Studies in Singapore Education:
Research, Innovation & Practice 4

Lay Hoon Seah · Rita Elaine Silver ·
Mark Charles Baildon *Editors*

The Role of Language in Content Pedagogy

A Framework for Teachers' Knowledge

NIE
NATIONAL INSTITUTE OF EDUCATION SINGAPORE
An Institute of
NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
Springer

Studies in Singapore Education: Research, Innovation & Practice

Volume 4

Changes in education and organisational structure, teacher education, school management, curriculum, and instruction and assessment over the last few decades, and more so in recent years, have contributed significantly to the rapid and systemic improvement in pedagogical quality in Singapore. While the outcomes of Singapore's success are internationally recognised, the processes, reasons and factors that contribute to pedagogical and systemic improvements have not been systematically captured in a comprehensive manner. The series aims to fill the gap by presenting a Singaporean perspective on pedagogical research and innovation, highlighting how Singapore, drawing on knowledge and research done both internationally and locally, has successfully mobilised resources and efforts to improve learning and teaching across the various subject disciplines and education sectors. The series also aims to present education research that will help propel Singapore's education system towards its goal of meeting the challenges of the coming Fourth Industrial Revolution. It includes titles that focus on de-emphasising academic performance in favour of deep and soft skills, on de-emphasising knowledge transmission and rote learning in favour of inquiry methods, applied learning and experiential learning, titles that look into tripartite relationships with students, schools and industry to develop updated experiences with apprenticeships and internships, and titles that address the socio-political blind spots in the Singapore education system in terms of gender, racial and class equity, and others. The series includes monographs that examine Singaporean pedagogies in terms of policies and practices. It also includes edited volumes that will cover, but not be limited to, the following structure: a state-of-the-art review of research and knowledge in the topics covered by and, an introduction of the purpose and the key issues covered by the volume; international and Singaporean experience in these topics, presented in a series of empirical studies or theoretical/conceptual pieces; comparison and synthesis of Singaporean pedagogical research and innovation experiences, and its applicability to other systems; and directions for future research and practice.

Please contact Grace Ma (e-mail: grace.ma@springer.com) for submitting book proposals for this series.

Lay Hoon Seah · Rita Elaine Silver ·
Mark Charles Baildon
Editors

The Role of Language in Content Pedagogy

A Framework for Teachers' Knowledge

Springer

Editors
Lay Hoon Seah
National Institute of Education
Nanyang Technological University
Singapore, Singapore

Rita Elaine Silver
National Institute of Education
Nanyang Technological University
Singapore, Singapore

Mark Charles Baildon
United Arab Emirates University
Al Ain, United Arab Emirates

ISSN 2730-9762 ISSN 2730-9770 (electronic)
Studies in Singapore Education: Research, Innovation & Practice
ISBN 978-981-19-5350-7 ISBN 978-981-19-5351-4 (eBook)
https://doi.org/10.1007/978-981-19-5351-4

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Contents

Contributors

Accurso Kathryn is Assistant Professor of Teaching in the Department of Language and Literacy Education at the University of British Columbia. Previously, she worked at the Center for Applied Linguistics in Washington, DC and in the Master of Arts in Teaching program at Mount Holyoke College where she co-founded the initial licensure program for teachers of English learners. As an applied linguist and former K-12 English language teacher, her work focuses on the relationship between literacies, equity, and teacher education, particularly how to best prepare K-12 teachers for work with multilingual students in the face of structural inequities. Her work has earned awards from the American Educational Research Association (AERA), The International Research Foundation for English Language Education (TIRF), and TESOL International, in addition to being published in numerous books and journals for teachers, teacher educators, and second language and literacy researchers (e.g., *Language and Education, Journal of English for Academic Purposes, TESL Canada* and practitioner-oriented journals TESOL Journal, MATSOL Currents and *SPELT Quarterly*).

Adams Jonathon is a Senior Specialist, English Language, at the English Language Institute of Singapore, Ministry of Education, Singapore. He develops resources and professional learning for educators in the areas of disciplinary literacy and effective communication for primary, secondary and post-16 education contexts. Jonathon trained as a secondary teacher and taught art in the UK and English communication at a national university in Japan. His research interests include examining the roles of technology, language and digital texts for teaching and learning. He has published research exploring these interests in journals including *Multimodal Communication, Pedagogical Linguistics* and *Learning: Research and Practice.*

Ardell Lillian is the founder of Language Matters, LLC. In her work as lead staff developer, she brings theoretical lenses to the practical application of teaching practices that center the role of language acquisition and biliteracy to teachers who work in linguistically diverse classrooms. She holds a degree in Bilingual Education from NYU Steinhardt's School of Education, where she became interested in teacher attitudes towards language and the complex ways these views inform their work with

bilingual learners. Through Language Matters, Dr. Ardell currently works as a biliteracy expert for grant-funded research projects while also serving school districts with high percentage of emergent bilingual learners across the US.

