norms across different disciplines as well as the changeability of conventions to serve different new functions and new interests. This kind of critical awareness and genre/linguistic analysis activities can serve both the pragmatic function of providing access while encouraging critical awareness of diversity and changeability of norms in different disciplines.

In the same vein, Lemke (1990) calls for demystifying the language of school science by exposing students to multiple genres and language patterns used to talk about science topics, to explicitly discuss the value of different genres, while at the same time providing access to the dominant ones:

> The language of classroom science sets up a pervasive and false opposition between a world of objective, authoritative, impersonal, humorless scientific fact and the ordinary, personal world of human uncertainties, judgments, values and interests. … Their cumulative effect very often is to project science as a simple description of the way the world is, rather than as a human social activity, an effort to make sense of the world. Statements about the way atoms are or the earth is tend to be less interesting to many students than statements about who did what to come up with these unfamiliar ideas. (Lemke 1990, pp. 129–131)

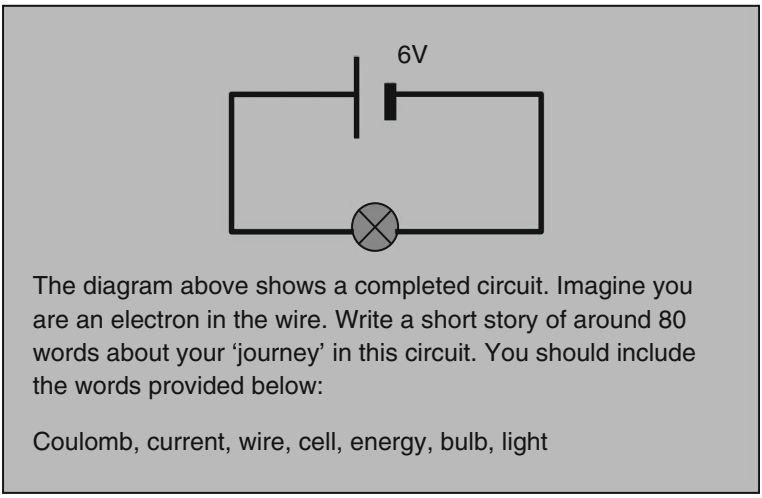


Fig. 8.1 An alternative assignment designed for Grade 9 integrated science students (From Fung 2010, Slide 8; reproduced by permission of Dr. Dennis Fung)

When assignments are designed in an innovative way, students' interest in learning science can be aroused. For instance, in Fig. 8.1, students are asked to write the story of the journey of an electron through a circuit from the first person perspective, i.e. personifying the electron and writing in the recount genre instead of the usual impersonal, explanation or description genres that are common in the science subject area.

This alternative assignment task has the following knowledge and skills objectives:

Knowledge Objectives:

(1) To describe the microscopic view of current.
(2) To link up different Physics concepts about the electric circuit.

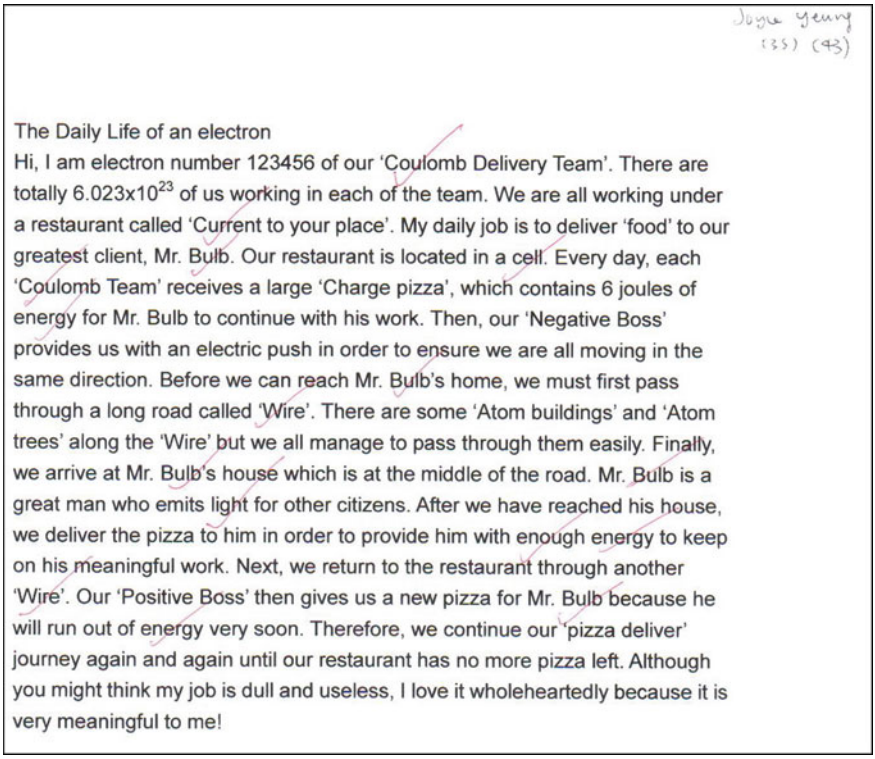
Skills Objectives:

(1) To write creatively.
(2) To organize the knowledge in their own way.
(From Fung 2010, Slide 7; reproduced by permission of Dr. Dennis Fung)

And the following marking scheme is used:

(1) 1 mark is awarded for using each quantity provided. (Max.: 7 marks)
(2) 3 marks for creativity
(3) 1 mark will be deducted if a concept is used wrongly
(4) Maximum marks for the assessment is 10.
(Fung 2010, Slide 9; reproduced by permission of Dr. Dennis Fung)

We can see that creativity is explicitly encouraged while accuracy of knowledge is also required. By designing an alternative assignment like this, teachers can create space within the science curriculum for students to express and organize knowledge *in their own way*. The benefits of having an alternative assignment like this confirmed Lemke (1990)'s idea that the more humanizing genres and registers for expressing knowledge can turn science from a cold, impersonal subject into an engaging subject for students. The students' writings also allow teachers to learn more about the everyday conceptions of students regarding the science topics that have been taught. So, this task can also serve a diagnostic purpose because when students are free to express what they know in creative and engaging ways, chances are that they are more willing to write more and this offers their teachers a better window on their thinking processes (see Figs. 8.2 and 8.3 for samples of students' writings). Teachers can then design follow-up activities/tasks to provide the missing knowledge or to clarify the scientific points not yet or partially grasped by their students.



The Daily Life of an electron

Hi, I am electron number 123456 of our 'Coulomb Delivery Team'. There are totally 6.023×10^{23} of us working in each of the team. We are all working under a restaurant called 'Current to your place'. My daily job is to deliver 'food' to our greatest client, Mr. Bulb. Our restaurant is located in a cell. Every day, each 'Coulomb Team' receives a large 'Charge pizza', which contains 6 joules of energy for Mr. Bulb to continue with his work. Then, our 'Negative Boss' provides us with an electric push in order to ensure we are all moving in the same direction. Before we can reach Mr. Bulb's home, we must first pass through a long road called 'Wire'. There are some 'Atom buildings' and 'Atom trees' along the 'Wire' but we all manage to pass through them easily. Finally, we arrive at Mr. Bulb's house which is at the middle of the road. Mr. Bulb is a great man who emits light for other citizens. After we have reached his house, we deliver the pizza to him in order to provide him with enough energy to keep on his meaningful work. Next, we return to the restaurant through another 'Wire'. Our 'Positive Boss' then gives us a new pizza for Mr. Bulb because he will run out of energy very soon. Therefore, we continue our 'pizza deliver' journey again and again until our restaurant has no more pizza left. Although you might think my job is dull and useless, I love it wholeheartedly because it is very meaningful to me!

Fig. 8.2 Sample of a student's work (From Fung 2010, Slide 11; by permission of Dr. Dennis Fung)

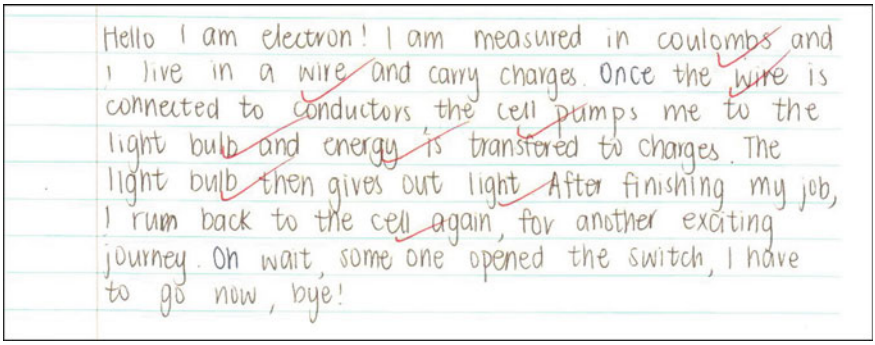

Hello I am electron! I am measured in coulombs and I live in a wire and carry charges. Once the wire is connected to conductors the cell pumps me to the light bulb and energy is transfered to charges. The light bulb then gives out light. After finishing my job, I rum back to the cell again, for another exciting journey. Oh wait, some one opened the switch, I have to go now, bye!

Fig. 8.3 Sample of another student's work (From Fung 2010, Slide 13; by permission of Dr. Dennis Fung)

Application Scenario 8.1
Figure 8.2 shows a student's writing on the story of an electron in a circuit. When I showed this example to a group of teachers in a workshop in Hong Kong, some teachers immediately raised the concern that this kind of writing will not be allowed in examinations and will not help students to succeed in examinations. Using the critical pragmatic approach, what can be some responses to alleviate such concerns? And what kind of complementary activities can be designed to ensure that students are exposed to and gain access to multiple kinds of genres (including the examination-required genres) while engaging their interest in science and enabling them to both like science topics and succeed in science examinations?

Application Scenario 8.1 addresses the concerns of teachers who are worried that using more everyday life genres (e.g. stories, recounts) might get students stranded in these everyday genres without gaining access to the language of science and the academic genres required for success in examinations. Regarding how teachers can provide access to the language of science while building on students' familiar resources to engage them in learning science topics Lemke (1990) has proposed a range of practical activities:

> Students will begin to grasp semantic and conceptual relationships in colloquial language first. Then they will substitute scientific, technical terms for colloquial words. … Along the way their version of scientific language will be… a sort of hybrid of colloquial and technical registers. The teacher will need to use these different varieties of language as well, and keep them straight for the students. In order for this to work, and in order to increase students' fluency and flexibility in using the foreign register of science when dealing with topics that are initially equally unfamiliar, they need practice in translation as well. Students should regularly have oral, and occasionally written, practice in class in restating scientific expressions in their own colloquial words, and also in translating colloquial arguments into formal scientific language. (p. 173)

Read the following sentences. Recognise any *Conversational Style (CS) Sentences*, and *Academic Style (AS) Sentences*. Then, rewrite these sentences into their counterparts.

(1) Mold, yeast and bacterial will spoil our food. (_____ style)

_____

_____

(2) Food preservatives are used to maintain the freshness of food. (_____ style)

_____

_____

(3) To be healthy and fit, we should have a balanced diet. (_____ style)

_____

_____

Fig. 8.4 One way of designing translation practice between everyday and academic styles

Lemke argues that translation practice needs to go both ways; i.e. from scientific and colloquial (or everyday) and from colloquial to scientific. This is akin to what we have discussed in Chaps. 3 and 4 about the need to help students unpack and repack academic language, and to shift comfortably between everyday and academic genres/registers, without privileging either but raising students' awareness of both. This view is also summarized in the rainbow diagram (See Fig. 5.12 in Chap. 5). Figure 8.4 shows an example of how translation practice can be designed to help students shunt between everyday and academic styles in English.

However, we must recognize that while colloquial and academic styles and genres might be abstracted as opposite categories in theory, in practice there will be many instances of language use lying in-between (Lemke calls them hybrids), just as BICS and CALP should not be conceived as binary opposites (see discussion in Chap. 2) although in theoretical modelling it might help to see them as the two poles of a continuum. We thus need to remind ourselves (and our students) that in actual language use, what people do is much messier than theoretical/linguistic modelling, and that in different contexts in different disciplines, different hybrids will actually be encountered and used (e.g. the more dynamic macro-genres; see Martin 1994; Martin and Rose 2008). If we can alert students to these critical issues, then we shall not be misleading students into thinking that language use falls nicely

into neat categories, but that flexibility and creativity is always a driving force in enriching, expanding and transforming the different fields of knowledge and the ways and styles people communicate in these fields. As Lemke (1990) proposes:

> Teachers should use all the stylistic and rhetorical means available to communicate science to students, including narrative and dramatic presentations; humor, irony, and metaphor. (p. 174)

While Lemke talks about science in particular, his proposals are equally useful for other disciplines. And in line with critical pragmatic principles, we should also provide students with explicit guidance on how to master those formal academic varieties/genres/styles that will help them succeed in examinations and in gate-keeping encounters (e.g. formal academic presentations/writing) while also raising critical awareness about them: i.e. they are not superior to other everyday, colloquial genres and styles. In sum, critical and pragmatic perspectives can be productively integrated into our approaches to academic literacies, EAP, LAC and CLIL. Critical perspectives help us to move away from *deficit* models of students' repertoires of communicative resources and to appreciate *diversity* of communicative styles, genres and resources. While recognizing the domination of certain varieties/styles/genres in society and the importance of providing access to them (pragmatic perspectives), we do not reify these patterns of meaning-making as static and universally superior (critical perspectives). In contrast, together with students we can analyse them and provide access to them and in the process raising critical awareness of both their functions and limitations and their dynamic, fluid changeability.

Application Scenario 8.2
Students in the humanities and social sciences are often confronted with complex academic style sentences like the one below:
e.g. 'His farsighted acts in accepting the Truce of Villafranca, in stopping Garibaldi from marching on to Rome, and in allying with Bismarck made the unification movement possible.'
Can you design a 'translation task' (in Lemke's sense) to help students shunt comfortably between everyday communicative styles and academic communicative styles? Remember that multimodal resources such as diagrams, cartoons and graphic organizers can also be used in coordination with language resources.
Can you also design a task to raise students' critical awareness of the different ways of communicating the topics (e.g. contrasting the use of a cartoon strip story and an academic exposition) and to discuss their different functions and uses in different contexts without privileging any way/style as naturally or universally superior?

Apart from helping students to become *genre and register analysts*, students also need to be alerted to the fact that genre templates (e.g. writing templates) are just mere abstractions (synoptic descriptions at best) made by genre analysts from observing numerous instances of similar texts serving similar communicative purposes in similar situations (e.g. a lab report, a sonnet, a haiku) and that genres are changing and can be changed. As Lemke puts it:

> Each enactment of a ritual, each performance of a song, each making of a tool, each writing of a sonnet will be unique and different, but it will also re-enact criterial features common to the type, to the cultural formation, the social practice. Other, initially incidental features, may in the course of cultural change become newly criterial ones for an evolved type. There is an essential dialectic between types and their 'tokens', between abstract practices and formations and their individual instances. This is a dynamic dialectic: it leads to change, it mediates the process of change. (Lemke 1993, pp. 267–268)

If genre-based pedagogies can also integrate activities raising the kind of critical awareness mentioned above, then students are not led to mechanically reproduce texts according to a writing template, but are also provided with the space to experiment with innovative features that can contribute to enriching and transforming the genre, as well as combining genres in creative ways serving their ever-changing communicative goals. Although much more curriculum research in this direction is needed, we are hopeful that a viable response to the critique that genre-based pedagogies might constrain creativity is both possible and feasible. In the next chapter, we shall chart out the different directions of future research that will contribute to the field of studies in LAC, CLIL and academic literacies.

Chapter Summary

This chapter addresses the concerns raised in the literature about the 'identify and induct' ('I & I') paradigm of EAP, the danger of reductive interpretations and implementations of genre-based pedagogies (e.g. the writing template teaching culture) as well as the 'access paradox'. All these are centrally related to the research and practice LAC and CLIL if LAC and CLIL pedagogies are to address issues of social justice, diversity and creativity. The chapter then focuses on critical pragmatic perspectives and ideas on how to build on students' familiar resources while developing their mastery of the dominant codes and discourses. All these perspectives converge on a dynamic view of language and genres as fluid resources and strategies that can be creatively renovated and used by students to achieve their ever-changing communicative goals.

End-of-Chapter Discussion Questions

1. Three major kinds of critique have been outlined in this chapter regarding the theory and practice of LAC and CLIL. Can you summarize the responses to each one of them, respectively? And what would be your own response to each of these critiques?

2. Some people might argue that critical approaches (i.e. raising critical awareness, either of the static nature of writing templates or of the dominance of a certain variety of languages) tend to confuse young students. Do you agree with this view or not? Is students' ability to do critical thinking often underestimated? If you are to design a lesson to engage young EAL students using a critical pragmatic approach, how would you design it without confusing students while still raising their critical awareness? You can borrow insights from Lisa Delpit's seminal study in 1988 where she engaged students in actively comparing and contrasting language features of African American English and standard American English while alerting them to the issue that a language variety has become standardized not because it is intrinsically superior but because of political domination of the social groups speaking this variety.
3. It can be hard for teachers (especially content teachers) to guide students in practising translation between everyday and academic styles of language. The reasons for this difficulty may include first of all the teachers' lack of awareness about the importance of teaching this; secondly, not all teachers are proficient in both styles. How can these teachers be trained and where and how can they get more resources and confidence to design such kinds of translation (or 'shunting') practice?

References

Bakhtin, M. M. (1986). Speech genres and other essays. In M. Holquist & C. Emerson (Eds.), (V. McGee Trans.). Austin: University of Texas Press.

Bourdieu, P. (1990). *Language and symbolic power*. Cambridge, Mass.: Harvard University Press.

Delpit, L. D. (1988). The silenced dialogue: Power and pedagogy in educating other people's children. *Harvard Educational Review, 58*(3), 280–298.

Foucault, M. (1978). *The history of sexuality* (Vol. 1) (R. Hurley, Trans.). London: Penguin.

Fung, D. (2010). *Teaching of integrated science: Presentation on alternative assignments*. [Unpublished PowerPoint slides]. Faculty of Education, The University of Hong Kong, Hong Kong.

Harwood, N., & Hadley, G. (2004). Demystifying institutional practices: critical pragmatism and the teaching of academic writing. *English for Specific Purposes, 23*(4), 355–377.

Hyland, K. (2007). Language, literacy, and writing instruction. *Journal of Second Language Writing, 16*, 148–164.

Janks, H. (2004). The access paradox. *English in Australia, 139*(1), 33–42.

Janks, H. (2010). *Literacy and power*. New York: Routledge.

Lea, M., & Street, B. (1998). Student writing and faculty feedback in higher education: An academic literacies approach. *Studies in Higher Education, 23*(2), 157–172.

Lemke, J. L. (1990). *Talking science: Language, learning, and values*. Norwood, NJ: Ablex Publishing Corporation.

Lemke, J. L. (1993). Discourse, dynamics, and social change. *Cultural Dynamics, 6*(1), 243–275.

Lillis, T., & Scott, M. (2007). Defining academic literacies research: Issues of epistemology, ideology and strategy. *Journal of Applied Linguistics, 4*(1), 5–32.

Lodge, H. (1997). *Providing access to academic literacy in the Arts Foundation Programme at the University of the Witwatersrand in 1996—The theory behind the practice*. University of the Witwatersrand: Unpublished Masters Research Report.

Luke, A. (1996). Genres of power: Literacy education and the production of capital. In R. Hasan & G. Williams (Eds.), *Literacy in society* (pp. 308–338). London: Longman.

Martin, J. R. (1994). Marcro-genres: The ecology of the page. *Network, 21*, 29–52. [Reprinted in Wang Zhenhua (Ed.) (2012). *Genre studies* (pp. 78–126), Volume 3 of the collected works of J. R. Martin. Shanghai: Shanghai Jiao Tong University Press.]

Martin, J. R., & Matthiessen, C. M. I. M. (2014). Modelling and mentoring: Teaching and learning from home to school. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 137–163). Dordrecht: Springer.

Martin, J. R., & Rose, D. (2008). *Genre relations: Mapping culture*. London: Equinox.

Street, B. V. (2004). Academic literacies and the 'new orders': Implications for research and practice in student writing in HE. *Learning and Teaching in the Social Sciences, 1*(1), 9–32.

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 CLIL[1], (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 CLIL[1] 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.

