Attention to Language in English-Medium Instruction in High School and University Settings in South Korea

Jiye Hong

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Applied Language Studies and Linguistics, the University of Auckland, 2021.

Abstract

English-medium instruction (EMI) has become prevalent worldwide due to the recent trend towards the internationalisation of higher education (HE), and South Korea is no exception. In South Korea, EMI is well established in HE and has recently begun to emerge also in secondary education. Most previous research in EMI focuses on policies or participant perceptions of EMI. Limited research to date has focused on the actions taken by content teachers to foster their students' disciplinary English development. This study examined the kinds of language support that content teachers and lecturers provided in their planned and incidental teaching practices and whether the attention to disciplinary uses of English in their incidental teaching practices appeared to lead to students' learning.

The study was conducted in a high school and university in South Korea. It investigated content teachers' planned and incidental attention to disciplinary uses of English in two Social Science and two Mathematics EMI classes. A comparison was also made between the high school and university. A mixed-method design was used, including classroom observation and analysis of transcripts, interviews and document analysis, and language tests. The teachers' planned practices were examined through an analysis of their teaching materials and interviews with them about their roles and intentions to support their students' development of disciplinary uses of English. Results revealed that the teachers and lecturers perceived highlighting disciplinary uses of language was integral to their EMI roles and that they included planned attention to language in their materials. The teachers' incidental attention to language was examined through an analysis of language-related episodes (LREs) arising during classroom interaction. A total of 430 LREs were identified from around 21 hours of naturally occurring classroom recordings, which indicated that shifts of attention from content to language were frequent during classes. Analysis revealed that there were more pre-emptive than reactive LREs, which suggests that the teachers took steps to highlight language use and not only respond to

linguistic errors. Nearly all LREs were found to focus on disciplinary uses of vocabulary. Tailor-made language tests were devised to ascertain whether students appeared to learn the language items targeted in the LREs. Test results indicated that students learnt the items targeted in the LREs and that there was a statistically significant relationship between the type and complexity of LREs and correct responses to test items.

The thesis concludes with theoretical implications drawn from the findings and practical applications in EMI, which it is hoped will be of use to academic researchers and EMI stakeholders in South Korea as well as other geographical contexts.

To my dearest mum

who has always been my role model at every stage of my life
and supported me throughout my academic journey.

Acknowledgements

This thesis would not have been possible without the help of many people. First and foremost, my sincere gratitude goes to my main supervisor, Associate Professor Helen Basturkmen, who supported, heartened, and inspired me from the very beginning to the end of my PhD journey. I consider myself blessed to be her student, and without any doubt, this thesis was only possible with her wise guidance, insightful feedback, and emotional support at all stage of my research. Thanks to her, I was able to enjoy this long journey so much even during the covid-19 pandemic and grasp many exciting opportunities that enormously helped me shape my academic career path early on. I also give my deepest thanks to my co-supervisor, Professor Martin East, who provided me with inspiring and practical advice and support whenever I asked him for help. My sincere appreciation also goes to the exam committee members, Professor Diane Pecorari, Professor Averil Coxhead, and Professor Garry Barkhuizen for their considerable insights and encouraging feedback and comments.

I feel indebted to all the anonymous participants who contributed to this research. I am so grateful to the Principal and the Deans for their deep understanding of my research and generous permission to conduct this study. My keen appreciation goes to the teachers and lecturers, who kindly allowed me to observe their classes and supported my research with great interest. I also thank the students. Without their outstanding cooperation, this thesis would not have been complete.

Special thanks are due to Professor Jun-kyu Lee for his warm encouragement and advice without which I would not have been able to begin my PhD. I would also extend my gratitude to Professor Hyun-woo, Lim, my Master's supervisor, who taught me the joy of research for the very first time. I appreciate Former Principal Choi for his great help to make my research

possible. My gratitude also goes to all my colleagues in CLL, especially Rosa, Worasuda, Ellen, and Annie, my fellow Korean tutor, Dr Anne Koh, and my dearest friend Franco for their kindness and support during my lonely and difficult times away from home. I would also like to thank my dearest friend, Kyung-mi, for her words of support and time to chat with me over the phone whenever I needed her.

Finally, I am forever grateful to my family for their unlimited support and love, and I dedicate this milestone to them. Without them, I would not have survived this arduous process. My mum, who is my one and only role model in life, deserves special thanks for providing me with her unconditional love, patient, and support. I also sincerely thank my dad, who is the first English teacher in my life, and I believe he must be so proud of me for following in his footsteps. My sister and best friend, Avarista, who always encourages and inspires me with her scientific perspective that I lack, should also take so much credit for what I am today.

CONTENT

LIST OF TABLES

LIST OF FIGURES AND GRAPHS

LIST OF ACRONYMS

CBI	Content Based Instruction
CLIL	Content and Language Integrated Learning
EAP	English for Academic Purposes
EFL	English as a Foreign Language
EMI	English-Medium Instruction
ESL	English as a Second Language
ESP	English for Specific Purposes
FFE	Form-Focused Episode
FoF	Focus on Form
HE	Higher Education
IELTS	International English Language Testing System
KMI	Korean-Medium Instruction
L	Lecturer
L1	First Language
L2	Second Language
LRE	Language-Related Episode
MA	Master of Arts
NNS	Non-native Speaker
NS	Native Speaker
PhD	Doctor of Philosophy
S	Student
SLA	Second Language Acquisition
T	Teacher
TOEFL	Test of English as a Foreign Language

CHAPTER ONE: INTRODUCTION

1.1 Background

Today, English is regarded as a medium or means of teaching and learning, not just a goal of education for students who speak English as a second or foreign language (ESL). Teaching disciplinary subjects through English, an academic lingua franca, is now believed to be an effective way for ESL students' natural acquisition of academic English as they learn disciplinary content (Park, 2018). This perspective is reflected by the emergence of English-Medium Instruction (EMI), which refers to the teaching of a disciplinary subject such as Economics, Science, History, or Mathematics, through English as a second language (Airey, 2016; Brown & Bradford, 2017; Macaro, 2018). Any disciplinary classes in which some or all students who speak English as a second language (L2) can be regarded as EMI settings (Airey, 2016; Brown & Bradford, 2017). Over the past several decades, EMI has been widely practised in Higher Education (HE) settings in both native and non-native English-speaking countries (Brown & Bradford, 2017). The main driving force behind this increase of EMI across the world is the potential enhancement of students' career opportunities and the recruitment of international academics and students (Galloway, Kriukow, & Numajiri, 2017; Hu, Li, & Lei, 2014). An ever-increasing number of EMI in HE has continued into other education levels. A recent study (Dearden, 2014), which investigated the trend of EMI around the world, found that EMI has also become common at both primary and secondary education, and it is more prevalent in private than public education.

In South Korea, EMI was first introduced under the government initiative for the internationalisation of HE (Byun et al., 2011; Jon, Cho, & Byun, 2020; Kim & Tatar, 2017; Park, 2014). Since the Korean Ministry of Education (MoE) adopted an EMI policy for HE in 2001 (Nunan, 2003), EMI has been rapidly implemented in HE institutions throughout the country. As of 2019, the proportion of EMI courses among all courses provided in 13

universities in Seoul, South Korea, has reached nearly 40% (Nam & Kwak, 2019; Yang, 2014). EMI has recently begun to emerge in both private and public high schools in South Korea with the aim of facilitating high school students' transition to universities overseas (Hong & Basturkmen, 2020). Despite this rapid expansion of EMI implementation, however, there has been limited literature on EMI in the South Korean context available to date. Especially, to the best of my knowledge, EMI in secondary education in South Korea has never been studied until recently.