Baildon Mark Charles is an Associate Professor in Foundations of Education at the United Arab Emirates University. His research and teaching interests focus on ways to support social studies inquiry practices, global citizenship education and 21st century literacies to address global issues. He has published in the *Cambridge Journal of Education, Curriculum Inquiry, Education Policy Analysis Archives, Cognition & Instruction, Journal of Adolescent & Adult Literacy, Teaching and Teacher Education,* and *Compare*. He has published three books: *Social Studies as New Literacies in a Global Society: Relational Cosmopolitanism in the Classroom (with James Damico; Routledge, 2011), Controversial History Education in Asian Contexts (co-editor; Routledge, 2013),* and *Research on Global Citizenship in Asia: Conception, Perceptions, and Practice (with Theresa Alviar-Martin, Information Age Publishing, 2021).* He serves on the editorial boards of *Theory & Research in Social Education* and the *Asia-Pacific Journal of Education*.

Bunch George C. is Professor and incoming Chair of the Education Department at the University of California, Santa Cruz. An experienced K-12 ESL and social studies teacher and teacher educator, he holds a PhD in educational linguistics from Stanford University and an MA in bilingual education and TESOL from the University of Maryland Baltimore County (UMBC). His research focuses on language and literacy for multilingual learners in K-12 and higher education and on policies, instruction, and teacher preparation for this population. He was awarded a Spencer Foundation Midcareer Grant to serve as a visiting scholar at the Carnegie Foundation for the Advancement of Teaching, a National Academy of Education/Spencer Postdoctoral Fellowship, and the Midcareer Award from the Second Language Research Special Interest Group of the American Educational Research Association. He serves on the Editorial Board for the *International Multilingual Research Journal* (IMRJ) and has published in numerous journals, including *Review of Research in Education, TESOL Quarterly, Journal of Second Language Writing, Linguistics and Education, Language and Education, Science Education, Community College Review,* and the *Yearbook of the National Society for the Study of Education (NSSE).* His most recent book (with Aída Walqui) is *Amplifying the Curriculum: Designing Quality Learning Opportunities for English Learners* (Teachers College Press, 2019).

Fang Zhihui is a Professor of Education in the School of Teaching and Learning at the University of Florida, USA. He specializes in language and literacy education, English teacher education, and functional linguistics in education, and is active in promoting "a linguistically informed, responsive, and embedded pedagogy" for disciplinary literacy instruction. He has served as author, column editor, editorial board member, or guest reviewer for over three dozen national and international journals in language/literacy education and related fields. His research explores different ways knowledge and ideology are constructed through language in different

academic disciplines, the challenges these ways of using language present to disciplinary reading and writing, and evidence-based strategies for addressing these challenges. His work has appeared in *Australian Journal of Language and Literacy, International Journal of Science Education, Journal of Adolescent and Adult Literacy, Journal of English for Academic Purposes, Journal of Literacy Research, Journal of Mathematical Behavior, Journal of Teacher Education, Linguistics and Education, Research in the Teaching of English, Science Education, Topics in Language Disorders,* and *Written Communication,* among others. His latest books include *Demystifying Academic Writing: Genres, Moves, Skills and Strategies* (New York: Routledge, 2021) and *Using Functional Grammar in English Literacy Teaching and Learning* (Beijing: Foreign Language Teaching and Research Press, 2021).

Fitzgerald Jason C. is an Assistant Professor of Curriculum and Instruction at Monmouth University in West Long Branch, New Jersey. As a former social studies teacher, his research interests center on ways to support social inquiry both through the teacher preparation process and in the Kindergarten-12th grade classroom. He has published in the *Peabody Journal of Education, The Clearing House,* the *Journal of International Social Studies, Social Studies Research and Practice,* and *The Social Studies*. He has also co-authored a recent book through Rutgers University Press, *Mapping the Way from Teacher Preparation to edTPA Completion*, focusing on curriculum design that incorporates teacher and student language awareness.

Ho Caroline is a Lead Specialist at the English Language Institute of Singapore, Ministry of Education. She is concurrently serving at the MOE Professional Development Policy Office. Her research interests include disciplinary literacy, design research in new media, writing and argumentation pedagogy. She has published in *Computers and Education, Computer Assisted Language Learning, Journal of Applied Linguistics* and *Innovation in Language Learning and Teaching* among other publications.

Levasseur John is a veteran educator with more than 20 years teaching experience on 3 continents. Early on, he taught English as a foreign language in Tanzania and China; however, most of his career has been spent as a high school chemistry teacher in the United States. For the last decade, he has combined these passions for language and science to teach secondary science courses for English language learners in an urban school district in Western Massachusetts. In addition, he is currently working on his doctorate at the University of Massachusetts, Amherst in the Teacher Education and School Improvement program. His research interests include the application of Halliday's theory of language (systemic functional linguistics or SFL) in secondary STEM classrooms and how to teach language in science as a means of teaching the topics and concepts of science. He has presented on these topics at major conferences such as TESOL and AERA, as well as local and regional conferences.

Lim Fei Victor is Assistant Professor at the National Institute of Education, Nanyang Technological University, Singapore. He is interested in how and what we should teach learners in today's digital age. As an educator and education researcher, he researches and teaches on multiliteracies, multimodal discourse analyses, and

digital learning. Fei Victor Lim is an editor of *Multimodality and Society* and an associate editor of *Asia Pacific Journal of Education,* and *Designs for Learning*. He has published in several top-tier journals on multimodality in education and is author of the book *Designing Learning with Embodied Teaching: Perspectives from Multimodality* published in the Routledge Studies in Multimodality in 2021.