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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 expertize 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

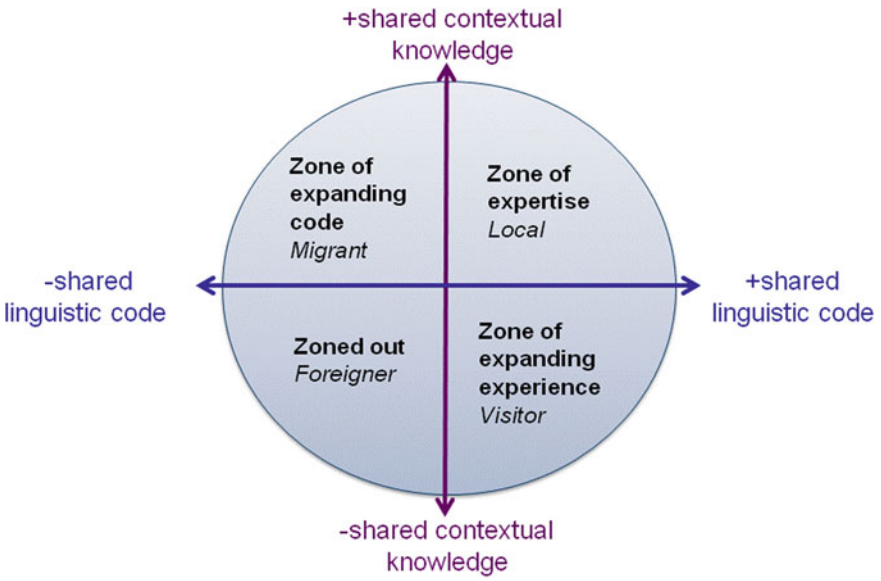


Fig. 9.1 Zones and metaphors of the DALP model (From Mahboob and Dutcher 2014, p. 126; reproduced by permission of Springer)

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 Brynes (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 Languaging, 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 *languaging*; as Swain and Lapkin (2013) delineate:

> 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 and Lapkin 2013, p. 105; italics added)

> … languaging, 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 languaging 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 languaging taking place. Here we can achieve a deeper understanding of the processes of languaging (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 'languaging'—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 'languaging' 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 abundancy' (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'?

References

Bachman, L. F., & Palmer, A. S. (1996). *Language testing in practice*: *designing and developing useful language tests*. Oxford University Press, Oxford.

Ball, D. L., & Bass, H. (2000). Interweaving content and pedagogy in teaching and learning to teach: Knowing and using mathematics. *Multiple perspectives on the teaching and learning of mathematics*, 83–104.

Bygate, M., Swain, M., & Skehan, P. (2013). *Researching pedagogic tasks: Second language learning, teaching, and testing*. Routledge.

Byrnes, H. (2008). Assessing content and language. In E. Shohamy, & N. H. Hornberger (Eds.), *Encyclopedia of Language and Education* (2nd ed.), *Language Testing and Assessment* (7), 37–52.

Byrnes, H., Crane, C., Maxim, H. M., & Sprang, K. A. (2006). Taking text to task: Issues and choices in curriculum construction. *ITL International Journal of Applied Linguistics*, *152*, 85–110.

Cammarata, L., & Tedick, D. J. (2012). Balancing content and language in instruction: The experience of immersion teachers. *The Modern Language Journal*, *96*(2), 251–269.

Carless, D. (2011). *From testing to productive student learning: Implementing formative assessment in Confucian-heritage settings*. New York: Routledge.

Carless, D. (2005). *Prospects for the implementation of assessment for learning*. *Assessment in Education*, *12*(1), 39–54.

Cheng, M. (2015). *Constructivism in Science Education* [PowerPoint slides]. Seminar, The University of Hong Kong, Hong Kong.

Dalton-Puffer, C. (2007). *Discourse in content and language integrated learning (CLIL) classrooms*. Amsterdam, The Netherlands: John Benjamins.

Dalton-Puffer, C. (2013). A construct of cognitive discourse functions for conceptualising content-language integration in CLIL and multilingual education. *European Journal of Applied Linguistics, 1*(2), 216–253.

García, O., & Li, W. (2014). *Translanguaging: Language, bilingualism and education*. Hampshire, U.K.: Palgrave.

Gibbons, P. (2009). *English learners, academic literacy, and thinking*: *Learning in the challenge zone*. Portsmouth, NH: Heinemann.

Halliday, M. A. K. (1993). Towards a language-based theory of learning. *Linguistics and education*, *5*(2), 93–116.

Halliday, M. A. K. (2004). The collected works of M.A.K. Halliday. In J. J. Webster Series (Ed.), *The language of science* (Vol. 5). London: Continuum.

Halliday, M. A. K., & Hasan, R. (1976). *Cohesion in English*. London: Longman.

Halliday, M. A. K., & Martin, J. R. (1993). *Writing science: Literacy and discursive power*. London: The Falmer Press.

Harders, P., & Macken-Horarik, M. (2008). Scaffolding Literacy and the Year 9 boys: Developing a language-centred literacy pedagogy. *TESOL in Context*, *18*(2), 4–21.

Laupenmühlen, J. (2012). Making the most of L1 in CL(1 + 2) IL. In D. Marsh & O. Meyer (Eds.), *Quality interfaces: Examining evidence & exploring solution in CLIL* (pp. 237–251). Eichstatett, Germany: Eichstatett Academic Press.

Lemke, J. L. (1990). *Talking science: Language, learning, and values*. Norwood, NJ: Ablex Publishing Corporation.

Lemke, J. (2002). Language development and identity: Multiple timescales in the social ecology of learning. In C. Kramsch (Ed.), *Language acquisition and language socialization* (pp. 68–87). London: Continuum.

Lin, A. M. Y. (2013a). Classroom code-switching: Three decades of research. *Applied Linguistics Review*, *4*(1), 195–218. doi:10.1515/applirev-2013-0009

Lin, A. M. Y. (2015b). Egalitarian bi/multilingualism and trans-semiotising in a global world. In W. E. Wright, S. Boun, & O. García (Eds.), *Handbook of bilingual and multilingual education*. Wiley-Blackwell: Hoboken, NJ.

Lin, A. M. Y., He, P., & Liu, Y. (2013). *Researching teacher education in "Content and Language Integrated Learning" (CLIL): Conceptualising the teacher knowledge base in CLIL*. Paper presented at the International Conference on Applied Linguistics Perspectives on Content and Language Integrated Learning (ALP-CLIL), Autonomous University of Madrid, Spain, June 8–June 10, 2013.

Lin, A. M. Y., & Man, E. Y. F. (2009). *Bilingual education*: *Southeast Asian perspectives*. Hong Kong: Hong Kong University Press.

Liu, Y., He, P., & Lai, H. (2014). *Reading and writing skills for HKDSE liberal studies exam*. Hong Kong: The Hong Kong Educational Publishing Co.

Lo, Y. Y., & Lin, A. M. Y. (2014). Designing assessment tasks with language awareness: Balancing cognitive and linguistic demands. *Assessment and Learning*, *3*, 97–119.

Lyster, R. (2007). *Learning and teaching languages through content: A counterbalanced approach*. Amsterdam: John Benjamins.

Mahboob, A., & Dutcher, L. (2014). Dynamic approach to language proficiency—A model. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 117–136). Dordrecht: Springer.

Martin, J. R., & Rose, D. (2008). *Genre Relations: Mapping Culture*. London: Equinox.

McDiarmid, G. W., Ball, D. L., & Anderson, C. W. (1989). Why staying one chapter ahead doesn't really work: Subject-specific pedagogy. *Issue Paper* 88–86. Michigan: The National Centre for Research on Teacher Education, Michigan State University.

Mortimer, E. F., & Scott, P. H. (2003). *Meaning making in secondary science classrooms*. Maidenhead: Open University Press.

Nikula, T., Dalton-Puffer, C., & García, A. L. (2013). CLIL classroom discourse: Research from Europe. *Journal of Immersion and Content-Based Language Education*, *1*(1), 70–100.

Nuttall, C. (1996). *Teaching reading skills in a foreign language*. Portsmouth, NH: Heinemann.

Rose, D., & Martin, J. R. (2012). *Learning to write, reading to learn: Genre, knowledge and pedagogy in the Sydney School*. Sheffield, U.K.: Equinox.

Rothery, J. (1996). Making changes: developing an educational linguistics. In R. Hasan & G. Williams (Eds.), *Literacy in Society*. Longman, London.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1–23.

Staver, J. R. (1998). Constructivism: Sound theory for explicating the practice of science and science teaching. *Journal of Research in Science Teaching, 35*(5), 501–520.

Stevens, R. A., Butler, F. A., & Castellon-Wellington, M. (2000). *Academic language and content assessment: Measuring the progress of ELLs*. National Center for Research on Evaluation, Standards, and Student Testing (CRESST), University of California, Los Angeles, CA.

Swain, M., & Lapkin, S. (2013). A Vygotskian sociocultural perspective on immersion education: The L1/L2 debate. *Journal of Immersion and Content-Based Language Education*, *1*(1), 101–129. doi:10.1075/jicb.1.1.05swa

Tsui, A. B. M. (2003). *Understanding expertise in teaching: Case studies of second language teachers*. Cambridge: Cambridge University Press.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1986). *Thought and language*. Cambridge, MA: MIT Press.

Widdowson, H.G. (2001). Communicative language testing: the art of the possible. In C. Elder et al. (Eds.). *Experimenting with Uncertainty: Essays in Honour of Alan Davies*. Cambridge: University Press.

Appendix A
A Sample Unit of Work for a Secondary One (Grade Seven) Integrated Science Class

A.M.Y. Lin, *Language Across the Curriculum & CLIL in English as an Additional Language (EAL) Contexts*, DOI 10.1007/978-981-10-1802-2

S1 Language Across the Curriculum (LAC) Programme

Unit 1: What is a scientific investigation?

Developed by Angel Lin and Tracy Cheung © 2011

S1 LAC – Integrated Science

Click here to know the meaning of the icons

Unit 1: What is a scientific investigation?

Activities	Skills involved
Activity 1: Which brand of tissue paper absorbs the most water?	Getting to know the topic
Activity 2: What is a scientific investigation? -Read an explanation text -Extract key information with a graphic organizer	Reading an explanation text Discussion
Activity 3: Understanding lab reports	Reading a lab report
Activity 4: A scientific investigation in our everyday life	Designing and carrying out an experiment Discussion
Activity 5: Understanding lab reports	Writing a lab report
Extended activity: Enjoying a rap song	Listening to a rap song

S1 LAC – Integrated Science

ACTIVITY 1:
Which brand of tissue paper absorbs the most water?

Have you used *Tempo* before? What do you think of it? Let's watch a short video clip. What is the video about?

S1 LAC – Integrated Science

Which brand of tissue paper absorbs the mo water?

- Have you used *Tempo* before? What do you think about it? Let's watch a short video clip. What is the video about?

Tempo

YouTube
Broadcast Yourself

Click icons to play

- The video is about (1) _____
  Tempo tissue paper and how much water it can absorb.

S1 LAC – Integrated Science

Which brand of tissue paper absorbs the most water?

- Have you watched any *Tempo* TV commercials before?
- *Tempo* claims that their tissue paper is the best. Do you think so?
- What about other brands of tissue paper? Which brand is better? Which brand absorbs the most water?

S1 LAC – Integrated Science

Which brand of tissue paper absorbs the most water?

		
Kleenex	*Tempo*	*Vinda*

- **What brand absorbs the most water?**
- I guess (2) _____ ? _____ absorbs the most water.

S1 LAC – Integrated Science

Which brand of tissue paper absorbs the most water?

- **The method used in the video clip**
- Let's think about the method used in the video.
  1. Is it a good method to test how well the tissue paper absorbs water?
  2. Can you think of a better test?
  3. Do you know how to do it scientifically?

S1 LAC – Integrated Science

ACTIVITY 2:

What is a scientific investigation?

Read the **explanation text** below, and extract the key information to complete the flow chart on page 4. Use the English phrases in the box on page 3 to help you.

S1 LAC – Integrated Science

An **explanation text** tells you how something works or explains some phenomenon.

This text explains what is a scientific investigation.

What is a Scientific Investigation?

This sentence **gives a definition.**

A scientific investigation is an activity carried out by scientists to answer questions and solve problems. In general, it involves five steps.

This sentence **describes the first step of a process.**

The first step of a scientific investigation is making observations. Scientists notice interesting things around the world through observation. They rely on different senses, e.g. sight, hearing and touch to make observations. Sometimes, they use instruments to help them.

S1 LAC – Integrated Science

The second step is asking questions. Based on the observation, scientists gather information to set a question. The next step is proposing a hypothesis. A hypothesis is a reasonable guess. It offers a reasonable explanation for the question set in step two. Note that a hypothesis is not made by simply guessing. It is made based on the information collected.

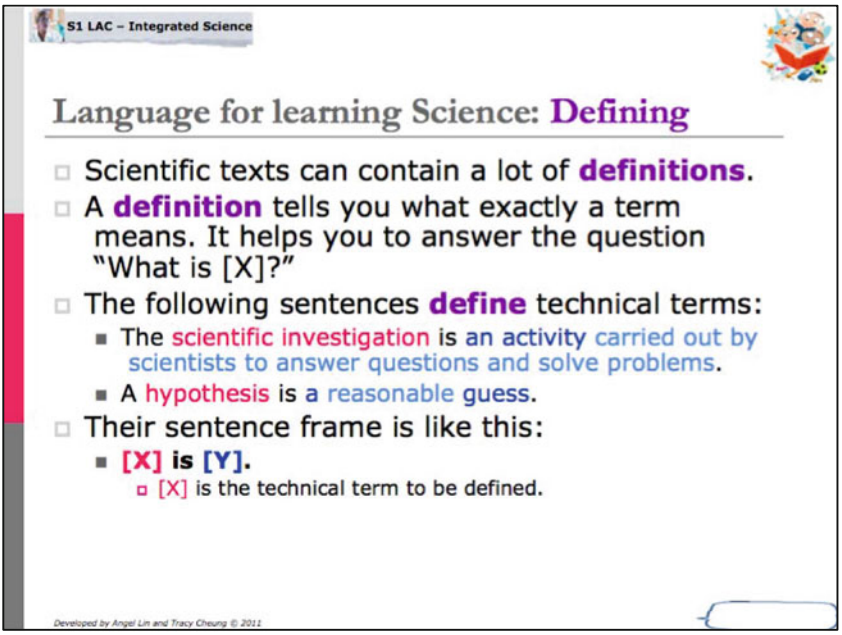
The fourth step is designing and carrying out experiments and recording results. Scientists design and conduct experiments to test the hypothesis. They might need to repeat the experiments several times and conduct them in a fair manner. They record the results carefully.

The final step is analysing results and drawing a conclusion. Scientists analyse the results carefully and check whether the results support their hypothesis. They can then draw a conclusion from the results.

A scientific investigation helps scientists to provide an explanation to some observations or answer some questions.

Important English phrases!

scientific investigation	making observations
asking questions	proposing a hypothesis
designing and conducting experiments	recording results
analysing results	drawing a conclusion


S1 LAC – Integrated Science
Language for learning Science: Defining
Scientific texts can contain a lot of definitions.
A definition tells you what exactly a term means. It helps you to answer the question "What is [X]?"
The following sentences define technical terms:
The scientific investigation is an activity carried out by scientists to answer questions and solve problems.
A hypothesis is a reasonable guess.
Their sentence frame is like this:
[X] is [Y].
[X] is the technical term to be defined.
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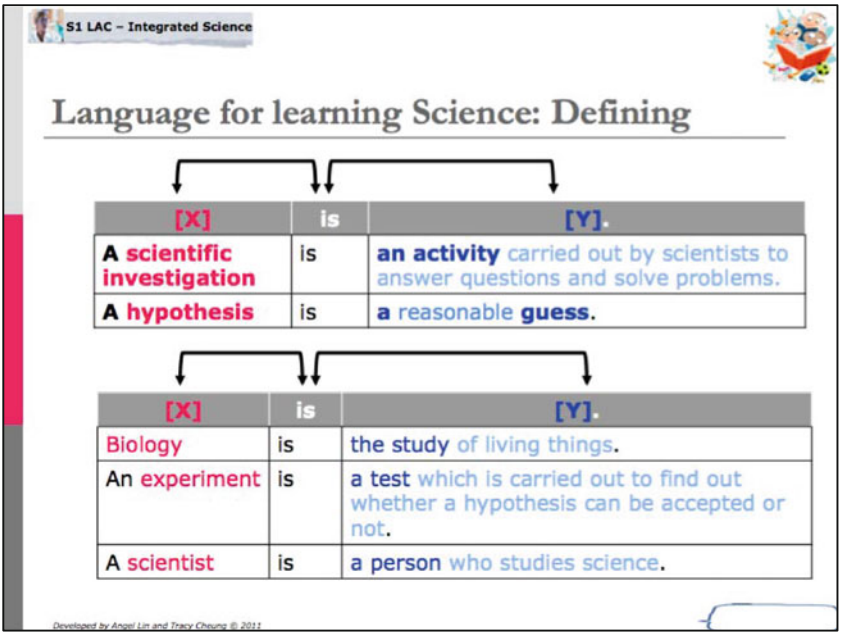
S1 LAC – Integrated Science
Language for learning Science: Defining
[X] is [Y].
A scientific investigation is an activity carried out by scientists to answer questions and solve problems.
A hypothesis is a reasonable guess.
[X] is [Y].
Biology is the study of living things.
An experiment is a test which is carried out to find out whether a hypothesis can be accepted or not.
A scientist is a person who studies science.
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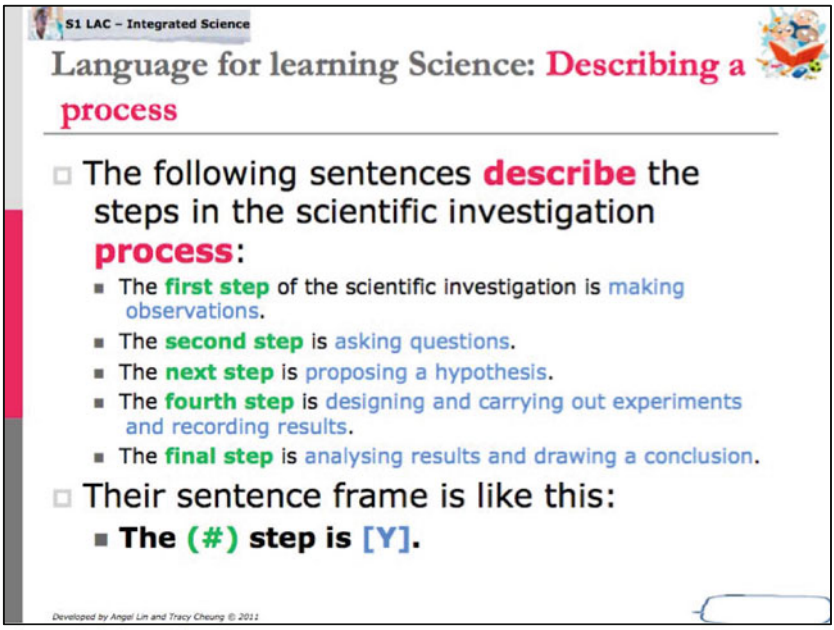
S1 LAC – Integrated Science
Language for learning Science: Describing a process
The following sentences describe the steps in the scientific investigation process:
The first step of the scientific investigation is making observations.
The second step is asking questions.
The next step is proposing a hypothesis.
The fourth step is designing and carrying out experiments and recording results.
The final step is analysing results and drawing a conclusion.
Their sentence frame is like this:
The (#) step is [Y].
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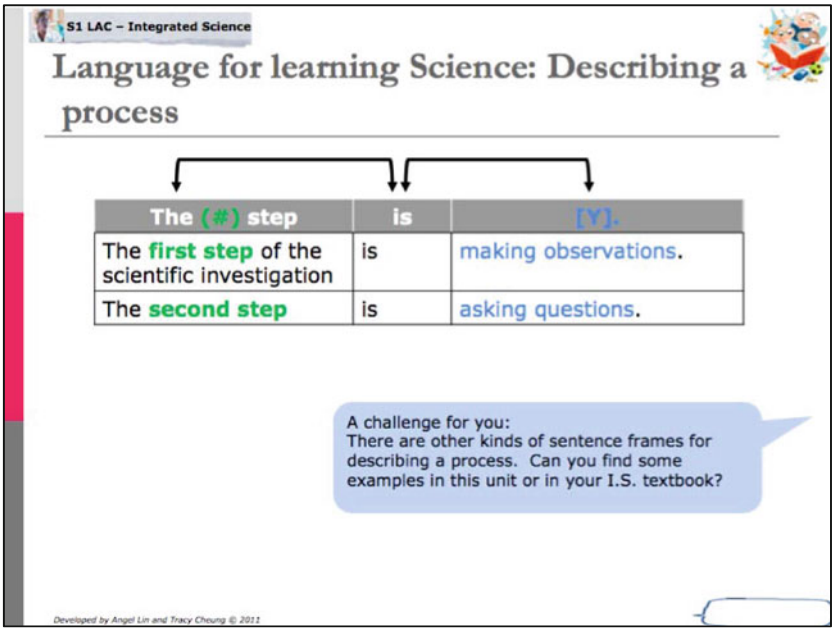
S1 LAC – Integrated Science
Language for learning Science: Describing a process
The (#) step
is
[Y].
The first step of the scientific investigation
is
making observations.
The second step
is
asking questions.
A challenge for you:
There are other kinds of sentence frames for describing a process. Can you find some examples in this unit or in your I.S. textbook?
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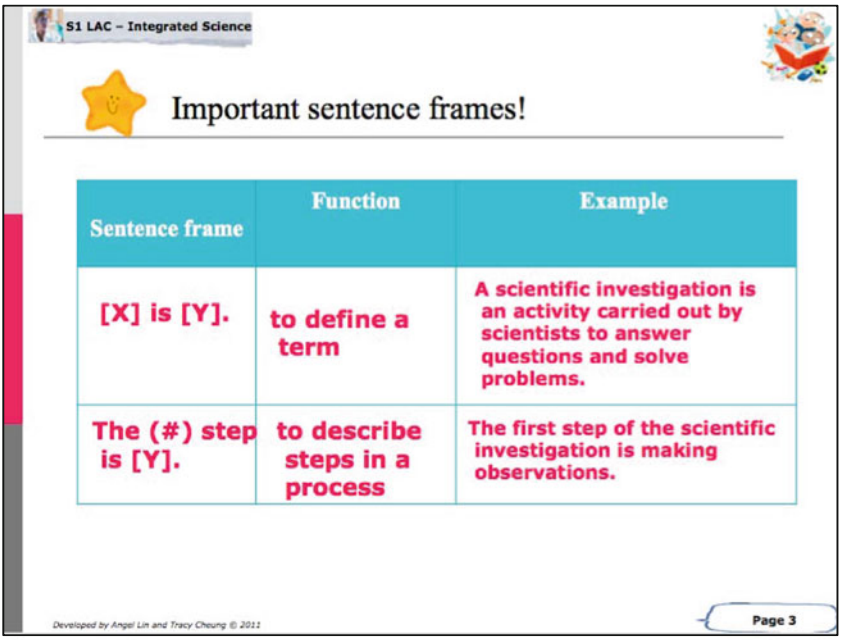
S1 LAC – Integrated Science
Important sentence frames!
Sentence frame
Function
Example
[X] is [Y].
to define a term
A scientific investigation is an activity carried out by scientists to answer questions and solve problems.
The (#) step is [Y].
to describe steps in a process
The first step of the scientific investigation is making observations.
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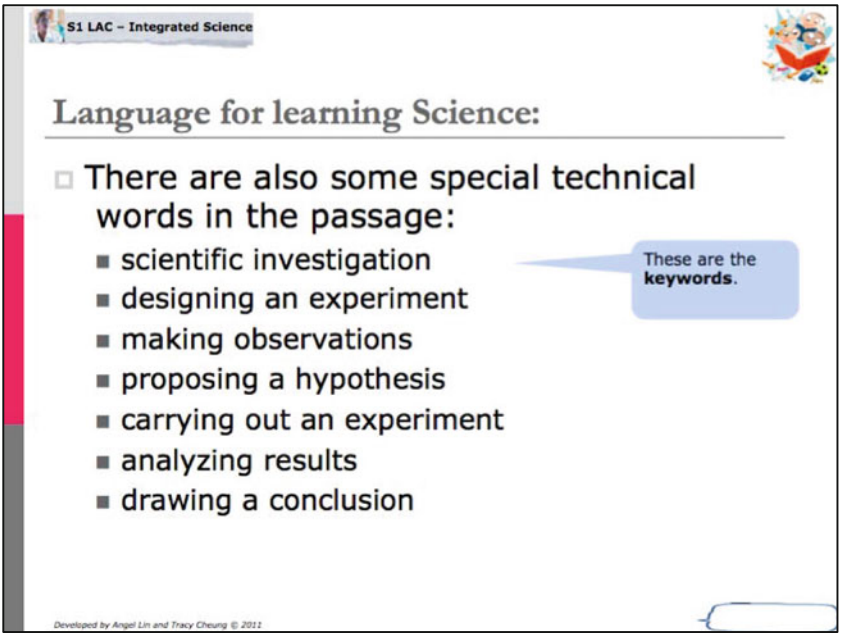
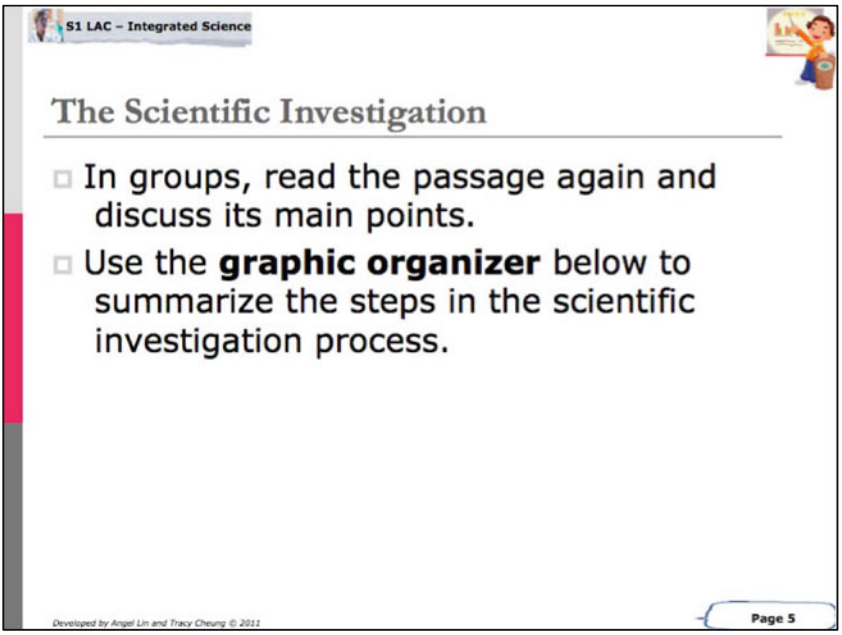
Page 3