EMI is argued to be an influential and essential site for students who have English as a second or foreign language (L2) to naturally and simultaneously learn academic English in the disciplinary context, although the explicit aim of EMI is students' learning of content knowledge (Aizawa & Rose, 2020; Basturkmen & Shackleford, 2015; Coleman, 2006; Hong & Basturkmen, 2020; Kamaşak, Sahan, & Rose, 2021; Smit & Dafouz, 2012). Galloway (2017) claims that ESL students in EMI are given more exposure to L2 and opportunities to naturally acquire it in a meaningful way in their disciplines. This argument can be supported by the claims of a number of researchers that language constitutes disciplinary content knowledge development (Ardasheva & Tretter, 2017; Nation, 2001; Stohler, 2006; Wolff, 2003) and that each discipline has its distinctive conventionalised ways of using language (Fang et al., 2006; Schleppegrell, 2004; Shanahan & Shanahan, 2017). According to Schleppegrell (2004), the language used for teaching content knowledge during classroom interaction is different from the language used outside classrooms. As Jexenflicker and Dalton-Puffer (2010) argue, students need to learn content knowledge "not only by rote memorisation but by interacting with it to make it their own" (p. 170). However, despite the benefits of EMI, as students make progress through school and across various disciplines, they are gradually expected to read and write discipline-specific, academic texts and may face linguistic challenges, which might hinder their learning of content (Fang et al., 2006; Schleppegrell, 2004). For ESL students in

EMI settings, it can be even more challenging to learn content knowledge and use academic language in a disciplinary way in their second language (L2). In addition, considering the fact that there is a difference in linguistic features between academic spoken English and academic written English (Dang, Coxhead, & Webb, 2017), the kinds of linguistic challenges that ESL students have when reading textbooks may differ from those they encounter when listening to their teachers – even in just one classroom. Thus, content teachers need to make considerable efforts to support their students in responding to such challenges and enhance their development of disciplinary literacy or specialised literacy practices of a discipline regardless of their first language (L1) (Moje, 2015; Van de Poel & Gasiorek, 2012).

A substantial body of literature on EMI has indicated some types of language-related challenges with reading and writing, which students in EMI settings may have (Blaj-Ward, 2017; Ramiro & Perez, 2015; Schleppegrell, 2007; Woodward-Kron, 2002). Blaj-Ward (2017) argues that EMI exposes ESL students to unfamiliar types of text and ways of reading, and they may find reading difficult when transitioning from ESL to EMI due to the lack of appropriate preparation. Al-Bakri (2013) also reports that reading textbooks that are written in English can be one of the difficulties for ESL students as their lack of content knowledge in a discipline as well as English vocabulary related to the discipline. In a study by Keuk and Tith (2013), which investigated the kinds of challenges for undergraduate students in an EMI university in Cambodia, students reported that unfamiliar English terms hindered their comprehension of the written texts. A study in a Spanish university (Ramiro & Perez, 2015), which examined 67 undergraduate Chemistry students' written work, also found that the students had difficulties using the disciplinary register and discourse aspects (text organisation).

Researchers also found that students had challenges during class interaction in EMI classes. Survey-based research by Shim (2010) examined challenges that Korean L1 students encounter in their EMI classes in a South Korean university. She found that the majority of

students reported difficulties following and comprehending lectures and interacting with their lecturers in EMI classes, which they had not experienced in Korean-medium instruction (KMI) lectures. Phuong and Nguyen (2019) state that ESL students may encounter challenges when clarifying their confusion by asking questions or fail to grasp key points delivered during the lecture that is unfolding in real-time due to their incompetence in English speaking and listening skills. A study into the Chinese HE context (Tong & Shi, 2012) found that lecturers were observed to frequently provide translated summaries of their lectures taught in English in order to facilitate their students' lecture understanding. In light of this, there is clearly a need for content teachers to make more effort to support their students with language when they teach their subjects in EMI to foster their development of content knowledge as well as disciplinary English.

1.2 Rationale and aims of the research

The rationale for choosing to investigate attention to language lies in its importance for EMI students' development of disciplinary English. Although there has been some research on EMI in the South Korean context within the past several years, to date, previous studies are largely restricted to an enquiry into students' and teachers' opinions and perceptions of EMI (e.g. Kim & Tatar, 2017; Lee & Lee, 2018) or a review of policy and implementation of EMI, mostly in the HE context (e.g. Byun et al., 2011; Williams, 2015). Very few studies (e.g. An & Kim, 2018; Jin & Shin, 2011; Lee & Kim, 2007) focused on students' learning of English in EMI classes. Still, these studies examined the effects of EMI in the manner of teachers' or students' survey or interview or focused only on students' development of general English proficiency measured by official English proficiency tests (e.g., TOEFL or IELTS) instead of the English language taught in EMI classes. Moreover, limited research to date has focused on the actions taken by content teachers to foster their students' disciplinary English development.

Classroom interaction in EMI classrooms has a potential key role in students' development of disciplinary English. A need for investigating the English language used in EMI classrooms has been proposed in order to examine if the learning of both content and language occur in such settings (Basturkmen & Shackleford, 2015; Dearden & Macaro, 2016; Hong & Basturkmen, 2020; Lee & Lee, 2018; McLaughlin & Parkinson, 2018; Oh, 2011). Dearden and Macaro (2016) suggest that it is necessary to examine how language is integrated into EMI courses to analyse the effects of EMI on students' simultaneous and meaningful learning of content and English. Lee and Lee (2018) also stress that the factors such as the nature of English input from EMI teachers should be identified in future studies.

Only very recently has much attention been paid to researching classroom interaction in EMI and investigating the opportunities classroom interaction may present for academic English teaching and learning. Some studies into the HE context (e.g., Basturkmen, 2018; Basturkmen & Shackleford, 2015; Costa, 2012; Hong, 2021) have drawn their attention to the ways content lecturers help their students with discipline-specific ways of using language during their EMI teaching. They used the concept of language-related episodes (LREs), instances that incidentally arise in which class participants talk about the language they use in content classes (Basturkmen & Shackleford, 2015). These studies have identified LRE as occurring in EMI classes in a HE and found that content lecturers frequently initiated LREs either pre-emptively to provide information about language or reactively to correct students' linguistic errors. Until recently, however, the literature on EMI has primarily been limited to studies in HE, and EMI in secondary education has scarcely been studied worldwide, including South Korea.

A recent study by Hong and Basturkmen (2020), which was a preliminary step into the present study, examined incidental attention to the language in the second-year EMI classes in public and private high schools in South Korea. It found that the shift of attention from

disciplinary content to language was common during classroom interaction in the EMI classes. Still, these studies on LRE in EMI classes have been primarily descriptive in nature and only examined incidental attention to language that arises during classroom interaction. Much less is known about whether content teachers attend to language in their planned teaching practices. Therefore, there is a need for classroom-based research that examines what content teachers or lecturers do to foster their students' learning and if students learn disciplinary ways of using English in EMI classes.

The main purpose of the current study is to investigate how content teachers and lecturers support their students with language in their planned and incidental teaching practices and examine if the attention to disciplinary uses of English in their incidental teaching practices leads to students' learning in EMI classes. The study was conducted in four EMI classes in two distinctive disciplines, Social Science and Mathematics, in two different settings, high school and university, in South Korea. Building on the initial work (Hong & Basturkmen, 2020), this study aims to investigate content teachers' and lecturers' reasons for providing language support and their planned practices. It also aims to examine the frequency and characteristics of LREs that incidentally arise during classroom interaction in the EMI classes. In addition, this study aims to investigate the effects of LRE on students' learning of disciplinary English by examining data from a tailor-made language test on the language items targeted in the LREs. Until recently, far too little attention has been paid to the features of LREs and their relationship with language learning in EMI classes. Thus, this study will examine which characteristics of LREs may associate with students' language learning.

1.3. Research questions

The central research questions that guide the current study are:

RQ1. What is the planned attention to language in two EMI settings in South Korea?

1.1 What are the types of planned attention to language?

1.2 What are teachers' and lecturers' reasons for their planned attention to language?

RQ2. What is the frequency and nature of Language-related episodes (LREs) in disciplinary classes in these settings?