Lin Yunqing was a Research Associate at the National Institute of Education, Nanyang Technological University. She has extensive research experience in quantitative and qualitative research design in the fields of linguistics and data analytics. She has published in *HSSE Online*, and currently works as a data analyst in the private sector.

Patrick Jennifer Drake is an Associate Professor in the School of Education at George Mason University in Fairfax, Virginia, USA. Her research interests include adolescent and disciplinary literacy, literacy coaching, and teacher professional learning. Her work has appeared in the *International Journal of Science Education, Educational Leadership*, and the *STEM Roadmap Curriculum Series.*

Prain Vaughan formerly a Professor in Science Interdisciplinary Education Research at Deakin University, is currently a Research Officer in the School of Education at this University. His research interests include the role of writing in learning in science, and more recently in how this mode relates to other modes, such as visual, mathematical and embodied modes in reasoning about, and constructing understanding of, scientific concepts and processes. His current research focus is on how learning in science can be enhanced by incorporating strategies and approaches used in other subjects, including visual arts. He has published widely in peak science education journals, including *Journal of Research in Science Teaching,* the *International Journal of Science Education*, and the *International Journal of Science and Mathematics Education.*

Seah Lay Hoon is a Senior Research Scientist with the Office of Education Research, National Institute of Education, Singapore. As a former secondary science teacher, she encountered first-hand how her students struggled with the use of language in science. Her research interests encompass teacher professional learning, classroom discourse analysis and disciplinary literacy, particularly in the context of science education. Currently serving as the managing editor of *Asia Pacific Journal of Education*, she has published in *Science Education, Computers & Education, International Journal of Science Education, Research in Science Education, International Journal of Science and Mathematics Education* and *School Science Review*.

Seow Tricia is Senior Lecturer in Humanities and Social Studies Education at the National Institute of Education, Nanyang Technological University. Her research interests include geographical inquiry in the classroom and in place-based learning, signature pedagogies in sustainability education, and teacher identities and practice. She has published in *International Research in Geographical and Environmental Education, Theory and Research in Social Education, Journal of Geography, Social Education* among others. She has co-edited a book on *Learning Geography Beyond*

the Traditional Classroom. She is Associate Editor of *Pedagogies: An International Journal* (Taylor & Francis), the co-chair of the Sustainability Learning Lab at the National Institute of Education, and Honorary Secretary of the Southeast Asian Geography Association.

Silver Rita Elaine is an Associate Professor in English Language and Literature and Associate Dean for Research Design & Integrity at the National Institute of Education, Nanyang Technological University. She has published in *International Journal of Science Education, Journal of Teacher Education, International Journal of Multilingualism, International Journal of the Sociology of Language, Language Policy* and *AERA Open*, among others. Her research interests include teacher professional learning, language and literacy development, classroom discourse, language policy, research management and research ethics, and open science in educational linguistics. She is editor of *Language & Education* (Taylor & Francis). She serves on the editorial boards for *Educational Linguistics, Journal of Immersion and Content-Based Language Education, Language Policy* and the editorial review boards for *TESL-EJ* and *TESOL Journal*.

Stanley Julie is a Teaching Assistant Professor in the department of Elementary and Middle Grades at East Carolina University (ECU). Her experiences as a National Board Certified Teacher developed an interest in language acquisition and application in elementary-aged students. In her current role, Julie challenges the assumptions about language held by pre-service and in-service teachers. Her work aims to strengthen teachers' awareness of the significant role that language plays in learning and the critical nature of intentional planning of support for each language demand. She has published in *Action in Teacher Education.* Her additional research interests include teacher efficacy, beginning teacher support, and teaching in poverty.

Tan Kim Chwee Daniel is Associate Professor at the National Institute of Education, Nanyang Technological University, Singapore. He obtained his B.Sc.(Hons) and Diploma in Education from the National University of Singapore, and M.Sc. and Ph.D. from Curtin University of Technology. He taught chemistry in secondary school for 8 years before moving on to teacher education at the National Institute of Education. He is an Editorial Board member of the *International Journal of Science Education, International Journal of Physics & Chemistry Education*, and *Disciplinary and Interdisciplinary Science Education Research.* He is also an Advisory Board member for the *Royal Society of Chemistry Advances in Chemistry Education Series, Chemistry Education Research and Practice, Pedagogies: An international Journal*, and the *Journal of the Turkish Chemical Society, Section C: Chemical Education.* His research interests are: chemistry curriculum, translational research, ICT in science education, students' understanding and alternative conceptions of science, multiple representations and practical work.

Wrenn Melissa is an Assistant Professor of Elementary Education at East Carolina University. She has published research in *Action in Teacher Education, Journal of Adolescent and Adult Literacy, Journal of Ethnographic & Qualitative Research,*

Journal of Children's Literature, Roeper Review, among others. Her research interests include classroom discourse, disciplinary literacy, and teacher education. She employs a variety of methodologies including case study, action research, Q Methodology, design-based research, and others. Melissa teaches methods courses to those seeking licensure in elementary education and works to bring critical literacy and discursive practices to the forefront of teacher training. She is also a National Board Certified Teacher in the area of literacy: reading and language arts for early and middle childhood.