S1 LAC – Integrated Science
Language for learning Science:
There are also some special technical words in the passage:
scientific investigation
designing an experiment
making observations
proposing a hypothesis
carrying out an experiment
analyzing results
drawing a conclusion
These are the keywords.
Developed by Angel Lin and Tracy Cheung © 2011


S1 LAC – Integrated Science
The Scientific Investigation
In groups, read the passage again and discuss its main points.
Use the graphic organizer below to summarize the steps in the scientific investigation process.
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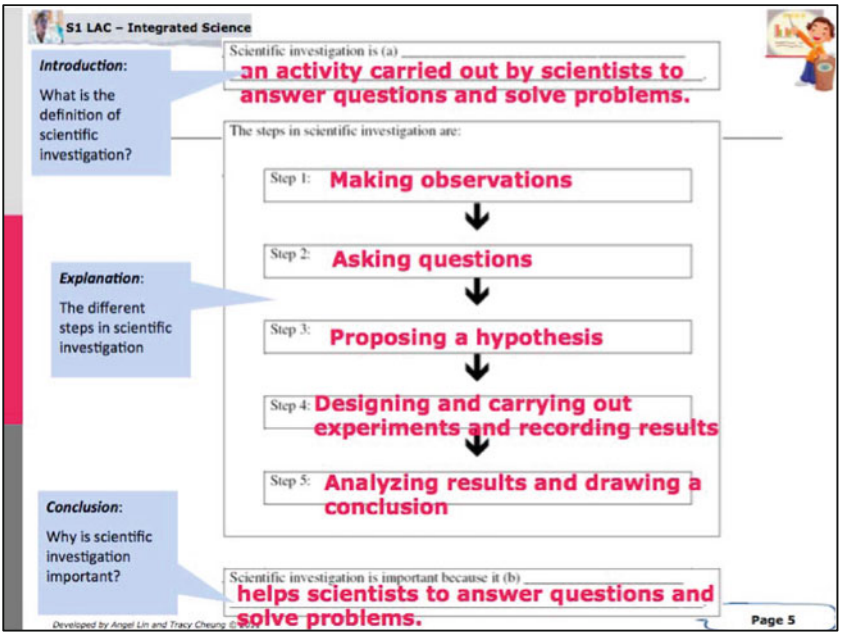
Page 5


S1 LAC – Integrated Science
Introduction:
What is the definition of scientific investigation?
Scientific investigation is (a) an activity carried out by scientists to answer questions and solve problems.
The steps in scientific investigation are:
Step 1: Making observations
Step 2: Asking questions
Step 3: Proposing a hypothesis
Step 4: Designing and carrying out experiments and recording results
Step 5: Analyzing results and drawing a conclusion
Explanation:
The different steps in scientific investigation
Conclusion:
Why is scientific investigation important?
Scientific investigation is important because it (b) helps scientists to answer questions and solve problems.
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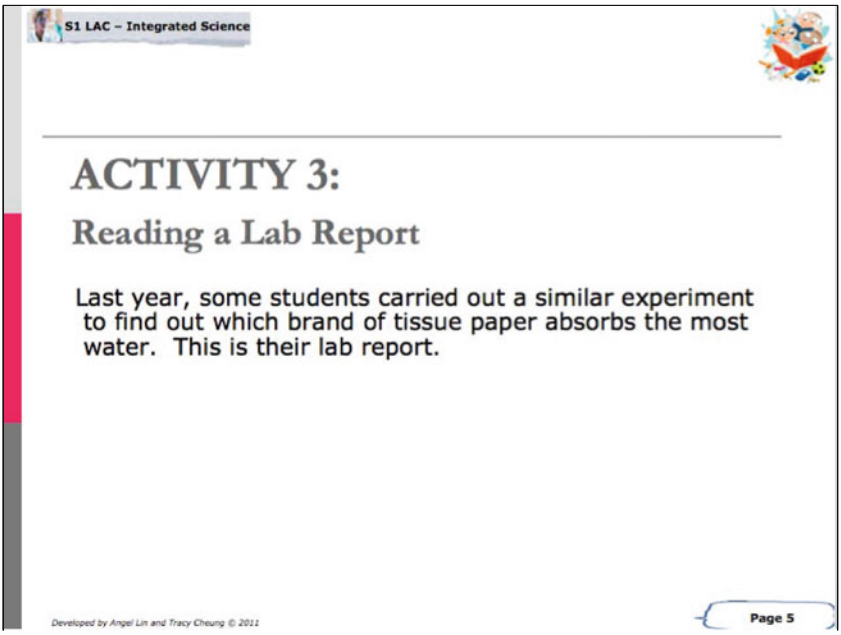
Page 5


S1 LAC – Integrated Science
ACTIVITY 3:
Reading a Lab Report
Last year, some students carried out a similar experiment to find out which brand of tissue paper absorbs the most water. This is their lab report.
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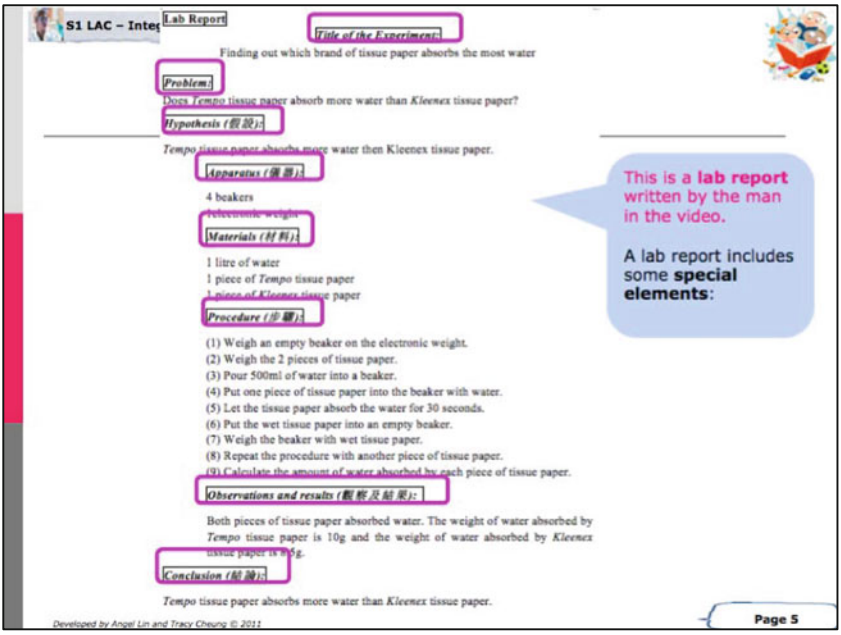
S1 LAC – Inte
Lab Report
Title of the Experiment:
Finding out which brand of tissue paper absorbs the most water
Problem:
Does Tempo tissue paper absorb more water than Kleenex tissue paper?
Hypothesis (假設):
Tempo tissue paper absorbs more water then Kleenex tissue paper.
Apparatus (儀器):
4 beakers
Electronic weight
Materials (材料):
1 litre of water
1 piece of Tempo tissue paper
1 piece of Kleenex tissue paper
Procedure (步驟):
(1) Weigh an empty beaker on the electronic weight.
(2) Weigh the 2 pieces of tissue paper.
(3) Pour 500ml of water into a beaker.
(4) Put one piece of tissue paper into the beaker with water.
(5) Let the tissue paper absorb the water for 30 seconds.
(6) Put the wet tissue paper into an empty beaker.
(7) Weigh the beaker with wet tissue paper.
(8) Repeat the procedure with another piece of tissue paper.
(9) Calculate the amount of water absorbed by each piece of tissue paper.
Observations and results (觀察及結果):
Both pieces of tissue paper absorbed water. The weight of water absorbed by Tempo tissue paper is 10g and the weight of water absorbed by Kleenex tissue paper is 8g.
Conclusion (結論):
Tempo tissue paper absorbs more water than Kleenex tissue paper.
This is a lab report written by the man in the video.
A lab report includes some special elements:
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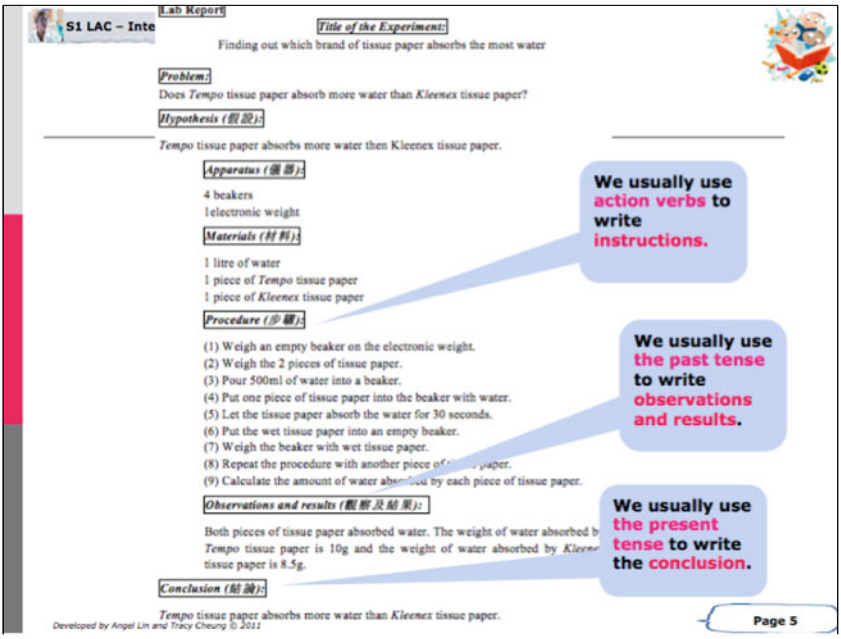
Page 5


S1 LAC – Inte
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Apparatus (儀器):
4 beakers
1electronic weight
Materials (材料):
1 litre of water
1 piece of Tempo tissue paper
1 piece of Kleenex tissue paper
Procedure (步驟):
(1) Weigh an empty beaker on the electronic weight.
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(3) Pour 500ml of water into a beaker.
(4) Put one piece of tissue paper into the beaker with water.
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(7) Weigh the beaker with wet tissue paper.
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Observations and results (觀察及結果):
Both pieces of tissue paper absorbed water. The weight of water absorbed b
Tempo tissue paper is 10g and the weight of water absorbed by Kleen
tissue paper is 8.5g.
Conclusion (結論):
Tempo tissue paper absorbs more water than Kleenex tissue paper.
We usually use action verbs to write instructions.
We usually use the past tense to write observations and results.
We usually use the present tense to write the conclusion.
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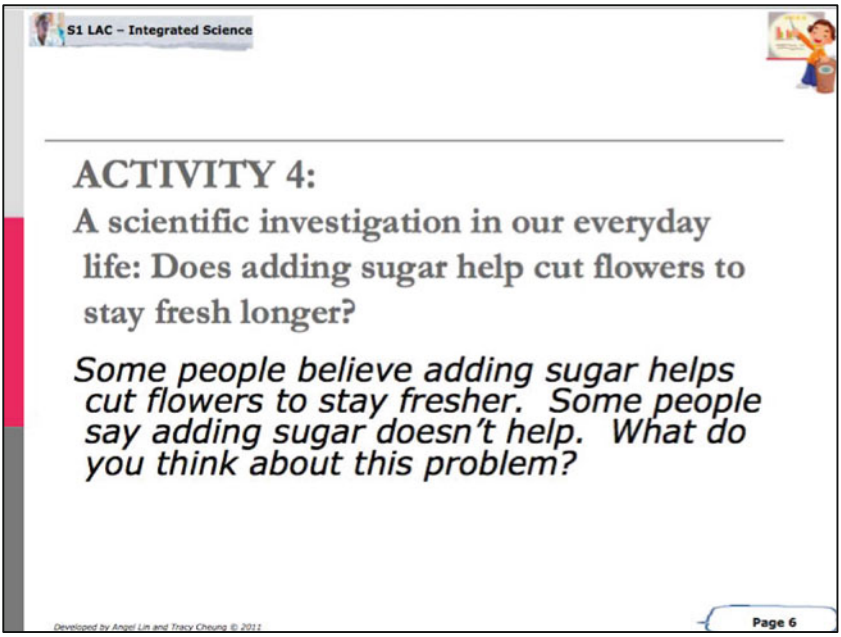
Page 5


S1 LAC – Integrated Science
ACTIVITY 4:
A scientific investigation in our everyday life: Does adding sugar help cut flowers to stay fresh longer?
Some people believe adding sugar helps cut flowers to stay fresher. Some people say adding sugar doesn't help. What do you think about this problem?
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Page 6

S1 LAC – Integrated Science

Does adding sugar help cut flowers to stay fresh longer?

- *Some people believe adding sugar helps cut flowers to stay fresher. Some people say adding sugar doesn't help. What do you think about this problem?*

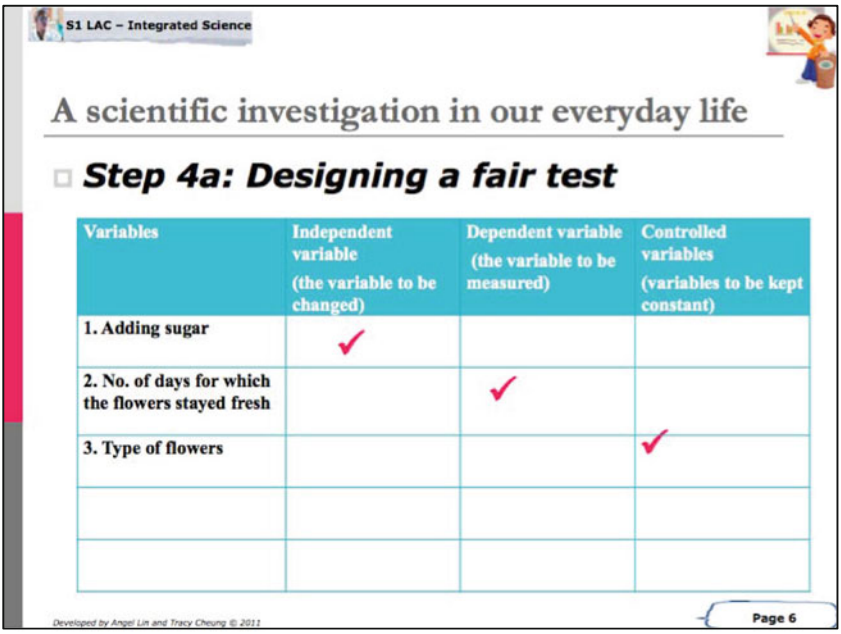
		
cut flowers	*fresh (adj.)*	*Withered (adj.)*

- Does adding sugar help cut flowers to stay fresh longer? Let's carry out a scientific investigation.

S1 LAC – Integrated Science

A scientific investigation in our everyday life

- ***Step 1: Making observations***
  - You observed that some cut flowers stayed fresh longer while some did not.
- ***Step 2: Asking questions***
  - You started thinking about this observation. You asked the question:
  - Does (1) **adding sugar** help cut flowers to stay fresh longer?
- ***Step 3: Proposing a hypothesis***
  - (2) **Adding sugar** helps cut flowers to stay fresh longer than (3) **not adding sugar**.