2.1 To what extent do LREs occur in the EMI classes?

2.2 What are the characteristics of LREs in the EMI classes?

RQ3. Do students learn linguistic items targeted in LREs in these settings?

3.1 What characteristics of LRE are associated with students' learning of language?

1.4 Definition of key terms

The present study adopts Robinson's (2003, p. 631) definition of attention, Basturkmen and Shackleford's (2015, p. 89) definition of LREs, and McConachie and Petrosky (2010, p. 6) definition of disciplinary literacy. Robinson (2003) defines attention (to language) as "the process that encodes language input, keeps it active in working and short-term memory, and retrieves it from long-term memory" (p. 631). One distinction is made between planned and incidental (unplanned) attention to language (Ellis et al., 2001b; Ferrokhi & Gholami, 2007; Hong & Basturkmen, 2020). In this study, planned attention to language consists of teachers' or lecturers' prior decision to target specific linguistic items in anticipation of challenges that students may encounter during class. This consists of syllabi, lesson plans, glossaries or word lists of vocabulary that are provided to students. Incidental attention to language, on the other hand, occurs spontaneously when teachers or students focus transiently on the language during class interactions without any prior intention (Ellis et al., 2001b).

Basturkmen and Shackleford (2015) define LREs as "instances when teachers and learners talk about language, such as grammar or vocabulary, or a feature of the discourse or phonological systems within communication that is primarily concerned with exchanging messages" (p. 89).

McConachie and Petrosky (2010, p. 6) define disciplinary literacy as "the use of reading, reasoning, investigating, speaking, and writing required to learn and form complex content knowledge appropriate to a particular discipline". Based on McConachie and Petrosky's definition, in this study, the term 'disciplinary language' refers to the language used in disciplinary ways, including disciplinary registers. Likewise, 'disciplinary English' refers to English used in a disciplinary way.

In this study, the term 'disciplinary subjects' refers to academic subjects such as Economics, Science, Accounting, or Mathematics, in which language is not a primary aim of learning. Throughout the thesis, the term 'disciplinary subject' and 'content subject' are used interchangeably to refer to non-language academic subjects.

1.5 Structure of the thesis

This thesis consists of eight chapters. The introductory chapter has described the rationales, aims, and research questions guiding this research, which examines attention to language and students' language learning in EMI. Chapter 2 reviews the literature and research that are related to this study and outlines relevant theories of language learning. The review includes the literature pertaining to the topic of EMI, attention to language, and disciplinary acculturation. Chapter 3 details the research methodology and research design of the study. Chapters 4, 5, and 6 report the main findings according to research questions. Chapters 4 and 5 explore the types of and reasons for planned attention to language as well as the frequency and characteristics of incidental attention to language in EMI classes in each setting. Chapter 6

investigates the effects of LRE on students' learning of language. Chapter 7 discusses all the findings of the research in relation to each research question and compares the findings between the settings. The relationship between the findings and results with previous studies is also discussed. Finally, Chapter 8 reviews the main findings and draws conclusions. Theoretical implications and practical applications are outlined, and some limitations are presented. It concludes with a statement on the importance of this study.

CHAPTER TWO: LITERATURE REVIEW

The purpose of this study is to investigate EMI in Korean education, focusing on planned and incidental attention to language and students' learning of disciplinary language in EMI classes. This chapter reviews the theories and literature relevant to the topic under investigation in this study. Section 2.1 begins by defining EMI and compares EMI to other teaching approaches. It then delineates the implementation of EMI in secondary and higher education (HE) contexts across the world, along with an evaluation of the role of language and students' learning outcomes in EMI settings. In Section 2.2, three converging areas relevant to EMI, disciplinary acculturation, disciplinary literacy, and disciplinary vocabulary, will be discussed. Section 2.3 reviews the theory and literature on language acquisition and explains language-related episodes (LREs), a construct on which this study draws for examining classroom interaction, along with types and characteristics.

2.1 English-Medium Instruction (EMI)

English-medium instruction (EMI) is considered a relatively new field of research attributed to the internationalisation of education worldwide. Because of this newness, there is still a lack of consensus on the definition of EMI (Macaro, 2018), and this absence of a shared, common ground definition is argued to be an obstacle to research on EMI; it may cause confusion between definitions of EMI in relation to the purpose of using English as students' L2 in EMI settings (Gundermann, 2014). Macaro (2018) defines EMI as "the use of the English language to teach academic subjects (other than English itself) in countries or jurisdictions where the first language of the majority of the population is not English" (p. 19). However, his definition of EMI has been challenged by many researchers for covering only a narrow range of applications, "the majority of the population is not English" (p. 19). Pecorari and Malmström (2018) claim that EMI should also include Anglophone countries where the majority of the

population is English L1 speakers, including classrooms with some students who do not have English as their L1 (e.g., New Zealand, Australia). Likewise, Baker and Hüttner (2017, 2019) claim that the English in EMI is English as a second or foreign language of students and that whether content teachers or lecturers are aware of it, English used in schools and universities in Anglophone countries is L2 to some of their students. In this study, EMI is defined as the teaching of disciplinary subjects (other than language subjects) through English in settings that consist of some or all English as a second or foreign language (ESL/EFL) students at any stage of the education cycle.

The sole and explicit aim of EMI that researchers in applied linguistics have claimed is successful learning of disciplinary knowledge, whereas the learning of the language (English) may or may not be an implicit goal (Costa, 2012; Dearden & Macaro, 2016; Smit & Dafouz, 2012; Unterberger & Wilhelmer, 2011). For example, Costa (2012) reported that the EMI lecturers in the Italian HE institutions mainly focused on teaching content knowledge without any explicit aim for language teaching and learning. Similarly, Airey (2012) also found that the Physics lecturers from four EMI universities in Sweden did not consider any linguistic aspects when planning and teaching their EMI classes and that none of their course outlines or syllabuses had any mentions of language learning. Although EMI does not explicitly aim for students' learning of English, there is an expectation for EMI that it can foster ESL students' development of English naturally and simultaneously in the course of learning the content knowledge (Bradford & Brown, 2017; Hong & Basturkmen, 2020; Macaro, 2018; Rose et al., 2020; Yang, 2014). Rose et al. (2020) have argued that EMI is expected chiefly as an effective and ideal site for ESL students to be exposed to English while negotiating disciplinary content knowledge during classroom interaction.

2.1.1 Comparison between EMI and other teaching approaches

EMI is often mistaken with other teaching approaches such as Content-based Instruction (CBI), Content and Language Integrated Learning (CLIL), or English for Academic Purposes (EAP), which focus mainly on language (English) itself. The literature in applied linguistics has long argued that EMI is not based on existing language teaching approaches and is also distinctive from CLIL, CBI, and EAP (Airey, 2016; Bradford & Brown,2017; Macaro, 2018). According to Macaro (2018), EMI does not have any theoretical framework. Brown and Bradford (2017) view EMI differently from Content-Based Instruction (CBI), asserting that these terms should not be regarded as synonyms because of the noticeable differences they have, that is, the role of content knowledge and language in each approach. They claim that in CBI, content knowledge is usually used as an aid for teaching language. In addition, they argue that "the aim of CBI is language learning; the subject matter acts as a vehicle for language learning" (p. 331), while in EMI, content knowledge is a core or sole aim of teaching and learning. The other point that distinguishes EMI from CBI is teachers' L1 and disciplinary backgrounds (Macaro, 2018). Macaro (2018) assert that teachers in CBI are English first language (L1) speakers, whereas EMI teachers are not always. Also, he argues that in EMI, only content teachers are responsible for teaching, whereas, in CBI, both content teachers and ESL teachers share the responsibility of teaching.