Yeo Jennifer is Associate Professor at the Singapore University of Social Sciences, Singapore. Prior to that, she was Assistant Professor at National Institute of Education (NIE), Nanyang Technological University, Singapore. She obtained her Ph.D. from Nanyang Technological University, Singapore. She was a physics teacher in secondary school for 8 years and thereafter, a physics teacher educator at NIE. Her current work includes academic professional development in the areas of teaching and learning. She is also an Editorial Board member of the *International Journal of Science Education*, and an Associate Editor of *Learning: Research and Practice.* Her research interests includes students' meaning making, multimodality, and teacher education.

Yoder Paul J. is an Assistant Professor of Teacher Education at Eastern Mennonite University. Paul's scholarship interests include the teaching and learning of history among culturally and linguistically diverse student populations. Paul's publications and conference presentations have additionally addressed issues related to acknowledging trauma in education, language learning, Mennonite education, student identity, and the enacted curriculum.

Chapter 1
Introduction to the Volume: Mapping the Language-Related Knowledge Base for Content Teaching

Lay Hoon Seah, Rita Elaine Silver, and Mark Charles Baildon

1.1 Introduction

In this volume, we focus on the language-related knowledge base (LRKCT) for content teachers, i.e., those who are not teaching language as an academic focus. Taken together, the chapters in this volume build on and illuminate the LRKCT framework proposed in this chapter. The framework comprises four interacting knowledge components (plus one sub-component) which are important for content teachers to utilise. In addition to explaining the framework, this introductory chapter provides background to show the links between content and language in learning, including discussion of teacher roles in relation to language use in the classroom. After explaining the broad theoretical underpinnings of the volume, this introduction culminates with a brief description of each chapter and how each fits within the volume's broader conceptualisation and the LRKCT framework.

L. H. Seah (✉) · R. E. Silver
National Institute of Education, Nanyang Technological University, Nanyang Walk 1, Singapore 637616, Singapore
e-mail: lhseah@nus.edu.sg

R. E. Silver
e-mail: rita.silver@nie.edu.sg

M. C. Baildon
College of Education, UAE University, Sheikh Khalifa Street at Tawam R/A, Maqam District, Al Ain, United Arab Emirates
e-mail: mark.baildon@uaeu.ac.ae

L. H. Seah et al. (eds.), *The Role of Language in Content Pedagogy*,
Studies in Singapore Education: Research, Innovation & Practice 4,
https://doi.org/10.1007/978-981-19-5351-4_1

1.1.1 Background: Language in Learning

Learners encounter multiple languages in the course of schooling. These can include home language(s) and foreign languages, as well as academic language and disciplinary languages. In any learning situation, consciously or otherwise, students experience the learning of and about language through a multiplicity of languages.

We take language as a semiotic ('meaning-making') tool which is the foundation of learning (Halliday, 1993). Without language and other semiotic tools, humans would not have the means of knowing, i.e., "the process by which experience **becomes** knowledge" (original emphasis, ibid., p. 94). According to this view, the process of learning is fundamentally a semiotic one involving not just "learning *through* language" but also "learning *of* language" and "learning *about* language" (p. 113). This threefold perspective (through, of, about) applies not only to learning in a language classroom but to all learning processes, contexts (including home, neighbourhood, school and workplace) and contents (e.g., science, social studies, mathematics).

The links between language and content have been recognised for decades. For example, Mohan's seminal work (1986) devoted the first chapter to explaining the role of language as a medium for learning in contrast to language as a goal of learning. Mohan posited a knowledge framework which linked types of activities (e.g., classification) with types of language (e.g., description). He referred to these as "knowledge structures" as they required not only linking types of learning activities with language structures but also with thinking skills appropriate to the activity and language. Subsequently, a number of monographs explored the role of language in content learning, but often with a view towards supporting language learners in content area classes (e.g., Brinton et al., 1989; Cantoni-Harvey, 1987; Crandall & Dale, 1987). This area of scholarship is still vibrant, especially with investigations of theory–pedagogy links such as Content and Language Integrated Learning (CLIL, e.g., Cenoz et al., 2014; de Zarobe, 2016), including CLIL and teacher education (e.g., Banegas & del Pozo Beaumud, 2020; Darvin et al., 2020; Pérez Cañado, 2016), and language immersion-based content instruction (Navejas, 2022; Ó Ceallaigh et al., 2021). This volume, in contrast, focuses on content teachers and the need for a language-related knowledge base that extends beyond student language learning status.

In education research, the importance of language in learning has been widely recognised since the emergence of the "linguistic turn" (Veel, 1993) or the "interactional turn" (Erickson, 2006). For example, Lemke (1990) proclaimed that "learning science means learning to talk science" (p. 1). This is equally true in other content areas. Wagner (2007), for example, wrote about the critical need for students to develop "voice" in mathematics. Dombek et al. (2017) stressed the link between literacy and content for building science and social studies knowledge, while Duff (2010) emphasised the role of socialisation into academic discourse communities for all learners. These statements on the importance of language in content learning assume that language differs in some ways from one discipline to another. A key

consideration in this volume is the extent to which teachers are aware of such differences and how these differences might be usefully addressed to support student learning.