S1 LAC – Integrated Science
A scientific investigation in our everyday life
Step 4a: Designing a fair test
Variables
Independent variable (the variable to be changed)
Dependent variable (the variable to be measured)
Controlled variables (variables to be kept constant)
1. Adding sugar
2. No. of days for which the flowers stayed fresh
3. Type of flowers
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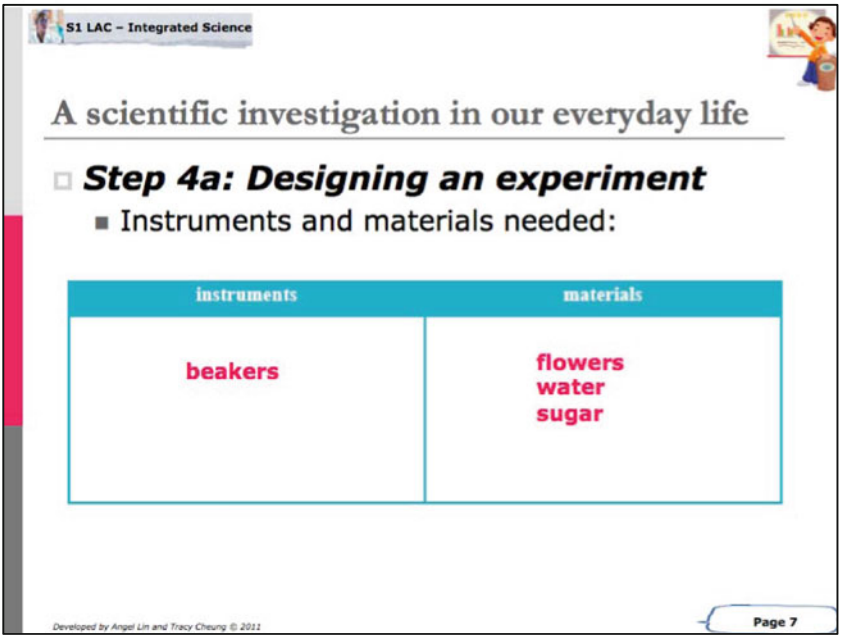
Page 6


S1 LAC – Integrated Science
A scientific investigation in our everyday life
Step 4a: Designing an experiment
Instruments and materials needed:
instruments
materials
beakers
flowers
water
sugar
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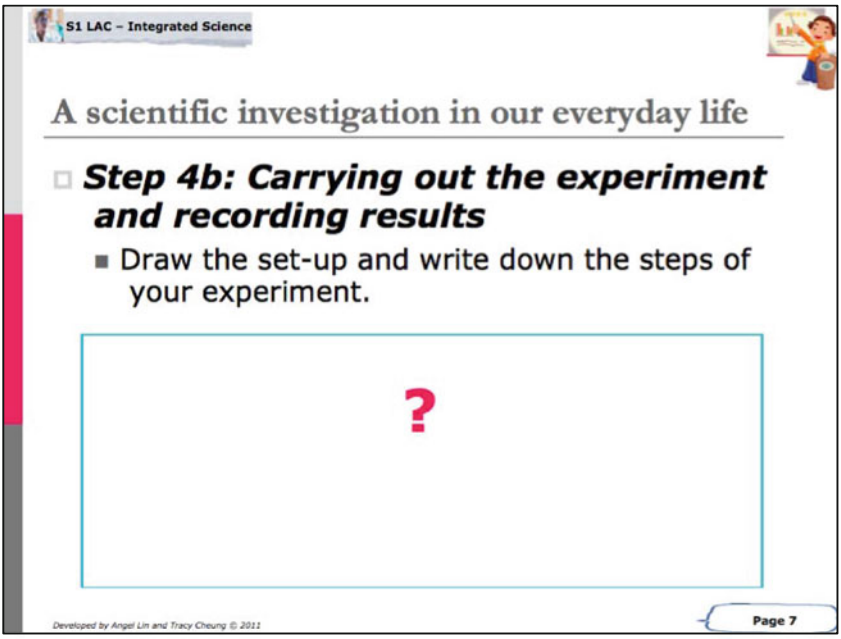
Page 7


S1 LAC – Integrated Science
A scientific investigation in our everyday life
Step 4b: Carrying out the experiment and recording results
Draw the set-up and write down the steps of your experiment.
?
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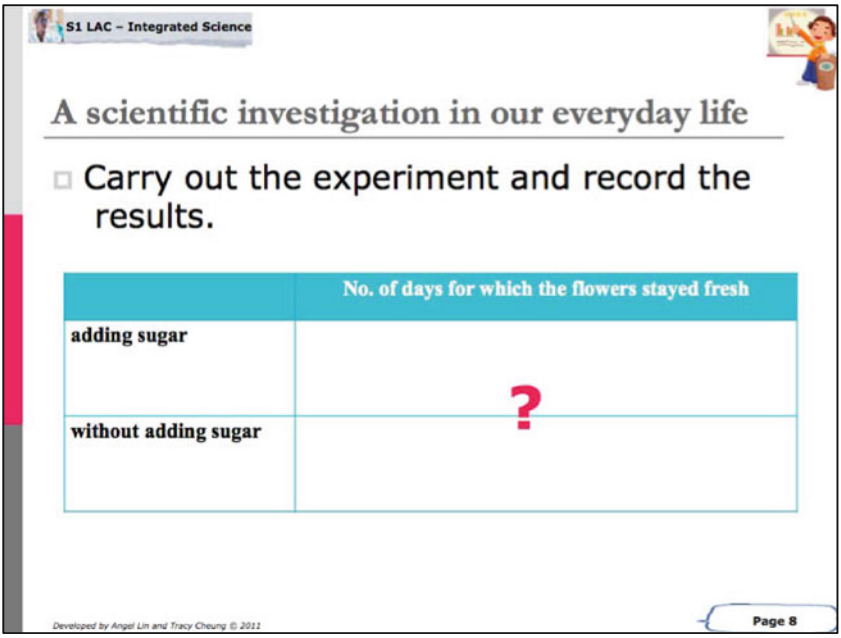
Page 7


S1 LAC – Integrated Science
A scientific investigation in our everyday life
Carry out the experiment and record the results.
No. of days for which the flowers stayed fresh
adding sugar
without adding sugar
?
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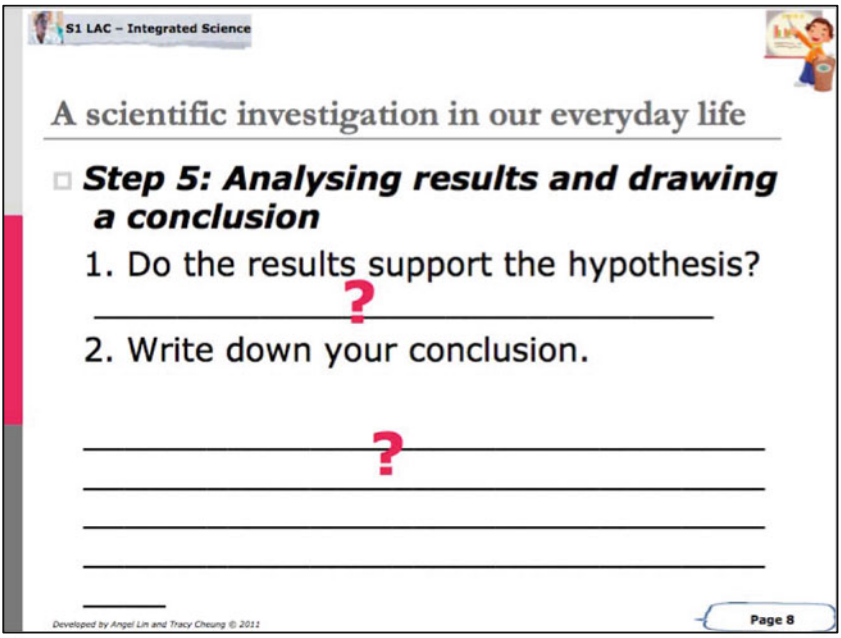
Page 8


S1 LAC – Integrated Science
A scientific investigation in our everyday life
Step 5: Analysing results and drawing a conclusion
1. Do the results support the hypothesis?
?
2. Write down your conclusion.
?
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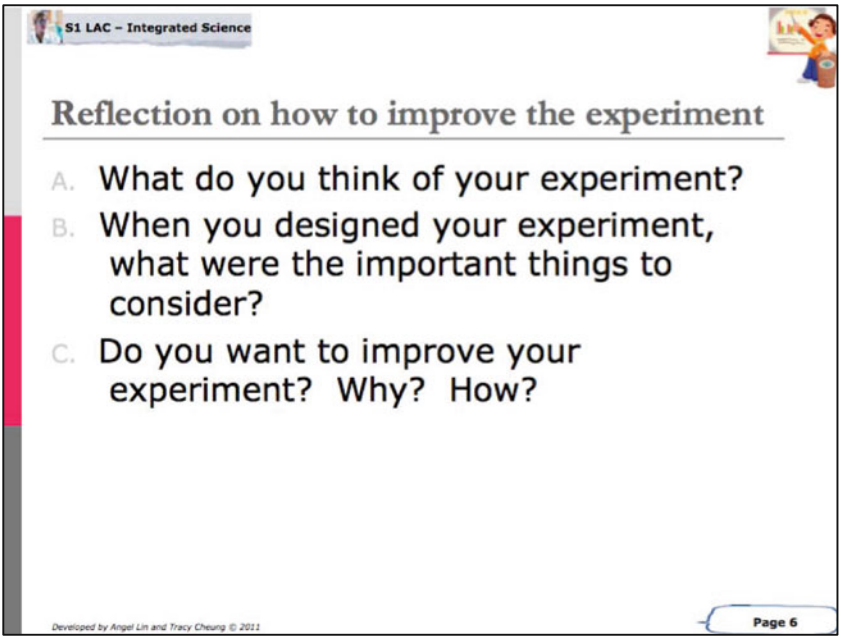
Page 8


S1 LAC – Integrated Science
Reflection on how to improve the experiment
A. What do you think of your experiment?
B. When you designed your experiment, what were the important things to consider?
C. Do you want to improve your experiment? Why? How?
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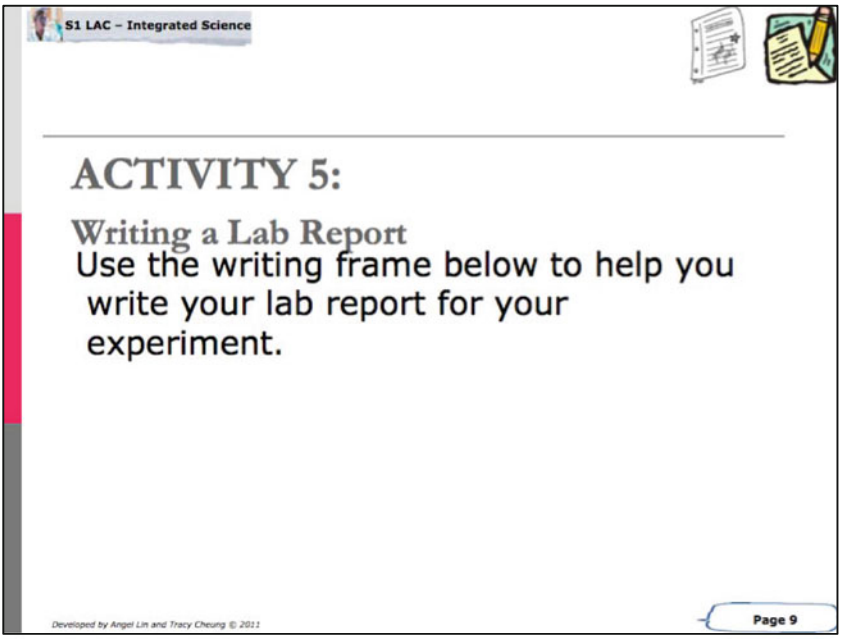
S1 LAC – Integrated Science
ACTIVITY 5:
Writing a Lab Report
Use the writing frame below to help you write your lab report for your experiment.
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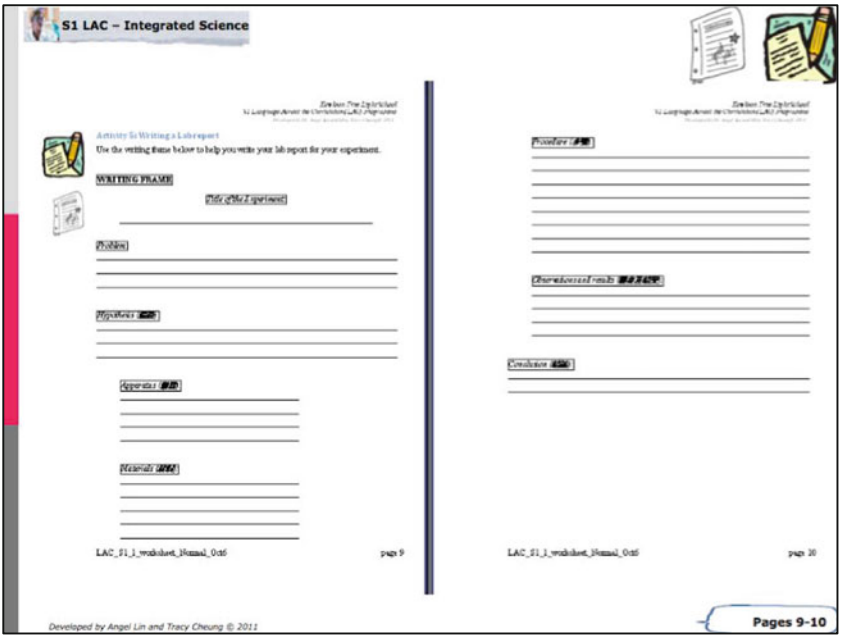
Page 9


S1 LAC – Integrated Science
Activity 5: Writing a Lab report
Use the writing frame below to help you write your lab report for your experiment.
WRITING FRAME
Title (the Experiment)
Problem
Hypothesis
Apparatus
Materials
Procedure
Observation/Results
Conclusion
LAC_S1_1_worksheet_Manual_0.16
page 9
page 10
Developed by Angel Lin and Tracy Cheung © 2011
Pages 9-10

S1 LAC – Integrated Science

FUN AHEAD

EXTENDED ACTIVITY

Let's enjoy a rap song about scientific investigation. Fill in the blanks in the lyrics while you listen to see how many words you can get!

YouTube
Broadcast Yourself

http://www.youtube.com/watch?v=8Xg4bIpuvRw

Click icons to play

Pages 11-13

S1 LAC – Integrated Science

FUN AHEAD

Scientific method rap

The (1) **scientific method** is really kind of neat
To make it even more fun
Let's put it to a beat

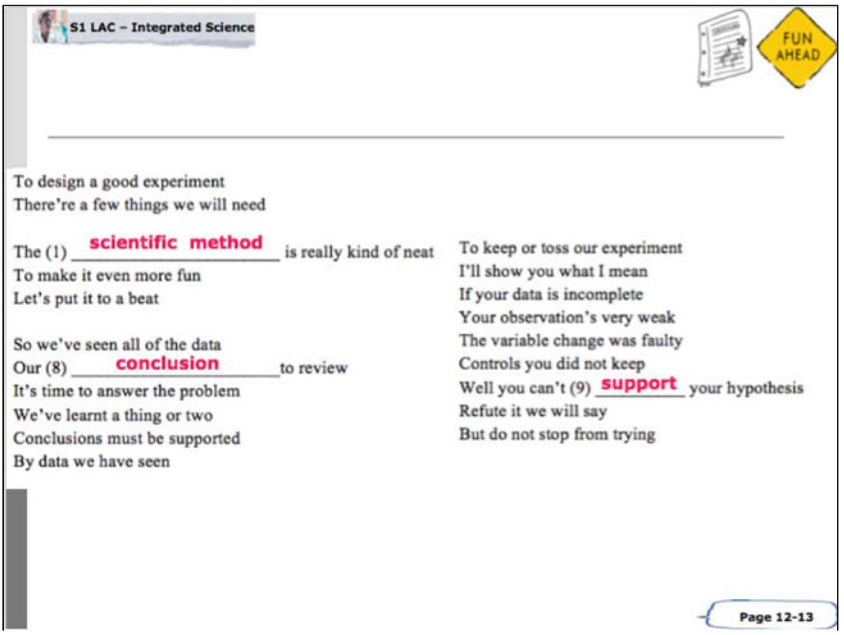
A (2) **problem** is a question
The answer we will find
Let's state it very carefully with a scientific mind

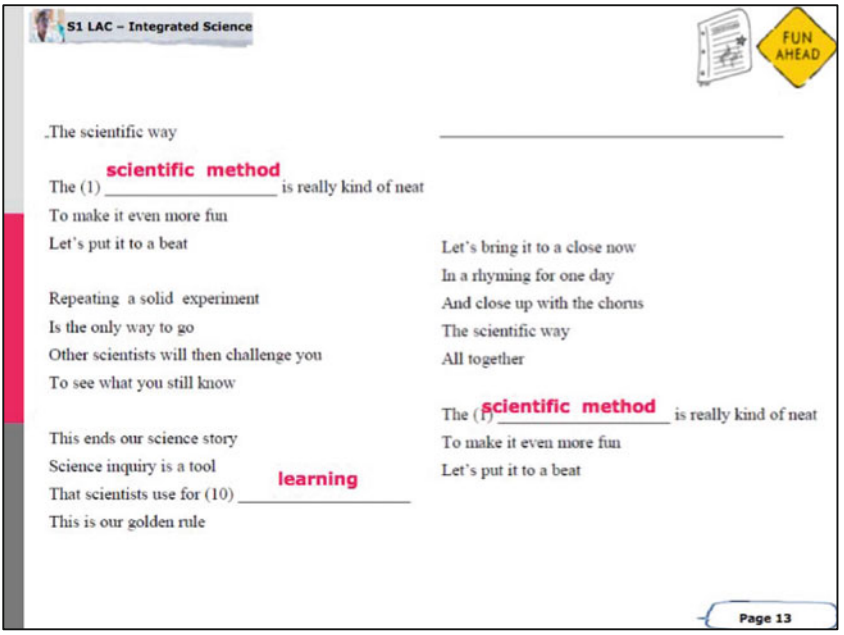
A prediction of the answer
Comes from the things we know
(3) **Observations** and past info
Lead the way in which to go
We call this a (4) **hypothesis**
A silly word we say
To guide us in the (5) **process**
The scientific way

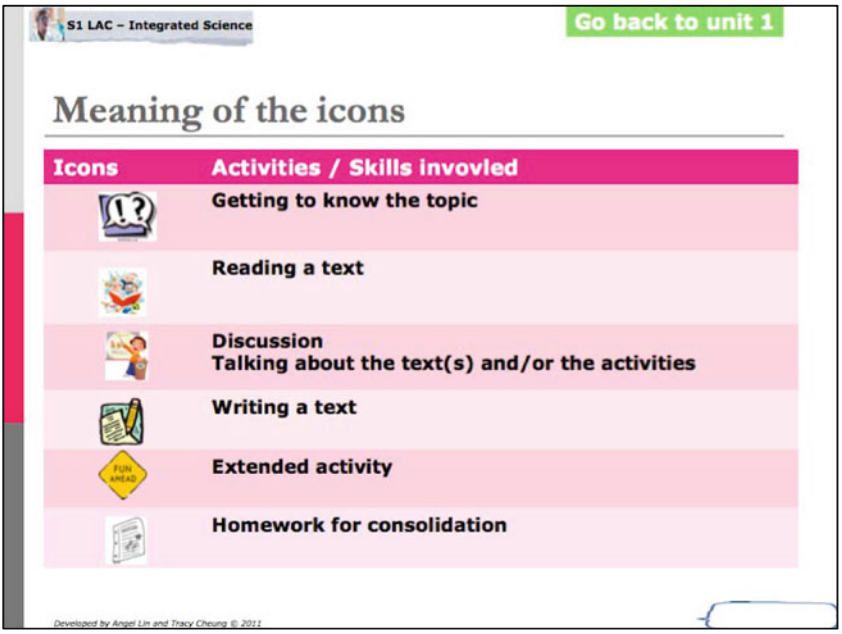
The (1) **scientific method** is really kind of neat
To make it even more fun
Let's put it to a beat

A scientist must (6) **experiment**
Five senses and tools we use
Collecting lots of data
(7) **Organizing** it how we choose

Page 11-12


S1 LAC – Integrated Science
FUN AHEAD
To design a good experiment
There're a few things we will need
The (1) scientific method is really kind of neat
To make it even more fun
Let's put it to a beat
So we've seen all of the data
Our (8) conclusion to review
It's time to answer the problem
We've learnt a thing or two
Conclusions must be supported
By data we have seen
To keep or toss our experiment
I'll show you what I mean
If your data is incomplete
Your observation's very weak
The variable change was faulty
Controls you did not keep
Well you can't (9) support your hypothesis
Refute it we will say
But do not stop from trying
Page 12-13


S1 LAC – Integrated Science
FUN AHEAD
.The scientific way
The (1) scientific method is really kind of neat
To make it even more fun
Let's put it to a beat
Repeating a solid experiment
Is the only way to go
Other scientists will then challenge you
To see what you still know
This ends our science story
Science inquiry is a tool
That scientists use for (10) learning
This is our golden rule
Let's bring it to a close now
In a rhyming for one day
And close up with the chorus
The scientific way
All together
The (1) scientific method is really kind of neat
To make it even more fun
Let's put it to a beat
Page 13


S1 LAC – Integrated Science
Go back to unit 1
Meaning of the icons
Icons
Activities / Skills invovled
Getting to know the topic
Reading a text
Discussion
Talking about the text(s) and/or the activities
Writing a text
FUN AHEAD
Extended activity
Homework for consolidation
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Appendix B
Online Resources

In this appendix, resources on CLIL and LAC for secondary and primary school teachers and researchers are first presented, followed by resources for college/university (tertiary) teachers and researchers. The websites included in these two sections have been selected from over a hundred relevant websites. They are selected because they are 'meta-websites', which summarize and organize resources from various sources and can be used as guides to other websites for a specific purpose or subject. At the end of the appendix, selected online corpus resources and tools are listed in tables, which can be used as reference tools for language learning and teaching for all levels of learners and teachers as well as for LAC and CLIL researchers. As with most sites found on the Web, readers are encouraged to exercise their critical minds to judge whether the resources are useful for them or not.