EMI is also argued to be distinguished from English for Academic Purposes (EAP). EAP is a sub-field of English for specific purposes (ESP) that refers to "the teaching of English as a second or foreign language where the goal of the learners is to use English in a particular domain" (Paltridge & Starfield, 2013, p. 2). EAP is defined as a type of English that is taught to students who speak English as L2 for study purposes in academic subjects (Basturkmen, 2012; Jordan, 1997). Its purpose is not to teach academic content but to teach the English language associated with academic subjects (Basturkmen, 2012; Jordan, 1997). In this regard,

Airey (2016) argues that EMI is distinctive from EAP; he asserts that in EAP, a language is the central focus of teaching and learning and is viewed separately from the disciplinary content. Airey further explains that in EMI, a language is merely a tool for teaching and learning disciplinary content, whereas, in EAP, acquisition of academic English skills (e.g., reading, writing, speaking, or listening) is a major goal.

The teaching approach that has mostly been compared to EMI in applied linguistics is CLIL. CLIL refers to "an approach to education that integrates language (L2) and content learning; planning for, fostering, and assessing both, though the focus may shift from one to the other" in the European context (Brown & Bradford, 2017, p. 331). One distinguishable aspect between EMI and CLIL is what to teach; CLIL aims to integrate content knowledge and L2 at the equivalent level without any preference for either (Coyle, 2007), while the focus of EMI is entirely disciplinary content knowledge. According to Graddol (2006), EMI differs from CLIL in that students in EMI settings are expected to meet a certain level of English proficiency before they learn content knowledge. By contrast, L2 proficiency may or may not be a prerequisite for students in CLIL. The other distinguishable aspect is the language used for teaching and learning. In CLIL, the language to be integrated is not necessarily English. On the other hand, in EMI, the language to be used is clearly indicated as English (Brown & Bradford, 2017; Coyle, 2008; Macaro, 2018). Brown and Bradford (2017) explain that unlike CLIL, which has a "dual-focused educational approach" (Coyle, Hood, & Marsh, 2010, p. 6), the explicit focus of EMI is entirely on students' disciplinary content knowledge mastery without any specified or explicit focus on language.

2.1.2 EMI in secondary and higher education

EMI has rapidly expanded in Higher Education (HE) worldwide (Airey, 2016; Brown & Bradford, 2017; Dearden, 2014). The fundamental driving forces behind this expansion are

associated with the internationalisation of HE. According to Dearden (2014), lawmakers tend to view EMI as a simple but effective and efficient way to internationalise the education they provide. Thus, with governmental support, the major reason for HE institutions to offer EMI courses is to bring in more international academics and students, to help domestic students be competitive in the global job market, and to rank higher in the world ranking such as the *Times Higher Education* (THE) or the *Quacquarelli Symonds (QS) World University Rankings* (Doiz, Lasagabaster, & Sierra, 2011).

Although EMI seems to have rapidly increased in the 20th century, EMI has already been prevalent since the middle of the 19th century in Hong Kong and Turkey (Coşgun & Hasırcı, 2017). Also, it has long been provided in both secondary and higher education sectors in these countries (Macaro, 2018). Recently, there have been a substantial number of studies on EMI conducted in the European context. The Bologna Declaration in 1999, which allowed HE degree courses to be credited between the European countries, led to an increase in mobility for students and academics across Europe (Airey et al., 2017). As a result, the number of EMI courses provided in HE has significantly increased in European countries (Airey, 2016). A series of research into the European HE context (Maiworm & Wächter, 2002; Wächter and Maiworm, 2008, 2014) was conducted over 15 years, and it was found that the number of EMI courses in the HE institutions multiplied more than tenfold over the 15 years in Europe. Brenn-White and Faethe (2013) investigated the proportion of EMI graduate courses across disciplines in HE settings in 11 European countries, and they found that the most significant proportion of EMI courses was provided in Business and Economics (28%) followed by Engineering and Technology (21%). Research in the Asian HE context reports that universities in Asia are experiencing a rapid surge in international students, and this results in the expansion of EMI courses (Kim, 2017; Liyanage, 2018; Walkinshaw et al., 2017). In Asia, as of 2014, there were more than 2,600 EMI courses identified across China, Japan, Malaysia, Singapore, South Korea,

and Taiwan (Byun et al., 2011; Neghina, 2017; Vu & Burns, 2018).

Generally, EMI implementation does not necessarily involve any linguistic support for ESL students (Pecorari & Malmstrom, 2018). According to Macaro (2018), however, there are three types of implementation of EMI courses in the HE context that include linguistic support for students. The first type is called the Preparatory Year Model (PYP), which is widely used in Turkey and Saudi Arabia. In the PYP model, all ESL students who transit from secondary schools to universities are prepared to develop their English proficiency for about a year before starting EMI courses (Macaro, 2018). The second type of EMI implementation is the university support model that does not involve any preparatory steps for students' English development (Macaro, 2018). Instead, in this model, all potential students have access to EMI courses while simultaneously receiving concurrent language support from ESP/EAP specialists in the university (Macaro, 2018). The last type is the selecting model that involves the process of selecting students who can access EMI courses (Macaro, 2018). ESL students with a sufficient level of English fluency are only admitted to take EMI courses, and those who have failed to reach that level are taught in their first language-medium instruction courses (Macaro, 2018).

The scope of EMI has begun to expand into secondary schools and even primary schools in non-Anglophone countries (Aizawa & Rose, 2019; Brown & Bradford, 2017; Chalmers, 2019; Coleman, 2006; Dearden, 2014; Hong & Basturkmen, 2020). According to Dearden (2014), this expansion is driven by horizontal forces, from the private education sector to the public education sector, and also vertical forces, from HE to secondary or elementary education. In her study that provides a broad picture of EMI across the world, Dearden (2014) investigated EMI policies in 55 countries, including both Anglophone and non-Anglophone countries. A survey of British Council staff in 60 countries was conducted using open-ended questionnaires. The findings of the study found that as the term EMI was relatively new, some countries used different terms, such as bilingual education or immersion education, to refer to the teaching of

disciplinary subjects in English. In terms of EMI adaptation, it was found that EMI was provided not only in HE settings but also in primary and secondary educational settings and that EMI courses were more common in private settings than public settings. The study also identified that among the 55 countries, 27 had policies or official statements that allowed public schools to use EMI. Also, it was found that in some countries, there were concerns that EMI would have a socially divisive nature as teaching through English may cause socio-economic inequality in access to EMI and a fear that the use of L2 eventually weakens the L1 or national identity. However, one minor weakness of the study is that it only presents the percentage of schools that were allowed to provide EMI, and therefore, it remains unclear if EMI is actually being offered in such settings. Also, the study did not include South Korea, one of the Asian countries where EMI has developed considerably.

Although EMI is widely introduced throughout all educational stages globally, many researchers have pointed out that there are still insufficient policies related to EMI teaching. Also, the need for practical guidelines and language support for both teachers and students in EMI to help them overcome linguistic challenges has been the focus of many discussions in EMI research (Byun et al., 2011; Byun & Kim, 2010; Joe & Lee 2013; Kang & Park 2004a; Kim, 2017; Macaro, 2018; Tatzl, 2011). Airey et al. (2017) compared the ways EMI was implemented in HE in four European countries (Denmark, Finland, Norway, and Sweden) and found the absence of a national policy or a guideline on EMI programmes. They urged that more detailed policies and manuals are needed considering the differences of each disciplinary subject in order to support EMI lecturers to minimise linguistic difficulties for themselves as well as their students. Similarly, in a study of two EMI high schools in South Korea, Hong and Basturkmen (2020) have confirmed that EMI was offered in the official curricula in public as well as private high schools they observed, yet, they found a lack of guidelines and support for EMI teachers in relation to linguistic challenges in both settings. As many researchers argue,

the absence of EMI guidelines or support for content teachers may impede its effects on students' learning (Dearden, 2014; Hong & Basturkmen, 2020; Kim, 2017; Park, 2018).