To meet the needs and requirements of specific content in a given context, language changes in meaningful, functional ways (Halliday & Martin, 1993). These language changes may relate to conceptual, ontological or epistemological distinctions across disciplines. For this reason, language as used in one discipline may contain features, linguistic resources, norms and conventions distinct from the features, resources, norms and conventions in another discipline even if both disciplines are being taught in the same linguistic variety (e.g., in English) (see for example, Schleppegrell, 2004). Differences between disciplinary languages can extend to differences in literacy practices such as reading (Shanahan et al., 2011). For instance, Shanahan et al. (2011) found that critique during reading by chemists, historians and mathematicians differed in nature. They asserted that these different reading practices provide "clear evidence" that the disciplinary expertise the readers brought with them could influence the ways in which readers engaged with the texts (p. 424). Disciplinary differences in reading extend beyond words or linguistic structures. They also encompass the use of multiple semiotic modes (e.g., graphs, diagrams, photographs, charts) which serve distinctive purposes and embodied unique conventions (see, e.g., Prain, this volume; Yeo & Tan, this volume). As every discipline comes with its own epistemic values and ontological requirements, further research is needed to unpack how these disciplinary differences can impact on the nature of the language and literacy practices of each discipline and teachers' language-related knowledge base.

K-12 students do not just engage in the disciplinary languages of the various subject areas they are exposed to, they also encounter multiple uses of language in everyday life. Using a science classroom as an example, Yore and Treagust (2006) introduced the "three-language problem" to encapsulate the different languages a learner encounters: home language (i.e., everyday conversational language); academic language [for our purposes, this refers to the linguistic variety used in schools and for schoolings (see Schleppegrell, 2004)]; and scientific language. In an increasingly globalised world, the home linguistic variety of the learner can and often does vary from the linguistic variety used as a medium of instruction in school. In such cases, learners grapple with learning academic language with and through a different linguistic system. Extending the three-language notion to learning in other disciplinary areas, students must learn multiple "languages" including one or more home linguistic varieties, one or more school linguistic varieties, multiple disciplinary languages and how to leverage these multiple languages in their learning.

While we acknowledge that students experience learning through, of and about language, this volume focuses on the teacher's roles, knowledge and understandings of language in school contexts to support student learning. We consider teachers' knowledge of and about language, the influence of teachers' knowledge of (their) students and teachers' pedagogical knowledge. We are particularly interested in how teachers' knowledge of language, students and content are linked as part of a larger pedagogical content knowledge which includes knowledge of the role of language in content learning.

1.1.2 Teachers' Roles

Classroom teachers take on multiple roles. In addition to the role of content teacher and teacher of disciplinary language, they must concurrently be proficient language users. To support students in learning disciplinary languages, teachers must develop a deep appreciation of the language demands and challenges involved in the learning process. This entails being an analyst of the language. These three distinct roles—language teacher, language user and language analyst (cf. Andrews & Lin, 2017)—encapsulate the demands placed on teachers and point to the knowledge base that teachers need to be equipped with to take on a "language-informed" approach to teaching, an approach to teaching that explicitly and systematically considers the role and nature of language in and for student learning (Fillmore & Snow, 2018).

Teacher language awareness (TLA), characterised by Thornbury as "the knowledge that teachers have of the underlying systems of the language that enables them to teach effectively" (1997, p. x), provides one potentially useful lens for identifying the knowledge base with which content teachers would need to take on a language-informed approach to teaching. TLA has been closely associated with knowledge of language needed for language teaching (see Andrews, 2003, 2006 for reviews and discussion in relation to second language teacher professionalism). This notion has also been implicated in second language teachers' knowledge about language and knowledge of students to support selection of language resources, design language scaffolds and deliver corrective feedback on students' language use (Andrews, 2008). In taking a language-informed approach, content teachers are expected to make pedagogical decisions similar to those of language teachers, albeit with a focus on disciplinary semiotics. Hence, the components of TLA such as knowledge of language (KL), knowledge about language (KAL) and knowledge of students (KS) offer useful constructs for unpacking the language-related knowledge base of content teachers.

Notably, Fillmore and Snow (2000) highlighted what "the average classroom teacher" (p. 13) should know for language/literacy in content teaching. Adger et al. (2018) articulated why basic language knowledge (e.g., differences between oral and written language; fundamentals of language development, linguistics and cultural diversity; what makes texts easy/difficult to read) is essential to all teachers, including content teachers. However, these early discussions did not develop a framework for understanding and investigating a language-related knowledge base (LRKCT) for content teachers.

In the next section, we articulate a framework for LRKCT based in prior scholarship and as the basis for this volume. We turn the lens away from language awareness as a broad approach and from the teaching of linguistic varieties to teaching of other content subjects.

1.2 Language-Related Knowledge Base for Content Teaching (LRKCT)

Several constructs have been proposed in recent years to capture the components of a language-related knowledge base that teachers need to support students in their learning of content. Examples are "pedagogical language knowledge" (PLK, Bunch, 2013), "language knowledge for content teaching" (LKCT, Morton, 2016) and disciplinary linguistic knowledge (DLK, Turkan et al., 2014). These constructs have been proposed in response to the challenges of teaching in contemporary classrooms that are often composed of students of varied cultural and linguistic backgrounds, students who are learning language and content concurrently. It is our contention that the language-related knowledge base proposed below is equally relevant for teaching in monolingual classrooms, albeit to a different extent from multilingual ones, since disciplinary languages are distinctive. Thus, all content teachers need a strong LRKCT.