Useful Websites for Secondary and Primary School Teachers

- http://www.readingtolearn.com.au/index

  - What it offers: 'reading to Learn (R2L) is one of the world's most powerful literacy programmes'. This website sets out the principles of the Reading to Learn programme. Reports and articles on the methodology can be downloaded for free, and the teacher resource package can be ordered online, with some samples shown on the site.
  - Special features: a handy introductory website to the R2L programme; it outlines the purposes and effectiveness of the programme with strong support from the research literature.
  - Suitable for: secondary school teachers who want to know about the R2L programme and to order their workbooks and videos online and researchers who want to know about this programme in depth.

A.M.Y. Lin, *Language Across the Curriculum & CLIL in English as an Additional Language (EAL) Contexts*, DOI 10.1007/978-981-10-1802-2

- https://www.teachers.cambridgeesol.org/ts/teachingqualifications/clilTest
  - The official website for a specialist module of the Teaching Knowledge (TKT) that focuses on CLIL and content and language integrated teaching in an additional language. It introduces the module briefly but clearly, with purposes, free downloadable training materials for the test (and also for learning about CLIL approaches).
  - Special features: good for learning about how CLIL teachers are trained; help in-service teachers (across all levels) learn, assess the knowledge of and train themselves to be CLIL teachers; with handbooks, sample test papers and keys, and teacher guides (for knowing about CLIL and the TKT-CLIL test): can be a quick and systematic introduction to one version of the CLIL approach; the short, workable, self-trainable worksheets with answer keys are particularly useful; registration valid for only 7 days, or one has to re-register when it expires.
  - Suitable for: all levels of teachers who want to know about CLIL and how to qualify as a CLIL teacher. However, bear in mind that CLIL is an umbrella term for a great variety of approaches and the CLIL approach introduced here is one of the many possible approaches.
- https://sites.google.com/site/englishforclilteachers/Home
  - What it offers: A collection of Web resources for primary teachers; it can be seen as a virtual learning centre for individual development of the specific language and teaching competences that each teacher needs in his/her specific CLIL context.
  - Special features: well organized; list the kinds of competences that a CLIL teacher would need for effective teaching, especially linguistic competences including learning strategies, pragmatic competences and academic English.
  - Suitable for: mostly primary CLIL teachers and other teachers as well.
- http://www.teachingenglish.org.uk/clilsimple
  - What it offers: This is a BBC teaching support website for CLIL, an introductory website.
  - Special features: simple, introductory, with a limited number of CLIL activities as illustration, and an introduction of manageable simple tools and teaching resources for novice CLIL teachers. It provides several other very useful links about CLIL, including one with lesson plans, videos and activities which can be downloaded by grade level and topic. http://teachunicef.org/ (from prekindergarten to grade 12).
  - Suitable for: teachers who are completely new to CLIL. Again, bear in mind that the activities and teaching approaches need to be adapted for different contexts.

- http://www.isabelperez.com/clil.htmprojects
  - What it offers: A comprehensive introduction to CLIL provided with Internet resources about its origin, projects, articles and, most importantly, portals and encyclopaedias for many school subjects: a resource bank with hundreds of links to CLIL resources, including suggested ratings.
  - Special features: the resources section provides a comprehensive list of practical websites with teaching support tools and resources (grouped by language and subject), but one has to sort out the most useful ones by himself/herself; useful for teachers involved in implementing bilingual education in European schools; multiple languages (English, French and German are featured).
  - Suitable for: primary and secondary school teachers.
- "CLIL 4 Teachers" http://clil4teachers.pbworks.com/w/page/8427859/CLIL4teachers%20Front%20Pagea
  - What it offers: A wiki for sharing teaching resources of CLIL of different languages. It is part of the Association for Language Learning's FLAME initiative to support cross-curricular approaches to language learning. Teachers are free to upload their own teaching materials to share with other teachers, including PowerPoint slides, documents, photographs and audio files.
  - Special features: ready-made PPT slides and worksheets for download (access upon email request); 'the resource bank' is a collection of uploaded resources, which were organized by subject and by language; multilingual materials (English and French are featured); teaching materials are provided by any teacher who is interested in sharing.
  - Suitable for: primary and secondary school teachers who want to share teaching materials with other CLIL teachers.
- "CLIL Teachers' Web Guide" (http://webguide.wordpress.com/)
  - What it offers: An Internet guide of interactive resources for CLIL teachers.
  - Special features: extensive lists of resource websites for CLIL teachers of four broad subject areas (mathematics, natural sciences, physical education and social sciences); support and resources for technology teachers; these websites are mostly interactive and interesting, which can be used to motivate learners.
  - Suitable for: secondary school teachers
- http://digifolio.rvp.cz/artefact/file/download.php?file=14043&view=2893according
  - Another good summary of useful CLIL websites, listed to subjects.

- http://patins-training.wikispaces.com/Free+Online+Resources+for+Teaching+Across+the+Curriculumof
  - What it offers: This is a free online resource hub 'teaching across the curriculum'.
  - Special features: list the free online LAC resources for different curriculum areas, including mathematics, science, social studies, reading/language arts, writing and special education; teacher resources are also available such as those for quizzes, tests and classroom social networking and management; the links are selected from many relevant ones, and each is annotated; generally good in organization, quality and amount.
  - Suitable for: primary and secondary school teachers.
- http://gzhemily.wix.com/hkuqefproject (password: hkuqefproject)
  - What it offers: The website '*Content and Language Integrated Learning (CLIL) for South Asian Students: Building Teacher Capacity to Cater for Learner Diversity*' is one of the deliverables of the Hong Kong Education Bureau (EDB) Quality Education Fund (QEF) Project developed by the CLIL Project Team at the Faculty of Education, the University of Hong Kong. The website provides examples of CLIL curriculum materials and pedagogical strategies for the subject of integrated science at junior secondary levels (Grade 7–9). Video clips of CLIL classroom activities, teacher workshops and student learning strategy workshops as well as curriculum materials (PowerPoint slides, worksheets, teacher notes, handouts, pictures) and research articles are available for download.
  - Special features: lesson video excerpts and samples of student work to illustrate CLIL teaching and learning processes. Feedback and reflections from the teacher participants and research team members are also available which may offer a helpful window on CLIL classroom practices. Teachers visiting the website can also share CLIL teaching experiences and exchange ideas by joining the 'HKU-QEF PROJECT' Facebook group and becoming a member of the project community.
  - Suitable for: both secondary and primary school teachers in CLIL/LAC programmes in English as an additional language (EAL) contexts. It may also serve as a useful resource for CLIL/LAC teacher professional development workshops and university teacher preparation programmes.

Useful LAC/CLIL Websites for College/University (Tertiary) Teachers and Researchers

- http://mon.uvic.cat/clil/
  - What it offers: A website created by Universitat de Vic (UVic), which introduces CLIL for tertiary contexts and provides support for teachers. There are two main kinds of resources: teaching support and language support. In teaching support, one can find templates to help plan lessons and tasks in class, plus other resources. In language support, one can find examples of classroom and academic language and glossaries of subject-specific language.
  - Special features: a neatly organized website with very clear goals; one can gain an overall and macro-view of CLIL in tertiary contexts as well as guidelines for professional development in CLIL; the teaching support section sets out the goals about what constitutes good teaching practice in CLIL. The 'language support' section discusses three different 'languages' needed in the CLIL classroom: classroom language (general), academic language and subject-specific language, which echoes the framework proposed in this book. In the bibliography section, one can find references on CLIL in higher education, using an online journal search utility "Refworks". Links to multilingual CLIL are also listed.
  - Suitable for: teachers and researchers in tertiary/university contexts.

There are several developments of LAC: FLAC (Foreign Languages Across the Curriculum), CLAC (Culture and Language Across the Curriculum) and WAC (Writing Across the Curriculum). The LAC movement in the USA started out from colleges and universities, and LAC programmes in the USA are often offered at the tertiary/university level. Links to universities offering LAC/FLAC programmes are provided in the website below. On this website, when one checks out each link to the LAC programme in a college, one can visit its own 'resources' or 'links' sections for further information and resources about LAC other than the programme they offer.

- http://languagesacrossthecurriculum.com/resources
  - What it offers: resources and information for teachers interested in expanding their use of foreign languages beyond the traditional foreign language curriculum. It provides links to LAC articles, knowledge about LAC models, current issues and terminologies, and also links with other institutions offering LAC courses.
  - Special features: the "Higher Education Web Sites" section provides links to LAC programmes in the universities in the USA.
  - Suitable for: tertiary researchers and teachers in LAC.

The origins of WAC—Writing Across the Curriculum and Writing/English in the Disciplines. The website below provides resources for WAC and information on WAC international networks:

- 'The WAC Clearing House' (http://wac.colostate.edu/intro/)
  - What it offers: 'The WAC Clearinghouse, in with the International Network of Writing Across the Curriculum Programmes, publishes journals, books, and other resources for teachers who use writing in their courses'. It is a specific guide for information about WAC, from its origin, definition and purpose, to practical teaching tips and resources.
  - Special features: well organized for researchers and teachers, from beginner to advanced levels; introduction to the field, with information about research and teaching; for researchers, there are journals, books and conference information, building up a research community; for teachers, the 'WAC links' provides selected resources under a numbers of categories including programme design, assessment, teaching and technology.
  - This website provides a list of institutions offering WAC programmes in the USA with annotations on each. One can find more information about LAC programmes following these links (http://wac.colostate.edu/programmes/).
  - Suitable for: researchers and teachers interested in WAC at all levels.
- http://clacconsortium.org/
  - This is an introductory website for CLAC.

Free Online Corpora and Corpus Tools

The following section presents a table of some free online corpora and corpus tools which may be useful for language researchers and teachers. Corpora can be used not only for corpus linguistics and corpus-based research, but also for language teachers and learners to study word usage in authentic contexts, e.g. check the corpus data to learn about trends in the usage of specific language items or lexical phrases. Researchers have investigated the positive effect of hands-on online concordancing tools for language learning, although there are also some other concerns about problems in the use of computer and concordancing programmes (Boulton 2009). For practical guides in using online corpus tools and concordancers, please refer to a website created by Burgess and Cargill (2013) for a very simple example to illustrate the use of concordancing programmes in exploring language use patterns: (http://www.writeresearch.com.au/_html/concordancing_help.html).

For those who are not very comfortable using software or looking at a huge amount of texts, the writer suggests that it is better to see the corpora as reference tools, e.g. dictionaries with authentic examples.

- Selected major corpora of texts from various genres

Name of the corpus/corpus tool	Description	Advantages and special features	Suitable for
PolyU Language Bank https://www.polyu.edu.hk/engl/research/corpus-resources	Over 12 million words of multilingual, multigenre corpora	User-friendly; various corpora (including Brown Corpus, LOB) of different genres and disciplines can be selected for concordance searches, using the bank's built-in Web-based concordance	Teachers, researchers and learners
British National Corpus (1980–1993) http://www.natcorp.ox.ac.uk/	A 100-million word collection of samples of written and spoken language. For phrase search, see http://phrasesinenglish.org/	Free concordance sampler; only 50 examples provided. no KWIC (key word in context) for BNC; good phrase search at 'phrase in English'	Researchers, teachers and learners
The Corpus of Contemporary American English (COCA) (1990–2012): representative of modern American English http://www.americancorpus.org	450-million words, the largest freely available corpus of American English, equally distributed among spoken, fiction, popular magazines, newspapers and academic texts	Built-in concordancer with comprehensive search functions; lots of related resources are available: collocates, N-grams, academic vocabulary, word and phrase; full-text data can be purchased	Teachers, researchers and learners
GloWbE (Global Web-based English): http://corpus2.byu.edu/glowbe	1.9 billion words from 1.8 million web pages in 20 different English-speaking countries	The largest Web-based corpora for examining variation in English—by dialect, genre and over time; the same built-in concordancer as COCA	Researchers, teachers and learners
Enron email corpus: http://www.cs.cmu.edu/~enron/	Focusing on business-related emails; personal messages and jokes are avoided	The only corpus of email that is available for free downloading; no searching concordancer is offered	Researchers
ELISA—English Language Interview Corpus as a Second-Language Application http://www.uni-tuebingen.	A small audiovisual corpus of spoken English developed with pedagogical goals	Provides easy access to full interview texts and videos; can be browsed by topic index; online	Teachers, researchers and learners

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Name of the corpus/corpus tool	Description	Advantages and special features	Suitable for
de/elisa/html/elisa_index.html		concordancer (KWIC)	
WebCorp (basis: Google) http://www.webcorp.org.uk/live/	Search in the entire Web as the corpus	KWIC concordances and word lists; but not language-specific	Researchers, teachers, learners
CHILDES (Child Language Data Exchange System) http://childes.psy.cmu.edu	The world's largest child language database covering 32 languages, 44 million words, 750 GB of media files, 130 corpora; over 3200 published research articles used data from CHILDES	Need to learn the CHAT transcription system and the CLAN programmes; manuals and online tutorials available; more suitable for researchers than teachers	Researchers interested in children's spoken language development, conversation analysis (CA) of mother–child interactions, code-switching, or microanalysis of lexical, grammatical development

Notes KWIC Key Words in Context, a popular function in concordancing, denoting a corpus search in which the keyword is shown highlighted in the middle of the display, with the text forming its context on either side

- Selected major corpora of academic and professional texts

Name of the corpus/corpus tool	Description	Special features	Suitable for
Michigan Corpus of Academic Spoken English (MICASE) http://quod.lib.umich.edu/m/micase/	1,848,364 words; transcripts of academic speech	Can browse and search by speech event, discipline, participant and interactive level; all results can be viewed and downloaded, with KWIC	Researchers, teachers and learners
British Academic Written English (BAWE) corpus http://www2.warwick.ac.uk/fac/soc/al/research/collect/bawe/	6-million-word collection of 2761 high-standard student assignments, across 35 disciplines and across four levels of study (undergraduate and taught masters' level)	Both written and spoken corpora can be searched on the Web concordancer it provides: https://the.sketchengine.co.uk/open/	Researchers, teachers and learners
The Oxford Text Archive: http://ota.ahds.ac.uk	Thousands of texts in more than 25 different languages (literary and linguistic resources)	Downloadable archive; easy access to the information about other 70 corpora and sources of texts	Researchers

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Name of the corpus/corpus tool	Description	Special features	Suitable for
Corpus of research articles (CRA) http://rcpce.engl.polyu.edu.hk/RACorpus/	A large 5,609,407-word collection of research articles from 39 disciplines	Built-in concordancer with KWIC; can browse by discipline and by sections of research articles	Teachers, researchers and learners
Springer Exemplar www.springerexemplar.com	A website powered by Springer where the contents of its academic journals and books (6,985,111 documents) are made available as a corpus for limited searching using their Web-based concordancer	Very simple concordancer, large data set; but limited results are shown; no full-text view of results if they are not in the purchased documents	Teachers and learners

As suggested by Burgess and Cargill (2013), for purposes of teaching and learning, and revision of articles in specific fields, the use of self-made corpora plus a concordancing software program can be a more effective tool. For a discussion of corpus compilation, see: http://www.writeresearch.com.au/_html/corpora.html and also see: http://v.youku.com/v_show/id_XNDU5OTE5MzU2.html for a video guide.

Free concordancing programs (three user-friendly ones are suggested here)

Concordancing programs are used for corpus search. One needs to have at least a corpus (a collection of texts often in 'txt' format) in order to incorporate it/them into the program and perform the searches. These programs have similar functions as the online concordancing tools mentioned above, but can be run on one's own computer, and some have more comprehensive features.

- AntConc can be downloaded at: http://www.antlab.sci.waseda.ac.jp/antconc_index.html
  - Works in Windows and Linux; reads txt, html and xml files; self-contained application (no installation needed).
  - Main functions: concordances, citation of search term in its cotext, collocates, word clusters, frequency lists and text profiling through key word lists; very handy.
- TextSTAT, at http://neon.niederlandistik.fu-berlin.de/en/textstat/
  - Works in Windows, Linux and *Mac*; Reads txt, html, *Word* and *Open Office files*; Web spider facility for *corpus creation* directly from Internet sources.

  - Main functions: concordances, citation of search term in context and frequency lists; multilingual: corpora in 11 different languages are supported including English (no Chinese).

For comprehensive packages for corpus researchers, other tools are suggested, including MonoConc Pro and WordSmith Tools, which are not free.

Online Linguistic/Text Analysis Tools and Guides

This section lists a selection of simple text analysis tools that can be used online, i.e. without installation. These tools allow you to create concordances, word lists and text profiles from your own texts or from web pages of your choice. These tools are especially good for learners (analysing their own texts) and are also potentially useful for researchers and even teachers.

- http://www.lextutor.ca/: Compleat Lexical Tutor ('concordance' section)
  - KWIC concordance for each word in the text.
  - See also 'phrase extractor section' to build concordance with word clusters.
  - A very comprehensive website with different sections of interesting tools designed for learners and researchers.
- http://www.spaceless.com/concordancer.php: Spaceless
  - Returns document statistics with a text aloud and a variety of word lists.
- http://www.staff.amu.edu.pl/~sipkadan/lingo.htm: TurboLingo
  - KWIC concordance for all words in the text/web page.
  - Frequency lists and other features (sentence length count, concordance, etc.).
- http://www.writersdiet.com/WT.php: Writers diet
  - Diagnose your verbal fitness levels by entering your own writing for a test.
  - Test results show how fit your writing (in terms of sentence-level grammatical features) is and give practical tips on improvement.
- http://www.wordle.net
  - Wordle is a tool for generating 'word clouds' from a text that you provide.
  - Good for learners to try out and see the words they have used more frequently than others.
  - Interactive and fun.

Online Virtual Learning Centres for Academic Studies

- http://www.virtuallrc.com/
  - The Virtual Learning Resources Center indexes thousands of academic information websites, selected by teachers and library professionals worldwide, in order to provide students and teachers with current, valid information for school and university academic projects. Simply search whatever you want, and a list of websites would be presented for your choice.

Most academic learning centres (especially for academic writing) are offered for university and college students. Just google it, and one can find a great number of them; the following are selected examples with comprehensive lists of online resources:

- http://writingcenter.fas.harvard.edu/pages/resources—Harvard Writing Center
- http://writingcenter.gmu.edu/writing-resources/wc-quick-guides—George Mason University
- http://writing.wisc.edu/wac/browse—Writing Across the Curriculum at UW Madison
- http://writingcenter.unc.edu/esl/online-tools/—University of North Carolina
- https://www.amherst.edu/academiclife/support/writingcenter/resourcesforwriters—Amherst College

There are still many other writing centres which provide well-organized and selected lists of online writing resources. By referring to the sections with names such as 'online tools', 'links' or 'further resources' (other possible names as well) on these websites, one can find a sufficient amount of resources for self-learning.

Apart from these online resources and tools (for specific problems in writing), the most famous online writing laboratory that provides a full course-like tutorial of academic writing is the Purdue Online Writing Lab (OWL):

- https://owl.english.purdue.edu/
  - This writing laborotory is the best representative of online academic writing laboratories. There are many others at other universities too.