A number of researchers suggest that one way to gain an accurate and comprehensive understanding of linguistic challenges for content teachers and students in EMI is to investigate what exactly happens in EMI classrooms and examine the kinds of challenges they face (Basturkmen & Shackleford, 2015; Bradford, 2013; Galloway, 2017; Hong & Basturkmen, 2020; Macaro, 2018; Yang, 2014). To date, research from an applied linguistics perspective into the language used in EMI has been scarce in both secondary and higher education levels. This very limited amount of information on how content teachers and lecturers deal with the language they use and students' learning of academic language has led to this study.

2.1.3 EMI in the South Korean context

South Korea is one of the countries that has progressed further down the course of EMI in HE. In South Korea, EMI was first introduced under a government initiative in 1995 with the expectation of improving the global competitiveness of South Korean universities (Byun et al., 2011; Chang et al., 2013, 2017; Kim, 2017). In 2001, the Korean MoE adopted an EMI policy for HE (Nunan, 2003). In the MoE's *Strategic Plan of Internationalisation of Korean HE* (2006), the anticipated advantages of EMI are stated as (1) preparing domestic students for their future career in business or academia at the international level; (2) attracting prestigious international scholars and students; (3) promoting domestic faculties' English skills for teaching, which, in turn, is expected to allow them to contribute to internationalising the academic environment in South Korea. It was also anticipated that by providing EMI courses in HE settings, Korean students' outflow into universities overseas would decrease (Byun et al., 2011). Since EMI was first introduced to HE by the Korean government, the rate of EMI implementation in the HE context has risen sharply over the last two decades. In all universities

in South Korea, the proportion of EMI courses being provided increased from 2.2% in 2006 to 3.1% in 2010. When looking at universities in the Seoul metropolitan area, the rate of increase is even greater; the proportion of EMI courses provided in 37 universities located in the metropolitan area has soared from 5.6% in 2007 to 18% in 2011 (Yang, 2014). As of 2019, 13 of them were found to have increased the proportion of EMI courses up to 40% of the total courses (Nam & Kwak, 2019). A survey-based study of nearly 2,000 undergraduate students in the major universities in South Korea demonstrates that 55% of the students were taking EMI courses as of 2012, and the largest number of EMI courses was provided in Engineering, followed by Humanities, Social Science, and Natural Science (Lee & Hong, 2015). In the South Korean context, among the three models of EMI implementation with linguistic support classified by Macaro (2018), the second, concurrent language support provision model, is widely used. The increase of EMI courses in HE has naturally led to the implementation of EMI in secondary education in South Korea.

Despite the emergence of EMI in secondary education, there is no EMI policy explicitly stated for secondary schools in any government documentations in South Korea. Yet, schools in Korea were allowed by the MoE to create their own education curricula for EMI separate from the national education curriculum and implement it legitimately based on *The Enforcement Decree of the Elementary and Secondary Education Act* (MoE, 2018) regardless of the type and education stage. There is one condition of autonomy that schools should follow the official subjects that are set by the government when providing EMI classes. In the South Korean context, EMI is provided in public as well as private high schools as a result of the government's efforts for internationalisation of public education and also fill the educational inequality gap by providing domestic students with opportunities for applying for universities overseas.

Even though there is no official document regarding the number of schools that provide

EMI in South Korea, around ten high schools, six public and four private, were found to have EMI classes in the official curricula. These were special-purposed high schools with a focus on international studies and an aim to prepare students' transition to HE abroad. In these schools, EMI classes are usually provided for Advanced Placement (AP) subjects. The schools have stated in their education policies that all content subjects except language subjects, including the Korean language, and Korean history, can be taught in EMI throughout all grades. One private high school states the EMI poly as follow:

> *"Under the English Only Policy, all school members should use English in their classrooms as well as the entire school […] All subjects except Korean language and Korean history should be taught through English."* (M high school, 2018)

As has been stated, one of the purposes of EMI provision in South Korea is ESL students' simultaneous development of content knowledge and English proficiency. However, many researchers have posed a number of problems and challenges for EMI in the South Korean context. Byun et al. (2011) state that South Korean universities have focused mostly on increasing the number of EMI courses and have failed to consider if students benefit from EMI as expected. Also, many researchers have argued that it is students' and teachers' (general) English proficiency that determines the success or failure of EMI. Kim (2017) has pointed out three major hindrances to the success of EMI in Korean HE: students' insufficient English proficiency for lecture comprehension, lecturers' insufficient English proficiency for teaching, and the lack of adequate teaching methods for EMI. Unlike teachers or lecturers teaching language-related subjects, those teaching content subjects in EMI usually lack an understanding of the L2 learning process and knowledge about language teaching strategies (Chang et al., 2017; Kang & Park, 2005; Park, 2007). In the South Korean context, students' English acquisition in EMI classrooms seems to have been left to students and teachers or lecturers

without sufficient support from schools, institutions, or the government.

2.1.4 Effects of EMI on students' learning outcomes

EMI has been seen as an effective way for students to improve their academic progress and English proficiency at the same time (Galloway et al., 2017). Smith (2004) insists that the advantages of EMI far outweigh the losses. Yet, to date, there is a lack of research that empirically examines students' learning in EMI. A majority of the existing studies on EMI were conducted in the manner of teachers' or students' opinion surveys or interviews (e.g., Byun et al., 2011; Kim, Kweon, & Kim, 2012; Sert, 2008; Song, 2008). Some studies focused on the students' learning outcome in EMI and found somewhat negative effects of EMI on students' learning. Barton and Neville-Barton (2003) sought to examine the relationship between EMI and first-year undergraduate ESL students' performance in mathematics at a university in New Zealand. A test that assessed students' understanding of mathematical concepts, including mathematical texts, symbols, diagrams, and graphs, was conducted and included 54 ESL students and 29 English L1 students. The results showed that the ESL students had a greater disadvantage by 10% in learning mathematics contents in the EMI lecturers. The study suggests that it is essential for ESL students to acquire mathematic terms and the conventionalised ways of using those terms to succeed in mathematics.

One longitudinal study that examined the influence of EMI on students' academic achievement in EMI was carried out by Yip et al. (2007). Yip et al. investigated how secondary students' academic achievement was affected by the medium of instruction in Hong Kong. They tracked the science achievement of nearly 2,000 students from 25 EMI and 75 Chinese-medium instruction (CMI) schools for three consecutive years. A science achievement test was administered to all students and compared between EMI and CMI schools. They found a hindering effect of EMI on students' science learning; EMI students performed poorly

compared to CMI students. In particular, the EMI students were found to have difficulties with problems that evaluated their understanding of abstract disciplinary concepts and their ability to distinguish scientific terms from other general words.

Lei and Hu (2014) investigated whether EMI had an impact on undergraduate Chinese L1 students' English proficiency. To examine students' English development, they used the scores of the national college English test (CET), which is designed to evaluate the general English proficiency of college students in non-language disciplines. Lei and Hu collected the CET scores of 64 students in the EMI course and 72 students in the CMI course that they take in their first and second years. They compared the changes in the test scores between the courses. The result indicated that the EMI students did not outperform the CMI students on the CET after taking the EMI course for one year. However, they noted a possible mismatch between the test they used and the kinds of the language skills targeted in EMI and suggested future research to employ a measure of discipline-specific English proficiency.

Unlike the studies mentioned above, some studies have found positive effects of EMI on students' learning. Lee and Kim (2007) found that EMI had some effects on students' learning of content and language. They investigated the difference in students' academic achievement between EMI and Korean-medium instruction (KMI) mathematics lectures in a South Korean university. Pre- and post-tests on content knowledge and disciplinary register were administered to 170 undergraduate students before and after the 9-week EMI lecture. They found that the EMI students got significantly higher scores in content knowledge and disciplinary register tests than the KMI students. It was also found that EMI students made significant progress with disciplinary vocabulary. These findings contrast with the general expectation that EMI hinders students' academic achievement. Lee and Kim assumed that the EMI students outperformed the KMI students because the difficulties they experienced in following the lectures in their L2 motivated them to do more preparation, such as previewing

the material to be covered before the classes. One drawback of the study, however, is the suitability of the test items. For disciplinary register testing, the EMI students were asked to translate some Korean sentences about the content knowledge into English. As this type of test has the possibility of testing not only disciplinary language skills but general English proficiency, students' responses may have been affected by their prior English proficiency. Despite this methodological problem, the study still implies that EMI can be as effective on students' content learning as content teaching through students' L1 for students' content learning.