We distinguish this knowledge base from the well-known construct pedagogical content knowledge (PCK) (Shulman, 1986, 1987). PCK links teachers' content knowledge, general pedagogical knowledge and specific pedagogical knowledge relevant for the subject content. This knowledge is seen as being unique to teachers. Similarly, we see LRKCT as a specialised body of knowledge, unique to content teachers. It serves to inform how content teachers represent content knowledge linguistically as well as supporting the learning of general academic discourse and disciplinary-specific language/literacy practices. In the following sub-sections, we outline the components constituting this knowledge base, synthesised from scholars such as Andrews and Lin (2017), Bunch (2013), Love (2009), Morton (2016), Turkan et al. (2014). These components include knowledge of language, knowledge about language, knowledge of students and pedagogical knowledge (with a sub-component knowledge of the role of language).

1.2.1 Knowledge of Language (KL)

This component (KL) refers to the linguistic competence of a teacher, including both the medium of instruction (the linguistic variety used), academic language (which, for our purposes, refers to the school-based language used for teaching that differs in many ways from conversational language) and the specific disciplinary language (Morton, 2016). KL encompasses the implicit knowledge held by teachers and manifested procedurally in practical language skills when talking, listening, reading and writing. KL represents the essentials of what teachers need to be able to communicate effectively in the medium of instruction and to represent the content of the subject in ways that are aligned with disciplinary standards and norms. Among the three teacher roles, KL would be of particular importance for a teacher as a language

user when communicating the content knowledge and as a language analyst when examining student work for language errors (Morton, 2016).

1.2.2 Knowledge About Language (KAL)

In contrast to KL, which is implicit, knowledge about language (KAL) refers to the explicit, conscious (i.e., declarative) knowledge of the nature of language (Essen, 2008). This comprises the different aspects and features of academic language and disciplinary language such as structural components, use of linguistic resources and disciplinary-specific conventions and norms of language use. The declarative knowledge that constitutes KAL also includes metalingual knowledge, that is, knowledge of the metalanguage used to label and describe linguistic features, categories, functions and conventions (cf. Andrews, 2007). KAL enables teachers to "explain the linguistic forms and discourse structures they are using" (Morton, 2016, p. 278), and thus equips teachers with tools for the role of language analyst. In the classroom, KAL also provides the tools and resources for the role of language teacher when explaining to students the nature, purposes and practices distinctive to the discipline. This teacher role is especially important given calls for more explicit instruction to help students access and master disciplinary language and literacy skills (Brown & Ryoo, 2008) given their distinctiveness across subjects (Schleppegrell, 2004; Shanahan et al., 2011).

1.2.3 Knowledge of Students (KS)

Knowledge of students (KS) identifies the knowledge that teachers have of their students in order to help the students develop academic and disciplinary language. Less developed in previous scholarship than the other knowledge components, the KS component is generally taken to include the language background of individual students (Rollnick et al., 2008). Language backgrounds of students, in this case, would include the linguistic varieties used at home as well as students' proficiency in the medium of instruction. Few studies have sought to unpack KS as related to disciplinary languages. One case study that examined the KS of a science teacher uncovered five aspects of KS beyond that of students' language backgrounds. These aspects were (i) prior knowledge of and about scientific language, (ii) difficulties with scientific language and its use, (iii) differences in ability across language skills, (iv) differences in language ability across subject areas and (v) learning progress in language use over time (Seah & Chan, 2021). A teacher's KS can relate to students in general, to specific groups of students or even to individual students. KS is related to KL in that the former is generated through evaluating students' linguistic performances against the latter. KS enables a teacher to attend to the emerging and evolving language needs of students and to adjust pedagogy in a responsive and contingent

manner. While KS is manifested in the teaching of the disciplinary language, it is generated when teachers take on the role of language analyst when examining students' language in reference to the disciplinary language.

1.2.4 Pedagogical Knowledge (PK)

In this framework, pedagogical knowledge (PK) includes both the declarative knowledge of the pedagogical strategies and approaches that are available for supporting instructional and disciplinary language learning as well as the instructional knowledge that is manifested when a teacher engages in teaching in the classroom. PK comprises the knowledge for engaging students in the disciplinary language, modelling and unpacking the use of the language as required in the curriculum (Turkan et al., 2014). PK may be explicit or tacit. It interacts with the other knowledge components as the teacher engages in pedagogical decision-making. PK is particularly important since it directly determines how lessons are planned and enacted as well as teacher responses during lessons.

1.2.4.1 Knowledge of the Role of Language (KRL)

Subsumed within pedagogical knowledge is knowledge of the role of language (KRL) (Love, 2009). KRL refers to knowledge about the role that oral language and written language serve in the teaching and learning of the disciplinary language. Oral and written language include whole class discourse, student-to-student interactions, textbooks and other written teaching and learning materials that function to illustrate, unpack and scaffold how disciplinary language is used in the context of the classroom. KRL encompasses the knowledge of the various functions that language as a whole serves in learning [e.g., as a cultural, cognitive and semiotic tool (Halliday, 1993; Vygotsky, 1986)] and in the discipline [e.g., as a communicative, rhetorical and epistemic tool in a science classroom (Carlsen, 2007)]. It also includes how classroom talk, whether as teacher–student or student–student interaction, reading/writing and visual representations can support and enhance learning (Love, 2009). In other words, KRL concerns language use for general instructional purposes and using language to meet the needs of all learners in classrooms. This knowledge component plays a direct role in supporting the teacher in the role of language user and teacher and even as language analyst.