Glossary

'2-in-1' teacher Teachers who have both the awareness and capacity to perform the dual roles of content teacher and language teacher; i.e. a teacher who can integrate content teaching with language teaching

Academic literacy/ies This term (in both plural and single forms) is often used to 'signify courses intended to enable student writers to meet the demands of writing in the university' (Lillis and Scott 2007, p. 6). By extension, it can be used to refer to the capacity/ies to read/write in academic contexts at all levels

Access paradox refers to the paradox that on the one hand, students should have access to the dominant variety of language to avoid being marginalized in the society; on the other hand, however, such access to the dominant language perpetuates and reinforces the dominance (Lodge 1997)

Adjunct language classes the adjunct language class is part of an adjunct model in a cross-curricular programme. According to Snow and Brinton (1988), the key feature of an adjunct model is that it is a 'cross-curricular program in which students are enrolled concurrently in two linked courses—a language course and a content course—that share the content base and complement each other in terms of mutually coordinated assignments' (p. 556)

BICS Basic Interpersonal Communication Skills. We use BICS in our everyday life, such as in face-to-face conversations with family members and friends, informal interactions with shop assistants when we go shopping or casual chit-chat on Facebook, WhatsApp, email or Internet forums. They are said to be used in context-embedded conversations

Bilingual education defined broadly, it involves teaching academic content in two languages (usually the native language and an L2) with varying amounts of each language used in accordance with the programme model. Bilingual programmes can be broadly classified into three types of models (Fishman 1976) based on their educational/societal aims: maintenance, transitional and enrichment programmes. The first two types have arisen from the needs of the linguistic minority/immigrant students in the society of another dominant language (L2). Enrichment programmes, in contrast, have been designed for majority language

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students who want to master a high level of proficiency in a socio-economically important L2 (e.g. immersion). There are, however, many other possible criteria to classify bilingual education programmes

Bridging pedagogy Pedagogy that aims at bridging between students' existing levels of knowledge and skills and the required levels of knowledge and skills required by the school curriculum

CALP Cognitive Academic Language Proficiency. As opposed to BICS, CALP refers to the academic language knowledge and skills useful in understanding and speaking about formal academic topics in the classroom and in reading and writing about these topics in school assignments and examinations. They are necessary for context-reduced communication

Classroom scaffolding strategies Scaffolding means the appropriate kind of support provided by the teacher or expert peer (usually through classroom talk and interaction) to help students complete a task (above their current level) progressively and reach a higher level of proficiency and understanding with reference to their current level

Cognitive discourse functions (CDF) Generic academic language functions that learners are required to perform across different content curricular areas; examples of these functions are 'defining', 'comparing', 'classifying', 'analysing', 'explaining', 'hypothesizing', etc.

Cognitive tradition in science education Teachers in the cognitive tradition tend to believe that the main goal of teaching science is to *understand the basic concepts* of physics, chemistry, biology or whatever field is being studied. The primary goal of 'understanding the concept' assumes a fundamentally mentalist approach to learning, under which concepts are seen as mental objects and understanding as essentially a mental process. This often characterizes a content curriculum with little concern about language and communication as an integral part of the content (the other side of the same coin)

Construe Construct and organize/classify using semiotic resources

Content and Language Integrated Learning (CLIL) CLIL has originated in Europe in the 1990s as an umbrella term to describe a wide variety of programmes in which a second or additional language (e.g. a foreign, regional or minority language and/or another official state language) is used to teach certain content subjects in the curriculum (Eurydice Report 2006)

Content-based instruction (CBI) An umbrella term encompassing a wide range of 'instructional approaches that make a dual, though not necessarily equal, commitment to language and content-learning objectives' (Stoller 2008, p. 59). Lyster (2007) has also used the term CBI in a broad sense to refer to 'classrooms where subject matter is used at least some of the time as a means for providing second language learners with enriched opportunities for processing and negotiating the target language through content' (p. 1). Although CBI has come to be

more associated with second or additional language (L2) contexts, CBI as a broad curricular framework includes work done in first language (L1) contexts as well (Stoller 2004). At the core of this approach to curriculum design is the belief that language instruction is most effective when it focuses on ensuring that students learn the language for communication in meaningful and significant social and academic contexts (Genesee 1994). There is a range of CBI models along a continuum varying from 'content-driven' to 'language-driven' learning goals (Met 1998)

Context-embedded communication Refers to everyday face-to-face conversations in which there are many cues to the listener such as facial expressions, gestures and concrete objects of reference

Context-reduced communication Refers to communication that takes place in formal lectures or academic writing where there are supposed to be fewer non-verbal cues and the language is more dense and abstract

Contextualized language teaching As the term content-based instruction (CBI) covers a number of different models and approaches with different emphases, Davison and Williams (2001) developed a framework in which language and content integration is seen as 'a cline ranging from "contextualised language teaching" to "language-conscious content teaching"' (p. 90). In general, contextualized language teaching means teaching language in a communicative way using authentic contexts of language use

Critical pragmatic approaches Critical pragmatic approaches aim at helping students to become critically aware of multiplicity of norms across different disciplines as well as the changeability of linguistic conventions to meet different new functions and new interests. This kind of critical awareness and genre/linguistic analysis can serve both the pragmatic function of providing access to dominant genres and varieties while encouraging critical awareness of diversity and changeability of norms in different disciplines

Cross-referencing An instance in a text referring to the related information mentioned elsewhere in the same document

Cultural capital A term used by Bourdieu (1973, 1991) to refer to language use, skills, competencies and orientations/dispositions/attitudes/schemes of perception (also called 'habitus') that a person is endowed with by virtue of socialization in her/his family and communities

Curriculum mapping To bridge the intra- and intercurriculum disconnects, teachers and curriculum developers can identify the language demands of different academic subjects and conduct horizontal (from input genres to output genres) and vertical (from junior to senior levels) mapping of language needs within and across different academic subjects

curriculum In a broad sense, this term can cover a wide range of components, including the selection and sequencing of academic content taught in a school or

in a specific course or programme, as well as the teaching and learning objectives, teaching materials, pedagogical approaches and assessment methods

Deconstruction One stage of the teaching/learning cycle (TLC). In this stage, teachers and students jointly analyse a text. The teacher usually engages the students in discussing the main communicative purpose and main ideas of the text and how the writer organizes these ideas systematically through different genre stages in order to achieve the main communicative purpose. The focus is thus on guiding students to notice both the global genre structure of the text and how the academic content (i.e. field) unfolds through the different stages of the genre. Students' attention is also drawn to language features specific to different stages and phases

Detailed reading This is an important stage in the renewed version of the teaching/learning cycle (TLC) in the Sydney School genre-based pedagogy (Rose and Martin 2012). In detailed reading, the teacher guides students to identify specific wordings in a short text. 'A highly designed mode of teacher-class interaction is used to prepare all students to identify each word group, which they highlight as they go. As each word group is identified, its meaning may be elaborated with definitions, explanation or discussion' (Rose 2012a, p. 8)

Dialogic strategy of teaching Teaching by engaging students in dialogues, such as student debates, student inquiry projects, pair/group work and teacher–student dialogue

Discourse semantics A term in systemic functional linguistics (SFL); it refers to the analysis of how a text is schematically structured into stages, phases and messages to achieve its primary social goal

Disintegrating approach In traditional language education, language is taught in systemic disintegrated contrasts moving from the lower level system (such as sounds and letters) to the higher (such as sentence grammar) in separate language activities in different classes and courses. For example, learners need to acquire phonics and letter–sound relationships before they could move on to words. This approach is criticized by proponents of top-down approaches such as the whole-language approach which emphasizes literacy learning in holistic meaningful contexts and de-emphasizes explicit teaching of bottom-up patterns and skills

EAL English as an additional language; intended as an umbrella term to cover a wide range of different scenarios, where English is learned as a language in addition to one's native or familiar language

Embedded literacy Systematic planning of embedded language support during content teaching

English medium education An education provision that uses English as the primary medium of instruction—in particular, where English is not the first language of the students

Entextualize To express/recode the information from notes, visuals, mind maps and graphic organizers in appropriate (academic) language

ESP English for Specific Purposes—a field of study that focuses on the teaching and learning of English for specific (professional) purposes, such as English for business, medical care, science and technology, and tourism. ESP is used in this book to refer to one tradition of genre study with a focus on the analysis, application and instruction of academic language in university and professional settings. Representative researchers in this tradition include John Swales, V. J. Bhatia, John Flowerdew and Ken Hyland

Explicit instruction Usually involves deductive and explanatory approaches to teaching. For example, an explicit instruction on genre structure would involve analysing the stages and phases in a model text to the students first before asking students to identify these stages and phases in another text from the same genre

Field The subject matter of the text

Focus on Form (FonF) A pedagogical approach defined by Long (1991) as drawing learners' attention to linguistic elements during a communicative activity, a modification on the entirely meaning-centred communicative language teaching (CLT) approach

Focus on meaning A communicative instructional approach which is meaning-centred. The proponents believe that comprehensible input and meaning-oriented tasks are necessary and sufficient for language acquisition

Form readers This is an extension by Cai (2014) on Hirvela's (2004) categories of readers with reference to the characteristics of Chinese learners. Chinese students in EFL (English as a foreign language) contexts are often reported to be form readers—linguistic or language readers who tend to mainly 'focus on form' when they are reading a text in English; i.e. they are actively analysing grammatical structures and accumulating new vocabularies for future reading and writing

Formative assessment Also known as assessment *for* learning, or assessment *as* learning, with the aim to use assessment (e.g. portfolios, projects) as a tool for students to learn

Genre analysis This term was originally proposed by Swales (1990). It is a process of analysing a sample text or exemplar text of a genre from top-down; i.e. from its purpose and audience, its macro-stages, to its lexico-grammatical choices

Genre-based pedagogy A cluster of teaching approaches that offer principled ways (usually through identification and analysis of text stages and linguistic features) of teaching literacy practices through involving students in understanding the features of different genres. 'By enabling teachers to ground their courses in the texts that students will need to write in occupational, academic, or

social contexts, they help guide learners to participate effectively in the school and the world outside the ESL classroom' (Hyland 2007, p. 149)

Genre Genre is defined differently under different theoretical traditions (see a comprehensive review by Hyon 1996); the author of this book finds the Sydney School's definition most useful to teachers in general: '…genres are 'staged goal-oriented processes': they are goal-oriented because a text unfolds towards its social purpose, and staged because it usually takes more than one step to reach the goal. Genres evolve in a culture to achieve common social purposes that are recognized by members of the culture so that the stages they go through are generally predictable for members of the culture'. (Rose 2012a, b, p. 1)

Grammatical metaphor Grammatical metaphor is closely linked to, but not the same as, nominalization. When a nominalized word or group functions *as if* it were a grammatical *participant* (e.g. grammatical *subject* or *object* in traditional grammar terminology), it is called a grammatical metaphor (Halliday 2004). For instance, the verb 'move' which functions as a *process* in the original clause 'an electron moves in an orbit' becomes nominalized as *motion* and functions as a *thing* (and a grammatical *subject*) in the nominal group in the sentence 'The orbital motion of an electron is studied with SPS'

Graphic organizer Using graphics (e.g. flow charts, tables, tree diagrams) to organize and structure ideas, concepts and information systematically

High challenge and high support principle Gibbons (2009) proposes that instead of being presented with dumbed-down tasks, students can be led gradually towards higher levels of performance through carefully designed challenging tasks with built-in language and cognitive support

High-stakes tests Tests that are used to make important decisions about students, educators, schools or districts and carry significant socio-economic or public consequences

Immersion Immersion is usually classified as a type of content-based instruction and is meant to be a kind of additive bilingualism (Cummins 1979) programme in which students coming from the same language background who speak the society's majority language as their first language (L1) are taught (some of) their content subjects in a target language (L2) other than their first language to attain a high level of proficiency in the target language without compromising their content attainment and first language attainment. The prototypical example of immersion is Canadian French immersion where English-speaking children are taught (some of the) content subjects in their L2, French. There are many different kinds of immersion programmes in the world, and the target languages usually include socio-economically important (trade) languages; e.g. Japanese and Chinese immersion programmes in Australia.

Implicit instruction Usually involves inductive and discovery approaches. Unlike explicit instruction, the instructor does not outline the rules or make direct

explanations, but involves students in inquiry-based tasks that allow students to explore and discover the concept or information through inquiry-based activities

Information readers Using Hirvela's (2004) analogy, there are two levels of processes in reading for gaining knowledge about writing: mining and writerly reading. Information readers are more attentive to information, meaning or 'content'; i.e. the *what* in a text.

Input genres The kind of genres that students are exposed to and taught in

Inquiry-based pedagogy Similar to 'problem-based learning' (PBL) approaches—which start by posing questions, problems or scenarios, rather than simply presenting established facts or memorizing information/knowledge from instructional materials

Instantiation of meanings 'Instantiation refers to the relation between features in language systems and instances of meaning in actual texts. Thus each genre and its attendant register variables (field, tenor, mode) is a specific instance of the language system as a whole. Instantiation occurs at all language levels, for example, sequences of phonemes in a word instantiate phonological systems' (Rose 2012a, b, p. 1). In short, systemic functional linguistics (SFL) theorizes language as a hierarchical system of different stratified layers (i.e. strata) of patterns of different combinations of elements, which together instantiate meanings

Integrating approach Rose's (2012a, b) notion of the *integrating* approach is different from the top-down approach, which to Rose (2012a, b) errs in not providing enough scaffolding to the learner in acquiring the bottom strata patterns. Rose's integrative approach is situated in the Sydney School genre-based pedagogy, which seeks to integrate both bottom-up and top-down approaches by proposing a *teaching/learning cycle (TLC)*

Intercurricular disconnect Disconnects *across* the curriculum, including those found among the different curriculums of content subjects (e.g. science, mathematics, history, social studies, geography) as well as a deep disconnect between the content subject curriculums and the curriculums of the language subjects (e.g. English as a foreign language subject, Chinese as the first language subject)

Intracurricular disconnect Disconnects *within* the curriculum. There are two types. The first type is horizontal disconnect: a mismatch between the input genres and the output genres that characterize a content curriculum. The second type is vertical disconnect, referring to the abrupt change in the nature and kinds of assessment tasks that students are required to do in the curriculum when transiting from junior levels to senior levels

Joint construction The students are engaged by the teacher in co-constructing a new text based on the notes that they have made during the first stage of text analysis. In this second stage of joint construction, the teacher provides ample language scaffolding to students as they jointly reconstruct a new text based on

the notes made, with the teacher constantly pointing at the notes made on the blackboard to provide clues to the students to answer his/her questions. With information genres and evaluative genres (e.g. classifying report, explanation, discussion, exposition), the new text looks very similar to the original text in terms of content, but new wordings are used. With narrative genres (e.g. stories, recounts), the new text looks very similar in terms of the structure and wordings, but new content is used

LAC Language across the curriculum; it emerged in the 1970s in Britain as a whole-school approach to address the language and literacy needs of students studying in different subject areas. It originally targeted all students (i.e. students study content subjects in their first language, not just linguistic minority students). The rationale behind LAC is that language aspects should be given due attention by teachers across different subject areas. LAC spread to the USA in the form of the Writing Across the Curriculum (WAC) movement in the 1980s mainly in the context of helping English as a second language (ESL) students in content areas to learn both content and the language that mediates that content. LAC has also spread to Europe as a way towards plurilingualism. LAC has been defined as both a concept and a policy 'linking different forms and aspects of language education within the school, particularly emphasising the role of language in all subject-matter learning' (Vollmer 2007, p. 177)

Language/academic functions A range of functions that are commonly found in academic texts and realized with various lexico-grammatical patterns (e.g. sentence patterns): e.g. comparing and contrasting, exemplifying, defining, classifying, hypothesizing, predicting, giving evidence and expressing conditional or causal relationships. Language functions are also called rhetorical functions in the literature. In this book, the term 'academic functions' is used to emphasize the role they play in academic contexts

Language modelling Lemke (2010) suggests that teachers can provide help to students by modelling how communication in science is achieved through language in both spoken and written forms in all kinds of school genres such as those found in textbooks, assignments and tests

Language strata (stratification) A term from systemic functional linguistics (SFL). 'Stratification refers to the organization of language and its social contexts as a hierarchy of levels or strata. The relation between strata is modeled in SFL as realisation. Thus patterns of meaning in texts (or discourse semantics) are realised (manifested/symbolized/expressed) by function of words in clauses (lexico-grammar), which are realised by patterns of sounds or letters (phonology or graphology)' (Rose 2012a, b, p. 1)

Language variation theory The language variation theory in this book refers to Mahboob's (2013) three-dimensional model, of which the basic assumption is that language varies based on whether we are communicating with people in or

outside of our community, in speech or in written forms, and in everyday or specialized discourses

Language-conscious content teaching According to Davison and Williams (2001)'s framework, language-conscious content teaching is placed towards the 'content' end of the continuum. Any approach which embeds some language objectives into a content syllabus or which is focused on the teaching of particular subject matter as an end in itself but in language-sensitive ways belongs to this model

Languaging Using language to mediate the formation of conceptual knowledge. It is 'not merely a means of communicating what is in one person's head to another person, but serves to *construct the very idea* that one is hoping to convey' (Swain and Lapkin 2013, p. 105)

Lexical metaphor Accomplished writers use lexical metaphors to achieve the purpose of engaging the audience by turning some abstract processes into concrete processes, e.g. 'Juliet is cold to her father'. The word 'cold' here is a metaphor because it is based on comparison or analogy with temperature (e.g. the weather is cold → she is cold to her father)

Lexico-grammatical resources Lexico-grammar is a term adopted in systemic functional linguistics (SFL), which describes the continuity between grammar and lexis (vocabulary). In this book, it often refers to phrases and sentence patterns that can be used as resources to perform academic functions and to construct texts

Linguistic capital According to Pierre Bourdieu's language and social reproduction theories (1973, 1991), different languages (or different varieties and styles of language) are given different valuations and have different currencies in a linguistic market, which is configured by power relations linked to the social structure in which the linguistic market has been formed and maintained. Some people by virtue of their family, community and/or school backgrounds can have more linguistic capital than others. Linguistic market is not a metaphor but has real, material impact on people and societies. Linguistic capital is a form of cultural capital

Linguistic repertoire The linguistic resources that a person has available for use, for example, the size and range of vocabularies, the different language structures and the different kinds of registers and genres one can understand and produce. A person's linguistic repertoire usually consists of more than one language, especially in plurilingual and globalized societies. The boundaries of languages are not discrete, and different linguistic resources are often mixed and combined fluidly in different genres, registers and styles to achieve different communicative purposes in different sociocultural contexts

Logical connectors Linking words (e.g. however, firstly, secondly)

Macro-genre A combination of genres, such as an essay that students are required to write in an integrated science examination paper, which consists of two parts, description and discussion

Mediation The tool and means through which humans interact with their worlds, for example, the use of cultural artefacts, tools and symbols, including language. In other words, content is 'mediated' or 'construed' (constructed) by language

Metalanguage The language used to describe or reflect on language. For example, the 'Genre Egg' in this book provides a common vocabulary (or metalanguage) that content and language teachers can share in order to work together to analyse academic texts found in content subject areas

Metalinguistic awareness Awareness of various aspects, functions and linguistic components of language. It involves the ability to think about and discuss language

Mode The channel of communication: e.g. written or spoken

Monologic strategy of teaching This strategy features the teacher exposing knowledge to students through monologue; e.g. in the form of teacher lecturing

Morpheme The smallest meaningful unit in a language which may or may not stand-alone as words. Free morphemes can stand-alone as words, while bound morphemes appear only as parts of a word, such as prefixes (un-) and suffixes (-ly)

Multimodal mediation Using multimodal resources as tools to understand academic content and experience (e.g. using visuals, gestures)

Multimodalities–Entextualization Cycle (MEC) A curriculum cycle formed by three core processes: (1) create a rich experiential context; (2) engage students in tasks that require some systematic 'sorting out' or re-/presentation of the experience gained from (1); and (3) engage students in *entextualizing* the experience using a combination of L1/local language/L2 (spoken/written) academic genres

Multimodality Using multiple modes of communication including spoken, written modes and non-verbal modes such as images, music, videos, gestures, movement and demonstration

Needs analysis Identifying students' needs, the essential initial step in developing an appropriate specialized English syllabus. It is a process to answer questions about *what to teach* and *how to teach* in designing a course for specific groups of students

New Rhetoric School Genre scholars in the New Rhetoric School focus on the 'situational contexts in which genres occur than on their forms, and have placed special emphases on the social purposes, or actions, that these genres fulfil within these situations' (e.g. Bazerman 1994; Coe 1994; Devitt 1993; Freedman

and Medway 1994). Like the ESP/EAP tradition, their work mainly focuses on postsecondary/tertiary-level students. This school has originated from North American scholarship concerned with rhetoric and compositional studies mostly in L1 English courses in the university (usually known as English Composition courses)

Nominalization The linguistic transformation process of turning a verb/adjective into a noun, often making it more technical and abstract. For example, in everyday language, one can say 'Be careful, the water is hot!'. However, in a science textbook, the adjective 'hot' becomes nominalized (i.e. turned into a noun) as 'heat', which is then turned into a technical term that can be systematically classified into different types: e.g. latent heat and radiant heat

Noticing A term in the field of second language acquisition (SLA) which refers to the awareness of the occurrence of an event (here mostly linguistic) or recognition of a general principle, rule or pattern. The noticing hypothesis (Schmidt 1995) proposes that noticing is the bridge for converting input into intake

Output genres The kinds of genre that students are expected to be able to produce in their assignments and assessment tasks

Parallel tasks Parallel tasks operate on the principle of repetition with variation. In the first task, a lot of content and language resources are provided (serving as an example); in the second task, which resembles the first task except for some variation, students can draw on both content ideas and language patterns from the first task to accomplish the second task

Pedagogical content knowledge (PCK) Refers to the knowledge of ways of 'representing and formulating the subject content that make it comprehensible to others' (Shulman 1986, p. 9)