Joe and Lee (2013) examined the impact of the medium of instruction on Korean L1 undergraduate students' lecture comprehension. They compared 61 undergraduate medical students' lecture comprehension and satisfaction with the same courses delivered in two different languages–one EMI and one KMI. Both the students and lecturers were Korean L1 speakers. The data were collected from students' final grades from EMI and KMI classes and surveys. The comparison of students' final grades between the EMI and KMI classes showed no difference in students' final scores between the classes, indicating that L2 (English) did not affect students' understanding of the EMI lectures nor their final scores. The survey result also revealed that most EMI students had a positive view of EMI in improving content knowledge and their general English proficiency.

Recent studies have also confirmed the effects of EMI on students' academic achievement. A study by Del Campo et al. (2015) investigated the differences in Spanish L1 undergraduate students' academic achievement between EMI and Spanish-medium instruction (SMI) economics courses at a Spanish university. Both EMI and SMI courses were the same academic subjects. A comparison of the Grade Point Average (GPA) of 15 EMI students and 15 SMI students was made. A statistically significant difference between the groups was found; EMI students showed higher academic achievements than SMI students. However, the study

only involved small samples for examination of the differences in academic achievement between the two student groups.

Similarly, Dafouz and Camacho-Miñano (2016) investigated if the medium of language affected students' learning of content knowledge in the Spanish HE context. They compared the academic achievement of first-year undergraduate ESL students in EMI and Spanish-medium instruction (SMI) accounting courses in a Spanish university. They collected 383 students' final grades in EMI and SMI accounting classes (175 students in EMI course and 208 students in SMI course), both of which were taught by the same Spanish L1 lecturer over four academic years. They analysed the differences in mean scores of students' grades between the groups by conducting *t*-tests. The study found that EMI students achieved the same academic results as SMI students, suggesting that EMI was as effective as SMI for students' learning of content knowledge and did not necessarily entail any negative aspects in students' academic achievement. The study also reported that the EMI students appeared to develop their disciplinary literacy in English for their future careers in an international context.

A similar conclusion was also drawn in a study by Zaif, Aydin, and Gonca (2017). They investigated the difference in students' academic achievement between EMI and Turkish-medium instruction (TMI) courses in business studies at a Turkish university. They compared midterm and final exam grades and overall grades of 386 undergraduate students (164 EMI students and 222 TMI students) using independent samples *t*-tests. The results showed no statistically significant difference between EMI and TMI groups, suggesting that there were no hindering effects of EMI on students' learning. An and Kim (2018) also examined if EMI was effective for undergraduate students' academic achievements in the South Korean university context for two consecutive years. They collected GPAs of 859 undergraduate students from various disciplines EMI universities in South Korea. The average of all students' GPAs for each year was compared. They found that overall, the students' GPAs slightly increased by

around 2%.

A recent study in the Turkish context by Curle et al. (2020) examined if fourth-year undergraduate students' academic achievement in Turkish-medium instruction (TMI) courses predict their academic success in EMI courses at a Turkish university. They collected all exam scores of 159 Turkish L1 students who had English as an L2 in 18 EMI courses and 35 TMI courses in Economics. The relationship between students' EMI academic achievement and their TMI academic achievement was examined. The study found that students' TMI academic success was a statistically significant predictor for students' EMI academic achievement, suggesting that students' L1 has a mediatory role in EMI learning. This study deserves attention as it examined the influence of academic achievement in content lectures taught in L1 on EMI academic success, which has been little studied; however, one limitation of the study is that it used the mean score of all students' academic scores in EMI and TMI classes for analysis instead of examining individual student scores.

The studies mentioned above primarily focused on the effects of EMI on disciplinary content learning. Although limited in number, research on students' learning of language in EMI settings has tended to show the positive influence of EMI. Marsh, Hau, and Kong's (2000) study is one of the very few studies that tried to examine the effects of EMI on both content learning and language learning. Marsh et al. investigated the difference in secondary students' academic achievement between EMI and Chinese-medium instruction (CMI). Their study involved more than 12,000 Chinese L1 secondary students in Hong Kong schools. They traced the academic achievement of the students in EMI and CMI schools for three years. In each subsequent year, they administered standardised achievement tests in two language subjects (ESL and Chinese) and four content subjects (Mathematics, Science, Geography, and History) to all students. They compared the academic achievements of students from EMI and CMI settings. The study found that EMI positively influenced students' ESL grades while negatively

influencing content subject achievement. Marsh et al. explained that the reason for such negative effects found in the four content subjects could be that the students had challenges learning disciplinary content that was relatively new to them in the language that they were not fluent in. They further suggest that students need to take enough time to get familiar with the new disciplinary vocabulary to comprehend the conceptual basis of the content subjects and actively engage in classroom interactions. The study is meaningful as it investigated more than one disciplinary subject to find the effect of EMI in a school setting. Still, it has a limitation in that it tested students' English learning by using randomly selected language items, which were not what students had learned during the EMI classes. Moreover, the test items used for all four disciplinary subjects were the same. Thus, it is hard to say if the study thoroughly and accurately examined students' acquisition of language from different EMI classes.

In order to examine ESL students' development of English listening skills in an EMI setting, Shim (2012) examined the effects of EMI on 108 undergraduate students' academic English listening improvement in six business classes in a South Korean university. In her study, students were given one pre-test at the beginning of the semester and one post-test at the end of the semester. The listening test items were excerpts from commercial TOEFL practice tests, and the same test items were used for both pre- and post-tests. A statistically significant difference between students' pre- and post-test results was found. Shim interpreted this as evidence that EMI was effective for students' learning of content and development of academic English listening at the same time.

Rogier (2012) examined if EMI was effective for students' English proficiency development in universities in the United Arab Emirates (UAE). Rogier investigated the changes in IELTS scores of 65 undergraduate students from various disciplines over the four years. The study found that the students' average IELTS scores in all areas (vocabulary, grammar, listening, and writing) increased after taking four years of EMI courses. However,

whether the students' different disciplinary backgrounds affected their English development differently remains unknown.

Although the studies mentioned above found some effects of EMI on students' English learning, one weakness is that they all focused only on general English proficiency development, not the language used and taught in EMI classrooms. Many researchers argue that the language used in content classes is different from the language taught in language classes or used in everyday communication (Fang et al., 2006; Schleppegrell, 2004; Shanahan & Shanahan, 2008; Hong & Basturkmen, 2020). Thus, the English that students are expected to learn in EMI classes is discipline-specific rather than general. Therefore, there is a need for investigating if students learn English in a discipline-specific way and understand the distinctive nature of the language used in EMI classes.

One study in which the researchers try to investigate students' learning of disciplinary language in EMI is Coxhead and Boutorwick (2018). They carried out a longitudinal study in an EMI secondary school in Germany to examine how vocabulary knowledge is developed for English L1 and ESL students in the EMI setting over seven years. They grouped students into three cohorts; native speakers (NS), non-native speakers (NNS), and non-native speakers who took EAL classes (NNSEAL). Each cohort was given the Vocabulary Levels Test developed by Schmitt, Schmitt, and Clapham (2001) each subsequent year. The study found that as their studies progressed, all the participating students showed increases in their vocabulary test scores. One noticeable finding of the study was that the NNSEAL students made the most significant gains of vocabulary knowledge, suggesting that ESL students with low English proficiency can also learn a great amount of academic vocabulary in EMI settings if they are provided with extra language support. The authors suggest that technical vocabulary development in secondary schools' content classes is important for future research as technical vocabulary is closely related to learning content knowledge.