While some prior scholarship has explored the knowledge constructs which are part of the LRKCT for content teaching, those studies were mainly theoretical or review studies which sought to highlight the importance of knowledge components for teacher professional learning. Among these are teacher language awareness (TLA, Andrews & Lin, 2017), Pedagogical Language Knowledge (PLK, Bunch, 2013), literacy PCK (Love, 2009), Common and Specialised Language Knowledge for Content Teaching (CLK-CT and SLK-CT, Morton, 2016) and disciplinary linguistic

Table 1.1 Knowledge components discussed in prior scholarship

Knowledge construct	KL	KAL	KS	PK
Teacher language awareness (Andrews & Lin, 2017)	Briefly	√	Briefly	√
Pedagogical language knowledge (Bunch, 2013)		√		√
Literacy PCK (Love, 2009)		√		√
Common and specialised language knowledge for content teaching (CLK-CT and SLK-CT, Morton, 2016)	√	√		√
Disciplinary linguistic knowledge (DLK, Turkan et al., 2014)		√		√

knowledge (DLK, Turkan et al., 2014). Table 1.1 highlight links between the four main constructs of LRKCT and prior scholarship.

Except for CLK-CT and SLK-CT (Morton, 2016), which elaborated and exemplified the importance of KL, other studies have mentioned KL briefly or taken it for granted. For instance, Andrews and Lin (2017) identified "knowledge of the language (i.e., language proficiency)" (p. 59) as a component of TLA, but they did not elaborate on the nature and role of this knowledge. Also, although Andrews and Lin (2017) mentioned the importance of an "awareness of students' developing interlanguage" and of the "knowledge of the learners" (pp. 58–59), for the most part, these studies did not unpack the content of KS as is done in this volume.

1.2.5 Mapping LRKCT

In our conceptualisation, LRKCT comprises four knowledge components: KL, KAL, KS and PK (with the sub-component of KRL). It is important to be clear that the distinctions between the various knowledge components are for analytical and theoretical purposes. In teaching, these knowledge components are likely to be utilised in a synthesised manner. Crucially, the knowledge components interact with one another to enable a teacher to serve the roles of a language user, language analyst and language teacher in the context of a content classroom.

Figure 1.1 shows our conceptualisation of how these knowledge components map to each other. There are three broad segments: the main components of LRKCT, the roles of teachers for enactment and the links to student learning.

The main components of LRKCT are positioned at the top of Fig. 1.1: KL, KAL, KS and PS. As mentioned above, KL includes knowledge of common and specialised language for content teaching (Morton, 2016), whereas KAL includes knowledge of academic language and disciplinary languages, and KS includes knowledge of the students' everyday languages. KS also includes the sub-component of KRL. A few specific details are included to show further mappings, e.g., common/specialised language knowledge as more detailed aspects of KL; students' everyday, instructional, disciplinary language as more specific aspects of KS.

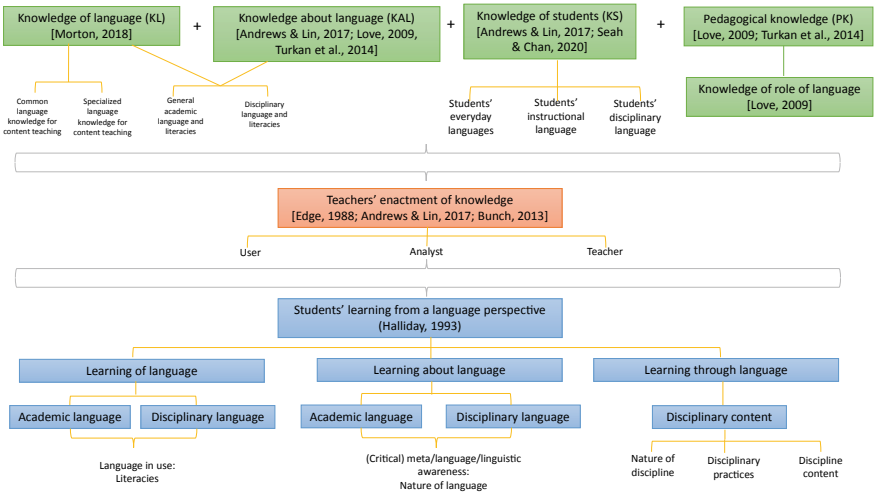

Fig. 1.1 Language-related knowledge base for content teaching (LRKCT)

The link between the main components and teacher roles as language user, language analyst and language teacher is shown in the centre of the figure. This also captures the positioning of teacher roles in classroom enactment.

Students' learning—encompassing the learning of, about and through language and linked with (general) academic language and disciplinary language—is shown at the bottom of the figure. Ultimately, language learning and learning in content instruction require language in use in the form of disciplinary literacies, while learning about language leads to awareness of the nature of language which constitutes students' (critical) meta/linguistic/language awareness depending on the extent of their KAL. Finally, learning through language refers to the learning of the disciplinary content, practices and its epistemic and ontological nature that is made possible through language. This connects to teachers' knowledge and enactment as contributors to students' learning.