Pedagogical disconnect The gap between the usual kind of pedagogies practised in content classrooms and the kind of pedagogies that is needed to enable students to produce appropriate responses (e.g. writing) in their assignments and assessments. In other words, there is a disconnect between what counts as 'knowing' in the classroom and what counts as 'knowing' in subsequent formal school written assignments/assessments

Pedagogy The method and practice of teaching

Phoneme The smallest contrastive linguistic unit which may bring about a change of meaning. For example, the words 'tip' and 'dip' differ in meaning through a contrast of a single phoneme /t/ and /d/ in English. Thus, /t/ and /d/ form a minimal pair

Productive language skills Namely speaking and writing, and producing texts (spoken/written texts)

Recast An implicit way of giving corrective feedback to students or children by repeating the students' error with a correct form instead of saying that it is wrong, which obstructs the conversation

Receptive language skills Namely listening and reading, and comprehending texts (spoken/written texts)

Register theory Language varies according to the social situation in which it is used. These varieties of language are called registers. There are three variables which work together to determine the register of a text (Halliday and Hasan 1976): field (what is the subject matter), tenor (who are involved) and mode (what is the channel). For example, we can distinguish an everyday register from an academic register by doing such an analysis, and one can further analyse the lexico-grammatical choices constrained and motivated by these variables

Repacking The opposite process of 'unpacking'; helping students to shift from everyday styles of speaking/writing to academic styles of speaking/writing

Rhetorical function Similar to speech act, it is the social function or communicative purpose (sometimes conventionalized into a text structure of a genre) that a cluster of sentences or utterances convey or perform. In academic writing, the common ones include 'defining', 'classifying', 'exemplifying' and 'comparing and contrasting'

Rhetorical readers The rhetorical readers (Hirvela 2004) tend to focus on the communicative purpose and how the communicative purpose is linked to different features of the writing style—*why* the author writes in this way

Schematic structure Recognizable patterned sequence of stages in a genre; it refers to the structuring of a text through stages. In this book, 'schematic structure', 'generic structure' and 'textual structure' are used as interchangeable terms with similar meanings

Semantic curve A curve (in a graph) that captures the semantic gravity and semantic density in relation to the temporal progression of the lesson and the pedagogical functions of 'unpacking' and 'repacking' (Maton 2013)

Semantic density In Maton (2013)'s legitimation code theory, it refers to the degree of condensation of meaning within sociocultural practices (symbols, terms, concepts, phrases, expressions, gestures, clothing, etc.). Semantic density may be relatively stronger (+) or weaker (−) along a continuum of strengths. The stronger the semantic density (SD+), the more meaning is condensed within practices; the weaker the semantic density (SD−), the less meaning is condensed

Semantic gravity In Maton (2013)'s legitimation code theory, it refers to the degree to which meaning relates to its context, whether that is social or symbolic. Semantic gravity may be relatively stronger (+) or weaker (−) along a continuum of strengths. The stronger the semantic gravity (SG+), the more

closely the meaning is related to its context; the weaker the gravity (SG−), the less dependent meaning is on its context

Semantic relations Relations between thematic items, which are the building blocks of meaning (Lemke 1990)

Semiotic resources Meaning-making resources such as language, visuals, diagrams and graphic organizers

Sheltered instruction Refers to similar needs ESL classes which are given content area instruction by a content specialist with special attention given to supporting these students

Sociocultural theory of language and literacy development The general sociocultural theory is developed from the theories of the Soviet psychologist Vygotsky (1962, 1978), which considers cognitive developmental processes and learning processes as products of our society and culture. From this perspective, literacy development is seen as a complex social practice, the process of students being apprenticed into the discourses and social practices of literate communities

Sociolinguistics One branch in linguistics that studies the relationship between language and society, the roles of language in society, why people speak and write differently in different social contexts and how language is used to construct social meanings

Speech act A linguistic term referring to the utterances which have performative functions. Common interpersonal speech acts include 'request', 'response' and 'promise'

Stages and phases (similar to 'moves' and 'steps' in John Swales' genre analysis framework) the smallest discourse unit that carries certain rhetorical (communicative) purpose as the text unfolds to achieve its primary communicative purpose. The *stages* are quite predictable across different instances of the genre, while the *phases* under each stage can be quite variable. For example, a descriptive report usually has two stages: Introduction ^ Description (the symbol ^ is used to denote 'followed by'), and under the stage 'Introduction', there may be phases such as 'defining' and 'classifying' (Rose and Martin 2012)

Structuralist linguistic theory Structural linguistics originated from the work of Swiss linguist Ferdinand de Saussure. It emphasizes seeing language as a system of interconnected units with meaning coming from the contrast of these units. It is concerned with the analysis of linguistic elements at different levels, such as the phonemes (the smallest units of phonology), morphemes (the smallest units of morphology), and phrases and clauses (the units of grammar)

Summative assessment Also known as assessment *of* learning (e.g. tests and examinations) with the aim to evaluate students' attainment of knowledge and skills; usually involves individual work

Surface features Refer to lexico-grammatical choices and lexico-grammatical realizations

Sydney School genre-based approach (and genre analysis) One of the three key traditions of genre analysis (see Hyon 1996 for a review of these three traditions). Genre researchers in the Sydney School (e.g. Martin and Rose 2008, 2012) have worked on analysing school genres and have made great contribution to the teaching of academic literacies in school settings. As for genre analysis of academic texts in university settings, it is the English for Academic Purposes (EAP) and English for Specific Purposes (ESP) studies that are dominant in the literature

Syllabification (syllabication) A strategy to help students to 'chop up' multisyllabic words (e.g. 'numerator', 'denominator' in mathematical texts) into different syllables in order to aid their learning of these key words

Syllabus An outline or summary of contents and topics systematically selected and sequenced to be introduced in a course

Systemic functional linguistics (SFL) An approach to linguistics developed by Halliday (1978) that considers language as a social semiotic (meaning-making) system. For Halliday, a central theoretical principle is that any act of communication involves choices. Language is a system of systems, and the choices available in any language variety are mapped using the representation tool of the 'system networks' (sets of options available in a language variety). It is also 'functional' because it considers language to have evolved under the pressure of the particular functions that the language system has to serve. Functions are therefore taken to have left their mark on the structure and organization of language at all levels

Taxonomy of school genres The school genres identified by the Sydney School researchers (Martin and Rose 2008, 2012) are divided into three main types depending on their global communicative purpose: informing, engaging and persuading. For details and subcategories of this taxonomy, please refer to David Rose's series of booklets entitled *Reading to Learn (*http://www.readingtolearn.com.au/) which presents the Sydney School genre-based pedagogy in teacher-friendly language with practical examples drawn from genre analysis of the Australian school curricular texts

Teaching/learning cycle In the teaching/learning cycle (TLC) designed by Joan Rothery and her colleagues (Rothery 1994), an instance of a genre is 'deconstructed' (or analysed) by the teacher and students through reading it together and guiding students to recognize its stages and key relevant language features. After deconstructing the model text, teacher and students then jointly construct a new text, using similar organization and key language features, but writing about a field that they have built up together

Technicality and abstraction Technicality 'refers to the use of terms or expressions … with a specialised field-specific meaning' (Halliday and Martin 1993, p. 144). Abstraction is a process that takes away the specificities of the 'here and now' of what is happening and turns it into a general, impersonal, atemporal, static, abstract concept. For example, the following two sentences represent two distinctly different degrees of abstraction and technicality through 'repacking': 'Look—it must be raining! People have their umbrellas open.' and 'The truest confirmation of the pluviosity of the weather is the extendedness of the umbrellas.'

Tenor The relationship between the speaker and listener or between the writer and reader

Thematic patterns Patterns which show how word meanings are connected in a particular field (Lemke 1990). The language of each specialized field of human activity has its own unique semantic patterns or patterns of meaning

Thematic progression and logical flow How arguments are built through the logical flow of the text. We can analyse the thematic progression of a text by doing theme–rheme analysis

Theme–rheme analysis The theme is the stable part in a sentence, the anchor or the point of departure and it is typically construed as a noun or a nominal group (usually the subject of the sentence, together with any minor clause or phrase. It is also the given (or shared) information. The rheme is the new information or the focus (usually the main clause) in a sentence or utterance. Nominalization often takes place to summarize the rheme (the main clause) of the previous sentence or sentences into the new theme (a nominal group) of the next sentence. This process repeats itself to move the argument forward step by step

Top-down approach to language learning This approach focuses on what the text is about, emphasizing literacy learning in holistic meaningful contexts and de-emphasizing explicit teaching of bottom-up patterns and skills. This includes 'whole language' and shared big book reading in the early years. In L2 learning, the top-down approach is often manifested as the communicative language teaching (CLT) approach

Trans-semiotizing A notion developed by Lin (2015b), expanding the concept of 'languaging' to 'semiotizing' in order to cover the use of multimodalities or multiple semiotics (meaning-making systems including languages, visuals, gestures and diagrams) to do the conceptualizing work of learning

Translanguaging Languaging across different languages, for example, the process of using the resources of L1 to mediate the understanding of new concepts in L2

Triadic discourse format The most commonly found interaction pattern in all kinds of classrooms. It consists of three parts: initiation, response, and feedback (IRF). In some studies, the last part is termed evaluation and thus IRE. Through a reiterative use of these IRF speech exchanges, the teacher monitors the

understanding of students and works some of the students' partial answers into official acceptable answers

Unpacking To help students simplify academic language into everyday language

Whole-school approach A holistic, inclusive and integrated approach which is required to respond to the learning needs of all students and in a wider community. It often calls for full participation from all school sectors, including learners, teachers and administrators to work together in building a sustainable school curriculum and also school life

Writerly readers It is the highest level of reading to write (Hirvela 2004). The writerly reader syncs with the writer and continually trying to be the writer—reading from the perspective of the writer to become a good writer

Bibliography

Bachman, L. F., & Palmer, A. S. (1996). *Language testing in practice: Designing and developing useful language tests*. Oxford: Oxford University Press.

Bakhtin, M. M. (1986). Speech genres and other essays. In M. Holquist & C. Emerson (Eds.), (V. McGee Trans.). Austin: University of Texas Press.

Ball, D. L., & Bass, H. (2000). Interweaving content and pedagogy in teaching and learning to teach: Knowing and using mathematics. *Multiple Perspectives on the Teaching and Learning of Mathematics*, pp. 83–104.

Bazerman, C. (1994). Systems of genres and the enactment of social intentions. In A. Freedman & P. Medway (Eds.), *Genre and the new rhetoric* (pp. 79–101). London: Taylor & Francis.

Boulton, A. (2009). Data-driven learning: Reasonable fears and rational reassurance. CALL in second language acquisition: New approaches for teaching and testing. *Indian Journal of Applied Linguistics*, *35/1*, 81–106.

Bourdieu, P. (1973). Cultural reproduction and social reproduction. In R. Brown (Ed.), *Knowledge, education and cultural change*. London: Tavistock.

Bourdieu, P. (1991). *Language and symbolic power*. Cambridge, Mass.: Harvard University Press.

Berry, R. (2008). *Assessment for learning*. Hong Kong: Hong Kong University Press.

Black, P. P. J., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2007). *Assessment for learning*. New York: Open University Press.

Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives: The classification of educational goals—handbook 1: Cognitive domain*. New York: McKay.

Brinton, D., Snow, M. A., & Wesche, M. (1989). *Content-based second language instruction*. New York: Newbury House.

Bullock, A. (1975). *A language for life: Report of the committee of inquiry appointed by the secretary of state for education and science under the chairmanship of Sir Alan Bullock*. U.K.: HM Stationery Office.

Burgess, S., & Cargill, M. (2013). Using genre analysis and corpus linguistics to teach research article writing. In V. Matarese (Ed.), *Supporting research writing: Roles and challenges in multilingual settings* (pp. 55–71). Cambridge UK: Woodhead Publishing.

Bygate, M., Swain, M., & Skehan, P. (2013). *Researching pedagogic tasks: Second language learning, teaching, and testing*. London: Routledge.

Byrnes, H. (2008). Assessing content and language. In E. Shohamy, & N. H. Hornberger (Eds.), *Encyclopedia of Language and Education* (2nd ed.), *Language Testing and Assessment* (7), 37–52.

Byrnes, H., Crane, C., Maxim, H. M., & Sprang, K. A. (2006). Taking text to task: Issues and choices in curriculum construction. *ITL International Journal of Applied Linguistics, 152*, 85–110.

Cai, J. (2014). *An integrated genre-based approach to scaffolding novice academic writers: Genre awareness, academic lexical phrases and student uptake*. Doctoral dissertation, The University of Hong Kong, Hong Kong.

A.M.Y. Lin, *Language Across the Curriculum & CLIL in English as an Additional Language (EAL) Contexts*, DOI 10.1007/978-981-10-1802-2

Cammarata, L., & Tedick, D. J. (2012). Balancing content and language in instruction: The experience of immersion teachers. *The Modern Language Journal, 96*(2), 251–269.

Cantoni-Harvey, G. (1987). *Content-area language instruction: Approaches and strategies*. Reading, MA: Addison-Wesley.

Carless, D. (2005). Prospects for the implementation of assessment for learning. *Assessment in Education, 12*(1), 39–54.

Carless, D. (2011). *From testing to productive student learning: Implementing formative assessment in Confucian-heritage settings*. New York: Routledge.

Cheng, M. (2015). *Constructivism in science education* [PowerPoint slides]. Seminar, The University of Hong Kong, Hong Kong.

Cenoz, J. (2015). Content-based instruction and content and language integrated learning: the same or different? *Language, Culture and Curriculum, 28*, 8–24.

Cenoz, J., Genesee, F., & Gorter, D. (2013). Critical analysis of CLIL: Taking stock and looking forward. *Applied Linguistics* (pp. 1–21). Oxford: Oxford University Press. doi:10.1093/applin/amt011

Coe, R. M. (1994). 'An arousing and fulfilment of desires: The rhetoric of genre in the process-era and beyond. In A. Freedman & P. Medway (Eds.), *Genre and the new rhetoric* (pp. 181–190). London: Taylor & Francis.

Collins, S. (2013). *The hunger games book 2-catching fire.* New York, NY.: Scholastic Press.

Coxhead, A. (2000). A new academic word list. *TESOL Quarterly, 34*(2), 213–238.

Coyle, D., Hood, P., & Marsh, D. (2010). *CLIL: content and language integrated learning*. Cambridge: Cambridge University Press.

Crandall, J. A. (Ed.). (1987). *ESL through content-area instruction; Mathematics, science, and social studies*. Englewood Cliffs, NJ: Prentice Hall.

Cummins, J. (1979). Linguistic interdependence and the educational development of bilingual children. *Review of educational research, 49*(2), 222–251.

Cummins, J. (1980/2001). The entry and exit fallacy in bilingual education. In C. Baker & N. H. Hornberger (Eds.), *An introductory reader to the writings of Jim Cummins* (pp. 110–138). Clevedon: Multilingual Matters. [This paper was originally given as a keynote address at the Workshop on 'Comparative Review of Identified District Continua' sponsored by the National Origin Desegregation LAU Centre, at the 9th Annual Bilingual Bicultural Education Conference (NABE), San Diego State University, Anaheim, California, April, 1980].

Cummins, J. (1991). Conversational and academic language proficiency in bilingual contexts. In J. H. Hulstijn & J. F. Matter (Eds.), *Reading in two languages* (pp. 75–89). Amsterdam: AILA.

Dalton-Puffer, C. (2007). *Discourse in content and language integrated learning (CLIL) classrooms*. Amsterdam, the Netherlands: John Benjamins.

Dalton-Puffer, C. (2011). Content-and-language integrated learning: From practice to principles? *Annual Review of Applied Linguistics*, *31*, 182–204. Cambridge: Cambridge University Press. doi: 10.1017/S0267190511000092

Dalton-Puffer, C. (2013). A construct of cognitive discourse functions for conceptualising content-language integration in CLIL and multilingual education. *European Journal of Applied Linguistics, 1*(2), 216–253.

Dalton-Puffer, C., Llinares, A., Lorenzo, F., & Nikula, T. (2014). "You can stand under my umbrella": Immersion, CLIL and bilingual education. A response to Cenoz, Genesee & Gorter (2013). *Applied Linguistics, 35*(2), 213–218.

Davison, C., & Williams, A. (2001). Integrating language and content: Unresolved issues. In B. Mohan, C. Leung, & C. Davison (Eds.), *English as a second language in the mainstream: Teaching, learning and identity* (pp. 51–70). Harlow England: Pearson Education.

de Silva, H., & Feez, S. (2012). *Text-based syllabus design*. Sydney: Phoenix Education.

Delpit, L. D. (1988). The silenced dialogue: Power and pedagogy in educating other people's children. *Harvard Educational Review, 58*(3), 280–298.

Department of Education Queensland (1989). *English language development across the curriculum (ELDAC)*. Division of Special Services: Immigrant Education Services.

Derewianka, B. (1990). *Exploring how texts work*. Australia: Primary English Teaching Association.

Derewianka, B. (1990). Rocks in the head: Children and the language of geology. In R. Carter (Ed.), *Knowledge about language and the curriculum: The LINC reader* (pp. 197–215). London: Hodder & Stoughton.

Derewianka, B. (2011). *A new grammar companion for teachers* (2nd ed.). NWS: Primary English Teaching Association.

Derewianka, B. (2014). Supporting students in the move from spoken to written language. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 165–182). Dordrecht: Springer.

Devitt, A. J. (1993). Generalizing about genre: New conceptions of an old concept. *College Composition and Communication, 44*(3), 573–586.

Echevarria, J., Vogt, M. E., & Short, D. J. (2004). *Making content comprehensible for English language learners: The SIOP Model* (2nd ed.). New York: Pearson.

Enright, D. S., & McCloskey, M. (1988). *Integrating english*. Reading, MA: Addison-Wesley.

Eurydice Report. (2006). *Content and language integrated learning (CLIL) at school in Europe*. European Commission. [http://www.eurydice.org/index.shtml; Aug 2006]

Fredericks, A. (1991). *Science Brainstretchers: Creative problem-solving activities in Science*. Culver City: Good Year Books.

Freebody, P. (2013). School knowledge in talk and writing: Taking 'when learners know' seriously. *Linguistics and Education,24*(1), 64–74.

Freedman, A., & Medway, P. (1994). *Genre and the new rhetoric*. London: Taylor & Francis.

Foucault, M. (1978). *The history of sexuality* (Vol. 1) (R. Hurley, Trans.). London: Penguin.

Fung, D. (2010). *Teaching of integrated science: Presentation on alternative assignments*. [Unpublished PowerPoint slides]. Faculty of Education, the University of Hong Kong, Hong Kong.

Fung, D., & Yip, V. (2014). The effects of the medium of instruction in certificate-level physics on achievement and motivation to learn. *Journal of Research in Science Teaching,51*(10), 1219–1245.

García, O., & Li, W. (2014). *Translanguaging: Language, bilingualism and education*. Hampshire, U.K.: Palgrave.

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave Macmillan.

Genesee, F., & Lindholm-Leary, K. (2013). Two case studies of content-based language education. *Journal of Immersion and Content-Based Language Education, 1*, 3–33.

Gibbons, P. (1993). *Learning to learn in a second language*. Portsmouth, NH: Heinemann.

Gibbons, P. (2002). *Scaffolding language, scaffolding learning: Teaching second language learners in the mainstream classroom*. Portsmouth, NH: Heine-mann.

Gibbons, P. (2008). "It was taught good and I learned a lot": Intellectual practices and ESL learners in the middle years. *Australian Journal of Language and Literacy, 31*(2), 155–173.

Gibbons, P. (2009). *English learners, academic literacy, and thinking: Learning in the challenge zone*. Portsmouth, NH: Heinemann.

Goodman, K. S. (2005). *What's whole in whole language* (20th ed.). Muskegon: RDR Books.

Guthrie, J. T., & Ozgungor, S. (2002). Instructional contexts for reading engagement. In C. C. Block & M. Pressley (Eds.), *Comprehension instruction: Research-based best practices* (pp. 275–288). New York: Guilford Press.

Guthrie, J. T., Schafer, W. D., Von Secker, C., & Alban, T. (2000). Contributions of integrated reading instruction and text resources to achievement and engagement in a statewide school improvement program. *Journal of Educational Research, 93*, 211–226.

Guthrie, J. T., Van Meter, P., Hancock, G. R., McCann, A., Anderson, E., & Alao, S. (1998). Does concept-oriented reading instruction increase strategy use and conceptual learning from text? *Journal of Educational Psychology, 90*(2), 261–278.

Guthrie, J. T., Wigfield, A., & Von Seker, C. (2000). Effects of integrated instruction on motivation and strategy use in reading. *Journal of Educational Psychology, 92*(2), 331–341.

Halliday, M. A. K. (1977/2004). Text as semantic choice in social contexts. Reprinted in full in J. J. Webster (2004) (Ed.), *The collected works of M.A.K. Halliday* (Vol. 2, pp. 23–81). London: Continuum.

Halliday, M. A. K. (1978). *Language as social semiotic*. London: Arnold.

Halliday, M. A. K. (1993). Towards a language-based theory of learning. *Linguistics and Education, 5*(2), 93–116.