Overall, although research on students' learning in EMI is still scarce, the existing studies have made important contributions to answering the question of whether EMI has effects on ESL students' learning of content and English. Almost all previous EMI research on students' English learning examined students' general English development, not disciplinary English. Therefore, it is clear that there needs to be research that examines if students learn disciplinary English taught in EMI classes.

2.1.5 The nature and role of language in EMI

Even though the main focus of EMI is on content learning, EMI can be directed towards improving students' language learning (Bradford & Brown, 2017). Researchers have long argued that the nature and roles of language in content classes are different from those of the language used outside of the classrooms or taught in language classes (Airey & Larsson, 2018; Dafouz et al., 2018; Hong & Basturkmen, 2020; Schleppegrell, 2004; Shanahan & Shanahan, 2008; Yang, 2014). Schleppegrell (2004) argues that the language used for teaching content subjects is different from the language used for everyday communication.

Researchers have recently viewed the language used in content teaching as more discipline-specific (Airey & Linder, 2018). As argued by Stohler (2006), the language used in content classes is a constitutive component of teaching and learning content knowledge, and therefore, content and language should not be viewed separately. Students are expected to acquire academic language, which is defined as "the vocabulary, syntax, and discourse strategies used to describe complex concepts, abstract ideas, and cognitive processes across and within disciplines" (Pritchard & O'Hara, 2017, p. 419), regardless of education level. Woodward-Kron (2002, 2008) argues that each discipline has a distinctive specialised way of using language and that students need to excel at using disciplinary language to be successful in their studies. Macaro (2019) also argues that the roles of language have different detailed

purposes for each discipline because a discipline has a distinctive register, specific semantic structures, and different approaches used to construct disciplinary knowledge.

It is frequently argued that the major function of English used in EMI is to construct meaning (Baker & Hüttner, 2017; Macaro, 2019; Schleppegrell, 2020). Llinares, Morton, and Whittaker (2012) state that the language in content classes has an ideational function, which enables students to represent and realise disciplinary concepts they have learned. They claim that in EMI contexts, the language used to represent the content is usually discipline-specific. Similarly, Dafouz et al. (2018) claim that EMI has resulted in a complex relationship between disciplinary content and the means of expressing expertise through appropriate ways of using English in a disciplinary way. Also, in EMI classes, the language can be a means by which content teachers or lecturers can check how accurately students comprehend disciplinary content (Macaro, 2018). Schleppegrell (2020) asserts that ESL students in schools need to know how the language is used to construct and present knowledge in discipline-specific ways in their L2. Moreover, for high school students, fluency in using language in these subject-specific ways in their writings or spoken production can be regarded as evidence of school success (Schleppegrell, 2002). In this regard, EMI contexts are argued to play an essential part in students' development of disciplinary English (Hong & Basturkmen, 2020).

As has been mentioned earlier, one distinctive factor that sets EMI apart from other teaching approaches is that in EMI, the language is limited to English. Kirkpatrick (2017) has pointed out that there is a general assumption that the "E" in EMI refers to English as an academic lingua franca across all disciplines, which is why EMI was able to spread widely in the HE sector across the world. In this regard, Belhiah and Elhami (2015) claim that using English instead of students' L1 in disciplinary teaching can provide an ample opportunity for ESL students to learn and practice the disciplinary language in English naturally in meaningful and authentic contexts. Considering the fact that most EMI teachers and lecturers do not speak

English as their L1, many researchers have pointed out that teaching their subjects to ESL students in English is often challenging for them (Dafouz et al., 2018; Hong & Basturkmen, 2020; Macaro, 2018). In this regard, another issue has recently come to the fore concerning the linguistic aspect of EMI, which is the use of students' L1 in EMI classrooms.

There has been a lengthy debate over whether it is desirable to use students' L1 in EMI classrooms. Even though the use of L1 has been regarded as detrimental to students acquisition of L2 in the SLA field, many studies on EMI have suggested that students' L1 and L2 (English) are mutually supportive and that the use of L1 is essential in EMI classrooms to address the problems of using English, for example, less clarity, redundancy, or precision (Breetvelt, 2018; Lee, 2010; Kang & Park, 2005; Kim, 2011; Kim et al., 2017; Kirkpatrick, 2014; Yeh, 2014). Yeh (2014) argues that students are more likely to feel less burdened when students share their L1 with their EMI teachers as they have "alternative channels of teacher-student communication" (p. 10). Macaro (2019) insists that it must not be forgotten that the main aim of EMI is not language but content teaching. That is to say, if necessary, it is possible to use L1 in EMI classes as long as the implicit goal of EMI – natural acquisition of English − is not significantly damaged. Chalmers (2019) also advocates using L1 in EMI classes, arguing that EMI teachers or lecturers should take a somewhat flexible position on the use of L1 and L2 to aid students' learning of content knowledge as well as L2. Moreover, he asserts that even in EMI classes, students are better to be equipped with the academic language skills in their L1 – which may be transferred to L2.

Although limited in number, some empirical research has confirmed content teachers' or lecturers' use of L1 during their EMI teaching (Costa, 2012; Hong & Basturkmen, 2020). In a descriptive study in the Italian HE context (Costa, 2012), it was found that all six Italian L1 lecturers, who taught different content subjects, were observed to use code-switching (alteration of Italian-English) to help their Italian L1 students understand technical terms and

expressions better in anticipation of their students' lack of knowledge about the terms, and they also translated their English explanation into Italian. Hong and Basturkmen (2020) suggest that content teachers' L1 backgrounds may affect their use of L1 during their EMI teaching. Their study in EMI high schools in South Korea found that the use of L1 (code-switching or translation) was a usual part of the Korean L1 teacher's teaching practice, whereas it was not observed in the English L1 teacher's classes.

2.2. Disciplinary acculturation and literacy

2.2.1 Disciplinary acculturation

One distinctive feature of EMI is that it aims to promote ESL students' abilities to understand disciplinary knowledge through English. In other words, EMI can be described as an instruction to acculturate students into new specific disciplines at an international level by using English. This study is based broadly on a recent tendency in the applied linguistics literature that views teaching and learning disciplinary language through EMI as disciplinary acculturation.

The process of disciplinary acculturation can be defined as "a dynamic adaptation process of linguistically and culturally diverse students engaging with the academic study culture" (Cheng & Fox, 2008, p. 308). Purves (1986, p. 39) has suggested that "instruction in any discipline is acculturation or the bringing of the student into the interpretive community of the discipline". Woodward-Kron (2008, p. 3) describes academic disciplines as "discourse communities", which foregrounds the linguistic and contextual dimensions of academic disciplinary knowledge. Each discipline constructs its rhetorical community, and the expectations of the use of language vary according to each discipline (Purves, 1986). According to Purves (1986), the differences among disciplines can easily be observed when reading each discipline's academic writings. Purves asserts that disciplines exert their force across the use of language in their discipline and that any rhetorical communities can be defined by disciplines.

Likewise, Webster (2005) argues that disciplines are distinctive social constructs where novices are required to be acculturated into a prior knowledge base.

In this regard, researchers have argued that it is students' familiarity with the rhetorical expectations of a discipline that decides their successful disciplinary acculturation. Love (1991) points out that students entering HE should cope with "the specific discourse demands of individual academic disciplines" (p. 89). Love argues that regardless of their L1, students need to improve their linguistic competence to deal with new requirements of each discipline to achieve a full comprehension of the disciplinary knowledge at the HE level. Moreover, Rashidi and Shahab (2013) argue that the differences among disciplines may result in different epistemology, which is how each discipline creates and disseminates knowledge. They insist that students' success largely depends upon their familiarity with the various epistemology across different disciplines. Students are required to learn the communicative currency of their academic community, including the norms, standards, procedures, and linguistic forms to interact with their community (Van de Poel & Gasiorek, 2012). They should learn these certain rhetorical expectations within their disciplines to get acculturated into the disciplines. Therefore, full acculturation of discipline means that a student can understand and recognise the function of language use in the discourse community of the discipline (Rashidi & Shahab, 2013).