The segments of the visual representation are not intended to be interpreted as hierarchical but as interactive. For example, students' learning can act as a feedback mechanism to teacher enactment and support continual teacher knowledge development.

1.2.6 LRKCT for Content Teaching and the PCK of Language Teachers

We recognise links between the LRKCT for content teaching and the PCK of a language teacher: these overlap when content teachers explicitly teach academic language as part of teaching content, with academic language serving as the conduit

by which the distinctive features and conventions of the disciplinary language are manifested. Nonetheless, the scope for content teachers to prioritise the teaching of academic language is less than the scope of a language teacher.

In this volume, our focus is on content teaching and content teachers which we see as being distinct from teaching a specific linguistic variety. Depending on the curriculum, language teachers are usually not expected to teach the distinctiveness of various disciplinary languages. Exceptions might be classes emphasising Language for Specific Purposes, typically English for Specific Purposes (ESP). ESP refers to "… the teaching and learning of English as a second or foreign language where the goal of the learners is to use English in a specific domain" (Paltridge & Starfield, 2013, p. 2) (e.g., medical English, English for tourism). Thus, ESP has a strong content component but the focus is on language learning. A recognised sub-field is English for Academic Purposes (EAP) which stresses language learner needs for academic language in general. This includes both native and non-native speaker needs and encompasses needs of students (K-12 and tertiary) and academics (especially non-native English users who use English for international, scholarly communication). Though the goal of ESP is usually to address the needs of specific learners (e.g., hotel workers or research students), the research has been criticised as being overly normative, prioritising English not as *an* academic language but as *the* academic language and neglecting the social–political influences on language use and learning in academic contexts. One useful point we take away from studies of EAP is the importance of considering learner needs not simply to instil normative practices but to understand disciplinary practices as social and to consider specific socio-political–contextual concerns as they link to LRKCT. Charles (2013) provides an overview of EAP but for our purposes it is sufficient to note that while there are some overlaps of interest, EAP still tends to be focussed more on language learning than on language-related knowledge for content learning.

1.2.7 LRKCT and the PCK of Content Teachers

Among previously published studies, there exist different views on the boundary between the constructs of LRKCT and PCK. While Bunch (2013) conceived of Pedagogical Language Knowledge (PLK) as conceptually distinct from PCK, Love positioned literacy PCK as part of the PCK of content teachers. The latter viewed teachers' understanding of "the role of language and literacy in learning disciplinary content" as "a key component" of PCK (p. 541). She identified three sub-components when unpacking literacy PCK: (1) "knowledge about how spoken and written language can be best structured for effective learning"; (2) "recognition that subject areas have their own characteristic language forms and hence entail distinctive literacy practices"; and (3) "capacity to design learning and teaching strategies that account for subject-specific literacies and language practices" (p. 541). She discussed these sub-components as constituents of KAL that are essential for teachers to acquire as they progress in their professional development. The lack of clarity on boundaries may

stem from a lack of consensus of what constitutes PCK. By contrast, the LRKCT framework distinguishes between the three sub-components by characterising (1) and (3) as PK and (2) as KAL, hopefully bringing more clarity to the distinctiveness of each component as well as coherence to the ways the components are interrelated.

As research on such a knowledge base is limited, it is perhaps unrealistic to draw a clear boundary between the LRKCT and PCK of content teachers, let alone comment on how the two constructs interact with each other. The intricate interrelationships between language and content (Fang, 2014) also mean that there are likely to be aspects of knowledge that involve both. Nonetheless, as noted by Morton (2016), "it is important to conceptually map out the types of knowledge in order to move towards adopting measures to facilitate their development in teachers", distinguishing the language and content dimensions in teacher knowledge base is thus "both an analytic and a practical move" (p. 278). We note that both LRKCT and PCK have sociocultural underpinnings. The teachers' knowledge base of language, pedagogy and the content they teach is always situated in the particular contexts of their teaching and professional learning. This volume is intended to conceptually map this knowledge base as an analytic and practical move and offers chapters that demonstrate how components of this knowledge base are both mobilised and developed when teachers confront the daily problems of their professional practice. While more research is needed to understand how teachers develop and can be supported to develop a language-related knowledge base for content teaching, it is our hope that this volume illuminates some of the ways the LRKCT and PCK of content teachers are interrelated and mutually reinforcing.

1.3 Overview of the Volume

1.3.1 Sociocultural Perspectives

The chapters address different academic subjects (e.g., physics, history), but there are common themes of teacher professional learning through engagement in collaborative studies, inquiry-based learning and knowledge building approaches to teaching and learning. In addition, the studies suggest ways to enhance LRKCT through pedagogical resources and implementations which incorporate classroom dialogue and talk moves, read-alouds, functional literacy and multimodality.

In addition, the chapters in this volume all locate their work within a sociocultural perspective on language and learning, broadly defined. Briefly, the work presented in this volume sees language and learning, including teacher professional learning, as socially, historically and culturally situated. Culture, in this view is seen as a system of meanings which can be linked to notions of practice (Göncü & Gauvain, 2012). This view aligns with the studies in this volume which investigate the systems of meaning and semiotic practices which are part of language-informed content teaching. Each empirical study focuses on a specific context for teacher professional