Halliday, M. A. K. (1994). *An introduction to functional grammar*. London: Arnold.

Halliday, M. A. K. (2004). The language of science. Reprinted in full in J. J. Webster (2004) (Ed.), *The collected works of M.A.K. Halliday* (Vol. 5). London: Continuum.

Halliday, M. A. K., & Hasan, R. (1976). *Cohesion in English*. London: Longman.

Halliday, M. A. K., & Martin, J. R. (1993). *Writing science: Literacy and discursive power*. London: The Falmer Press.

Harwood, N., & Hadley, G. (2004). Demystifying institutional practices: Critical pragmatism and the teaching of academic writing. *English for Specific Purposes, 23*(4), 355–377.

Harders, P., & Macken-Horarik, M. (2008). Scaffolding literacy and the year 9 boys: Developing a language-centred literacy pedagogy. *TESOL in Context, 18*(2), 4–21.

Hasan, R. (1992). Rationality in everyday talk: From process to system. In J. Svartvik (Ed.), *Directions in corpus linguistics: Proceedings of Nobel Symposium*, Vol. 82, Stockholm, August 4–8, 1991 (pp. 257–307). Berlin: de Gmyter.

Heap, J. L. (1985). Discourse in the production of classroom knowledge: Reading lessons. *Curriculum Inquiry, 15*(3), 245–279.

Hirsch, L. (1988). Language across the curriculum: A model for ESL students in content courses. In S. Benesch (Ed.), *Ending remediation: Linking ESL and content in higher education* (pp. 71–89). Washington, DC: TESOL.

Hirvela, A. (2004). *Connecting reading and writing in second language writing instruction*. Ann Arbor: The University of Michigan Press.

Hong Kong Curriculum Development Council. (1998). Hong Kong syllabuses for secondary schools (secondary 1–3)—Science. Issued by the Curriculum Development Council, Education Development, Hong Kong.

Hong Kong Examinations and Assessment Authority. (2012). *Hong Kong diploma of secondary education (DSE) biology exam paper (2012)*. Hong Kong: Hong Kong Government Printer.

Hong Kong Examinations and Assessment Authority. (2013). *Hong Kong diploma of secondary education (DSE) integrated science exam paper (2013)*. Hong Kong: Hong Kong Government Printer.

Hyland, K. (2007). Language, literacy, and writing instruction. *Journal of Second Language Writing, 16*, 148–164.

Hyon, S. (1996). Genre in three traditions: Implications for ESL. *TESOL Quarterly, 30*(4), 693–722.

Janks, H. (2004). The access paradox. *English in Australia, 139*(1), 33–42.

Janks, H. (2010). *Literacy and power*. New York: Routledge.

Kong, S. (2009). Content-based instruction: What can we learn from content-trained teachers' and language-trained teachers' pedagogies? *The Canadian Modern Language Review, 66*(2), 233–267.

Kong, S., & Hoare, P. (2008). Late immersion in Hong Kong: Still stressed but making progress? In T. W. Fortune & D. J. Tedick (Eds.), *Pathways to multilingualism: Evolving perspectives on immersion education* (pp. 242–263). Clevedon, UK: Multilingual Matters.

Kress, G., Jewitt, C., Ogborn, J., & Tsatsarelis, C. (2001). *Multimodal teaching and learning: The rhetorics of the science classroom*. London: Continuum.

Kress, G., & van Leeuwen, T. (2006). *Reading images the grammar of visual design* (2nd ed.). London: Routledge.

Laupenmühlen, J. (2012). Making the most of L1 in CL(1+2) IL. In D. Marsh & O. Meyer (Eds.), *Quality interfaces: Examining evidence & exploring solution in CLIL* (pp. 237–251). Eichstatett, Germany: Eichstatett Academic Press.

Lea, M., & Street, B. (1998). Student writing and faculty feedback in higher education: An academic literacies approach. *Studies in Higher Education, 23*(2), 157–172.

Lemke, J. L. (1990). *Talking science: Language, learning, and values*. Norwood, NJ: Ablex Publishing Corporation.

Lemke, J. L. (1993). Discourse, dynamics, and social change. *Cultural Dynamics, 6*(1), 243–275.

Lemke, J. (2002). Language development and identity: Multiple timescales in the social ecology of learning. In C. Kramsch (Ed.), *Language acquisition and language socialization* (pp. 68–87). London: Continuum.

Lemke, J. L. (2010). Transmedia traversals: Marketing meaning and identity. In A. Baldry & E. Montagna (Eds.), *Interdisciplinary perspectives on multimodality: Theory and practice.* Proceedings of the Third International Conference on Multimodality. Campobasso: Palladino.

Lillis, T., & Scott, M. (2007). Defining academic literacies research: Issues of epistemology, ideology and strategy. *Journal of Applied Linguistics, 4*(1), 5–32.

Lin, A. M. Y. (1996). *Doing-English-lessons in secondary schools in Hong Kong: A sociocultural and discourse-analytic study.* Doctoral dissertation, University of Toronto, Canada.

Lin, A. M. Y. (2000). Resistance and creativity in English reading lessons in Hong Kong. *Language, Culture and Curriculum, 12*(3), 285–296.

Lin, A. M. Y. (2006). Beyond linguistic purism in language-in-education policy and practice: Exploring bilingual pedagogies in a Hong Kong science classroom. *Language and Education, 20*(4), 287–305. doi:10.2167/le643.0

Lin, A. M. (2007). What's the use of "triadic dialogue"?: Activity theory, conversation analysis, and analysis of pedagogical practices. *Pedagogies: An International Journal, 2*(2), 77–94.

Lin, A. M. Y. (2010). *How to teach academic science language.* Keynote speech delivered at the Symposium on Language & Literacy in Science Learning, 24 June 2010. Hong Kong Education Bureau (Curriculum Development Institute—Science Education Section), Hong Kong.

Lin, A. M. Y. (2012). Multilingual and multimodal resources in L2 English content classrooms. In C. Leung & B. Street (Eds.), *'English'—A changing medium for Education* (pp. 79–103). Bristol: Multilingual Matters.

Lin, A. M. Y. (2013a). Classroom code-switching: Three decades of research. *Applied Linguistics Review*, *4*(1), 195–218. doi:10.1515/applirev-2013-0009

Lin, A. M. Y. (2013b). Towards paradigmatic change in TESOL methodologies: Building plurilingual pedagogies from the ground up. *TESOL Quarterly*, *47*(3), 521–545.

Lin, A. M. Y. (2015a). Conceptualizing the potential role of L1 in content and language integrated learning (CLIL). *Language, Culture and Curriculum, 28*(1), 74–89.

Lin, A. M. Y. (2015b). Egalitarian bi/multilingualism and trans-semiotizing in a global world. In W. E. Wright, S. Boun & O. García (Eds.), *The handbook of bilingual and multilingual education* (pp. 19–37). West Sussex, UK: Wiley Blackwell.

Lin, A. M. Y., & Cheung, T. (2012). *Training of resource persons in implementing LAC in EMI—Understanding LAC skills and strategies in different KLAs—Integrating perspectives* [PowerPoint slides]. In-service professional development programme for secondary school teachers, the University of Hong Kong, Hong Kong.

Lin, A. M. Y., & Cheung, T. C. L. (2011). *A 4-step literacy approach to developing language across the curriculum* [PowerPoint slides]. Teachers' workshop given at Munsang College, 18 January 2011, Hong Kong.

Lin, A. M. Y., Fung, D., Chan, S., & Lo, Y. Y. (2013). *Designing science assessment tasks with language awareness* [PowerPoint Slides]. Public Seminar, the University of Hong Kong, Hong Kong.

Lin, A. M. Y., He, P., & Liu, Y. (2013). *Researching teacher education in "Content and Language Integrated Learning" (CLIL): Conceptualizing the teacher knowledge base in CLIL*. Paper presented at the International Conference on Applied Linguistics Perspectives on Content and Language Integrated Learning (ALP-CLIL), Autonomous University of Madrid, Spain, June 8–10, 2013.

Lin, A. M. Y., & He, P. C. (2014). *Academic language functions and examples from the Sarasas corpus*. Unpublished manuscript. Faculty of Education, University of Hong Kong.

Lin, A. M. Y., & Man, E. Y. F. (2009). *Bilingual education: Southeast Asian perspectives*. Hong Kong: Hong Kong University Press.

Littlewood, W. (1981). *Communicative language teaching*. UK: Cambridge University Press.

Liu, Y., He, P., & Lai, H. (2014). *Reading and writing skills for HKDSE liberal studies exam*. Hong Kong: The Hong Kong Educational Publishing Co.

Llinares, A., & Lyster, R. (2014). The influence of context on patterns of corrective feedback and learner uptake: A comparison of CLIL and immersion classrooms. *The Language Learning Journal, 42*(2), 181–194.

Lo, Y. Y., & Lin, A. M. Y. (2014). Designing assessment tasks with language awareness: Balancing cognitive and linguistic demands. *Assessment and Learning, 3*, 97–119.

Lodge, H. (1997) *Providing access to academic literacy in the Arts Foundation Programme at the University of the Witwatersrand in 1996—The theory behind the practice.* Unpublished Masters Research Report, University of the Witwatersrand.

Long, M. H. (1991). Focus on form: A design feature in language teaching methodology. *Foreign language research in cross-cultural perspective, 2*(1), 39–52.

Luke, A. (1996). Genres of power: Literacy education and the production of capital. In R. Hasan & G. Williams (Eds.), *Literacy in society* (pp. 308–338). London: Longman.

Lyster, R. (2007). *Learning and teaching language through content. A counterbalanced approach*. Amsterdam: John Benjamins Publishing Company.

Lyster, R., & Ranta, L. (1997). Corrective feedback and learner uptake: Negotiation of form in communicative classrooms. *Studies in Second Language Acquisition, 19*(1), 37–66.

Mahboob, A. (2013). *World Englishes, identity management and education* [PowerPoint slides]. Seminar presented at the L1 & L2 Academic Literacies Seminar Series, Faculty of Education, University of Hong Kong, Pokfulam, Hong Kong.

Mahboob, A. (2014). Language variation and education: A focus on Pakistan. In S. Buschfeld, T. Hoffmann, M. Huber, & A. Kautzsch (Eds.), *The evolution of Englishes* (Vol. 2, pp. 267–281). Amsterdam: John Benjamins.

Mahboob, A. (in press). Understanding language variation: Implications of the NNEST lens for TESOL teacher education programs. In J. de Dios Martinez Agudo (Ed.), *Native and non-native speakers in English language teaching: Implications and challenges for teacher education*. Boston: De Gruyter Mouton.

Mahboob, A., & Cruz, P. (2013). English and mother-tongue-based multilingual education: Language attitudes in the Philippines. *Asian Journal of English Language Studies, 1*, 1–19.

Mahboob, A., & Dutcher, L. (2014). Dynamic approach to language proficiency—A model. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 117–136). Dordrecht: Springer.

Mahboob, A., & Szenes, E. (2010). Linguicism and racism in assessment practices in higher education. *Linguistics and the Human Sciences, 3*(3), 325–364.

Mahboob, A., & Tilakaratna, N. (2012). A principles-based approach for English language teaching policies and practices [White Paper]. *Retrieved from TESOL International Association website:* http://www.tesol.org/docs/pdf/a-principles-based-approach-forenglish-language-teaching-policies-and-practices.pdf

Marland, M., & Barnes, D. R. (1977). *Language across the curriculum: The implementation of the bullock report in the secondary school*. London: Heinemann Educational Books.
Marsh, C. (2008). Language awareness and CLIL. In J. Cenoz & N. Hornberger (Eds.), *Encyclopedia of language and education* (Vol. 6, pp. 233–246)., Knowledge about language Dordrecht: Springer.
Martin, J. R. (1994). Marcro-genres: The ecology of the page. *Network, 21*, 29–52. [Also collected in Wang, Z. (Ed.). (2012). *Genre studies* (pp. 78–126), Volume 3 in the Collected Works of J. R. Martin. Shanghai: Shanghai Jiao Tong University Press.]
Martin, J. R. (2010). *Modelling and mentoring: The yin and yang of teaching and learning from home through school*. [PowerPoint slides]. Seminar delivered at the Faculty of Education, University of Hong Kong, December 9, 2010, Hong Kong.
Martin, J. R. (2012). *Embedded literacy: Knowledge as meaning* [PowerPoint slides]. Seminar delivered at the Faculty of Education, University of Hong Kong, March 9, 2012, Hong Kong.
Martin, J. R. (2013). Embedded literacy: Knowledge as meaning. *Linguistics and Education, 24*(1), 23–37.
Martin, J. R., & Maton, K. (Ed.). (2013). Cumulative knowledge-building in secondary schooling. Special Issue, *Linguistics and Education, 24*(1), 1–74
Martin, J. R., & Matthiessen, C. M. I. M. (2014). Modelling and mentoring: Teaching and learning from home to school. In A. Mahboob & L. Barratt (Eds.), *Englishes in multilingual contexts* (pp. 137–163). Dordrecht: Springer.
Martin, J. R. & Rose, D. (2007). *Working with discourse: Meaning beyond the clause*. London: Continuum.
Martin, J. R., & Rose, D. (2008). *Genre relations: Mapping culture*. London: Equinox.
Martin, J. R., & Rose, D. (2012). Genres and texts: Living in the real world. *Indonesian Journal of SFL, 1*(1), 1–21.
Maton, K. (2013). Making semantic waves: A key to cumulative knowledge-building. *Linguistics and Education, 24*(1), 8–22.
Maton, K. (2014). Building powerful knowledge: The significance of semantic waves. In E. Rata & B. Barrett (Eds.), *The future of Knowledge and the Curriculum* (pp. 181–197). London: Palgrave Macmillan.
McDiarmid, G. W., Ball, D. L., & Anderson, C. W. (1989). Why staying one chapter ahead doesn't really work: Subject-specific pedagogy. *Issue Paper* 88-6. The National Centre for Research on Teacher Education, Michigan State University.
Mehan, H. (1979). *Learning lessons*. Cambridge: Harvard University Press.
Mercuri, S. (2010). *Teaching English versus teaching in English: Understanding the complexity of academic English* [PowerPoint slides]. Seminar presented at the Faculty of Education, the University of Hong Kong, Hong Kong.
Met, M. (1998). Curriculum decision-making in content-based language teaching. In J. Cenoz & F. Genesee (Eds.), *Beyond bilingualism: Multilingualism and multilingual education* (pp. 35–63). Clevedon: Multilingual Matters.
Met. M. (1999, January). *Content-based instruction: Defining terms, making decisions.* NFLC Reports. Washington, DC: The National Foreign Language Center. Retrieved October 14, 2014, from http://www.carla.umn.edu/cobaltt/modules/principles/decisions.html
Mohan, B. (1986). *Language and content*. Reading, UK: Addison-Wesley.
Mortimer, E. F., & Scott, P. H. (2003). *Meaning making in secondary science classrooms*. Maidenhead: Open University Press.
Nikula, T., Dalton-Puffer, C., & García, A. L. (2013). CLIL classroom discourse: Research from Europe. *Journal of Immersion and Content-Based Language Education, 1*(1), 70–100.
Nuttall, C. (1996). *Teaching reading skills in a foreign language*. Portsmouth, NH: Heinemann.
Nuthall, G. A. (2005). The cultural myths and realities of classroom teaching and learning: A personal journey. *Teachers College Record, 107*(5), 895–934.
Painter, C. (1991). *Learning the mother tongue* (2nd ed.). Geelong, Vic: Deakin University Press.

Painter, C. (1996). The development of language as a resource for thinking: A linguistic view of learning. In R. Hasan & G. Williams (Eds.), *Literacy in society* (pp. 50–85). London: Longman.

Painter, C. (1999). *Learning through language in early childhood*. London: Cassell.

Rose, D. (2006). Reading genre: A new wave of analysis. *Linguistics and the Human Sciences, 2*(2), 185–204.

Rose, D. (2010). *Reading to learn—book 1—preparing for reading and writing*. Sydney: Reading to Learn.

Rose, D. (2012a). Integrating SFL theory with literacy teaching. In Z. Yan, J. Webster & F. Yan (Eds.), *Developing systemic functional linguistics: Theory and application.* London: Equinox.

Rose, D. (2012b). *Designing curriculum genres* [PowerPoint slides]. Seminar delivered at the Faculty of Education, The University of Hong Kong, August 23, 2012, Hong Kong.

Rose, D. (2013). *The potential of detailed reading for second language literacy* [PowerPoint slides]. Seminar delivered at the Faculty of Education, The University of Hong Kong, January 22, 2013, Hong Kong.

Rose, D. (2015). Building a pedagogical metalanguage II: Knowledge genres. In J. R. Martin (Ed.), *Appliable linguistics and academic discourse* (pp. 29–58). Shanghai: Shanghai Jiao Tong University Press.

Rose, D., & Martin, J. R. (2012). *Learning to write, reading to learn: Genre, knowledge and pedagogy in the Sydney School*. Sheffield, UK: Equinox.

Rothery, J. (1994/2008). *Exploring literacy in school English (write it right resources for literacy and learning)*. Sydney: Metropolitan East Disadvantaged Schools Program. Republished 2008, Sydney: Adult Migrant Education Service.

Rothery, J. (1996). Making changes: Developing an educational linguistics. In R. Hasan & G. Williams (Eds.), *Literacy in Society*. London: Longman.

Sarasas Affiliated Schools (SAS). (2007). *Grade 4 science* (New edition). Unpublished textbook, SAS, Bangkok, Thailand.

Schmidt, R. (1995). Consciousness and foreign language learning: A tutorial on the role of attention and awareness in learning. *Attention and Awareness in Foreign Language Learning*, *9*, 1–63.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1–23.

Sinclair, J., & Coulthard, M. (1975). *Towards an analysis of discourse*. Oxford: Oxford University Press.

Snow, M. A., & Brinton, D. M. (1988). Content-based language instruction: Investigating the effectiveness of the adjunct model. *TESOL Quarterly, 22*(4), 553–574.

Staver, J. R. (1998). Constructivism: Sound theory for explicating the practice of science and science teaching. *Journal of Research in Science Teaching, 35*(5), 501–520.

Stevens, R. A., Butler, F. A., & Castellon-Wellington, M. (2000). *Academic language and content assessment: Measuring the progress of ELLs*. National Center for Research on Evaluation, Standards, and Student Testing (CRESST), University of California, Los Angeles, CA.

Street, B. V. (2004). Academic literacies and the 'new orders': Implications for research and practice in student writing in HE. *Learning and Teaching in the Social Sciences, 1*(1), 9–32.

Stiggins, R. (2005). From formative assessment to assessment for learning: A path to success in standards-based schools. *Phi Delta Kappan, 87*(4), 324–328.

Stoller, F. L. (2004). Content-based instruction: Perspectives on curriculum planning. *Annual Review of Applied Linguistics, 24*, 261–283.

Stoller, F. L. (2008). Content-based instruction. In N. Van Deusen-Scholl & N. H. Hornberger (Eds), *Encyclopedia of language and education* (2nd ed., Vol. 4, pp. 59–70). Springer Science +Business Media LLC.

Swain, M., & Lapkin, S. (2013). A Vygotskian sociocultural perspective on immersion education: The L1/L2 debate. *Journal of Immersion and Content-based Language Education*, *1*(1), 101–129. doi:10.1075/jicb.1.1.05swa

Swales, J. M. (1990). *Genre analysis: English in academic and research settings*. New York: Cambridge University Press.

Tang, G. (1992). *The effect of graphic representation of knowledge structures on ESL reading comprehension*. Cambridge: Cambridge University Press.

Tavares, N. J. (2015). How strategic use of L1 in an L2-medium mathematics classroom facilitates L2 interaction and comprehension. *International Journal of Bilingual Education and Bilingualism* (Special Issue on Multilingual and Multimodal CLIL). doi:http://dx.doi.org/10.1080/13670050.2014.988115

Tedick, D., & Wesley, P. (2015). A review of research on content-based foreign/second language education in US K-12 contexts. *Language, Culture and Curriculum, 28*, 25–40.

Tsui, A. B. M. (2003). *Understanding expertise in teaching: Case studies of second language teachers*. Cambridge: Cambridge University Press.

Vollmer, H. J. (2007). Language across the curriculum: A way towards plurilingualism. In W. Martyniuk (Ed.), *Towards a common European framework of reference for languages of school education* (pp. 177–192). Krakow: Universität Osnabrück. Retrieved November 2013 from http://www.universitas.com.pl/media/File/Fragmenty/TOW ARDS/mart_2-3.pdf.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1986). *Thought and language*. Cambridge, MA: MIT Press.

Wells, G. (1979). Describing children's linguistic development at home and at school. *British Educational Research Journal, 5*(1), 75–89.

Widdowson, H. G. (2001). Communicative language testing: the art of the possible. In C. Elder, et al. (Eds.), *Experimenting with uncertainty: Essays in honour of alan davies*. Cambridge: Cambridge University Press.

Zimmerman, F. (1989). *English for science*. New Jersey: Prentice-Hall.