Disciplinary acculturation is no longer a concept that is limited to contexts that use only one language. As English became an academic lingua franca, the importance of using English for acculturating ESL students into their disciplines has emerged in countries in which English is not the L1. Cheng and Fox (2008) argue that disciplinary acculturation cannot be achieved if ESL students learn English and disciplinary knowledge separately. Likewise, Zyuzin (2012) claims that ESL students should develop disciplinary literacies as they learn disciplinary knowledge for successful disciplinary acculturation.

2.2.2 Disciplinary literacy

In order to acculturate students into new disciplinary contexts, content teachers and lecturers should endeavour to improve students' disciplinary literacy. Biggs (2017, p. 19) states that all teachers recognise that reading, writing, and critical thinking are crucial for students' learning of their subjects, and thus, "all teachers are disciplinary literacy teachers". As Blaj-Ward (2017) argues, students need to understand the distinctive nature of the language used in content classes to choose the appropriate approach to use it. Especially in the EMI context, students are expected to be acculturated to their disciplines through L2, and thus, they may experience more difficulties acquiring disciplinary literacies than English L1 students.

Research into literacy that is specialised in a discipline dates back several decades under the terms 'literacy across the curriculum' or 'content-area literacy' (Shanahan & Shanahan, 2008). It has been argued that the importance of reading and writing should extend beyond language subjects to other disciplinary subjects. The term 'literacy' can be defined as fluency in specialised communicative practices used in various sites in society (Gee, 1991). In the academic context, literacy refers to students' abilities to read and write academic texts (Airey & Larsson, 2018). The term 'academic literacy' refers to the diverse use of language in specific academic contexts such as disciplinary and content subject courses (Lea & Street, 1998, 2006; Lillis & Scott, 2007; Street, 2015). Van de Poel and Gasiorek (2012) have defined academic literacy as "competence and range of skills students need not only to read and write texts but also to understand, interact and communicate with members of their academic community" (p. 296).

The concept of academic literacy draws on the assumption that different academic fields have substantively different language uses in all educational levels (Bloome et al., 2018; Lea & Street, 2006). As argued by Street (2001), a focus on literacy should be decided according to the domains in which literacy is used. Lea and Street (2006) also claim that academic literacy

concerns how literacy functions differently in each disciplinary area and involves processes in which students learn new disciplinary knowledge related to their major. Moreover, Van de Poel and Gasiorek (2012) have argued that in the context of academia, becoming academically literate is a process of being acculturated into disciplines by which students learn language-specific practices of various disciplines' academic cultures. According to Airey and Linder (2009), literacy involves the ability to read, write, speak, and listen and other non-linguistic abilities distinctive to a discipline such as experimental abilities, mathematics, or graphing abilities. Thus, literacy largely depends on the particular discipline for which students want to use these abilities (Airey, 2016).

In this regard, researchers have recently tended to identify literacy in a more discipline-specific direction, expanding their focus from academic literacy to disciplinary literacy. McConachie and Petrosky (2010) define disciplinary literacy as "[t]he use of reading, reasoning, investigating, speaking, and writing required to learn and form complex content knowledge appropriate to a particular discipline" (p. 6). Similarly, Tang (2016) also defines disciplinary literacy as "the specific ways of talking, reading, writing, and thinking valued and used by people in a discipline in order to successfully access and construct knowledge in that discipline" (p.220). Airey (2011a) has defined it more broadly as "[t]he ability to appropriately participate in the communicative practices of a discipline" (p. 3). Airey argues that disciplinary literacy refers to communicative competence not only in academia but also in the workplace and society. In this respect, Wolsey and Faust (2013) differentiate disciplinary literacy from content-area literacy; they assert that while content-area literacy is merely teaching strategies to read and write appropriately in content areas, disciplinary literacy is to extend students' abilities to think and communicate within disciplines actively. In other words, as Shanahan and Shanahan (2008, p. 8) argue, disciplinary literacy is a means that experts use to engage themselves in the work of a discipline. Each disciplinary area has different disciplinary literacy aims due to the

differences in disciplinary knowledge structures, and thus, each discipline seeks to develop different communicative practices (Airey & Larsson, 2014; 2018). That is, disciplinary literacy encompasses simple reading and writing as well as construction, negotiation, and dissemination of knowledge using a broad range of semiotic resources that are meaningful to a discipline (Kuteeva & Airey, 2014).

Developing students' disciplinary literacy has been argued to be the priority in teaching disciplinary subjects. Lemke (1990) claims that students' disciplinary learning depends on their abilities to interpret and use the specialised language in which disciplinary knowledge is construed. Students in schools and universities need to know about how language works differently for constructing and presenting knowledge in different subjects (Schleppegrell, 2020). Distinctive discourse features of a discipline may hinder students' comprehension of disciplinary knowledge if they are not fully accustomed to those features. In this regard, as Woodward-Kron (2002, 2008) argues, students' abilities to use the disciplinary language are fundamental to their successful learning of disciplinary knowledge because they should be able to accurately use the disciplinary language to prove their understanding of disciplinary norms and concepts. Shanahan and Shanahan (2008) also assert that unpacking the distinctive structures of the discourse of a discipline and their variations in detail enables students to better comprehend what is being communicated through text or conversation.

Fang (2012) argues that literacy ability and disciplinary content are inextricable in disciplinary classroom settings because disciplinary content can only be accessed through language. Fang insists that all content subjects can be seen as recontextualised disciplinary discourses for the purposes of education, and disciplines vary not only in content but in the ways the contents are produced, transmitted, and communicated. He further asserts that being literate in a discipline means to be able to understand the disciplinary content and the ways to communicate within the discipline and that students' disciplinary literacy can be best improved

in content classes. This is because students can be naturally exposed to discipline-specific practices as they engage with their content teachers. In this regard, content teachers and lecturers are responsible for teaching content knowledge and the process that students should follow to acquire content knowledge as well as to generate the concepts and their ideas in a disciplinary way (Airey, 2012).

The goal of disciplinary literacy is, in large part, consistent with the objective of EMI. Disciplinary differences in the use of language are outcomes of various knowledge-making practices and educational goals in a discipline (Kuteeva & Airey, 2014). Disciplinary literacy aims to develop students' abilities to be actively involved in social, cognitive, and semiotic practices that are consistent with those used by experts in a particular discipline (Fang, 2012). EMI shares the same goal with disciplinary literacy but using English, which is L2 for students, in order for them to cope with the internationalisation of education, the economy, and the job market.

2.2.3 Disciplinary vocabulary

One crucial part of disciplinary literacy development is students' abilities to use vocabulary in a discipline-specific way, which indicates their collective group belonging (Riccomini et al., 2015; Woodward-Kron, 2008). Webb and Nation (2017) argue that vocabulary is a basic and crucial component of educational success in both L1 and L2 contexts. According to Coxhead (2018), vocabulary provides a foundation from which morphology, phonology, and grammar emerge, and it gives students access to content knowledge in a discipline. In EAP/ESP studies, vocabulary specialised to a specific discipline has been examined under the term 'content-specific (specialised) vocabulary', 'technical vocabulary' or 'semi-technical vocabulary'. Nation (2001) defines technical vocabulary (or special purposes vocabulary) as words that are markedly specific to a certain discipline and closely related to the disciplinary content and

argues that this close relationship is what makes words unique to that discipline. He categorises vocabulary into four groups according to the level of technicality: high-frequency vocabulary, academic vocabulary, technical vocabulary, and low-frequency vocabulary. High-frequency vocabulary is the most frequent words that cover around 80% of the running words of academic texts (Nation, 2001). Academic vocabulary is common to various academic fields and is not typically associated with just one discipline. Technical vocabulary frequently occurs in a specific discipline but rarely occurs in other disciplines, and low-frequency vocabulary rarely appears outside the particular discipline and includes all the words that are not included in the other three groups. Low-frequency vocabulary is considered to be "purely technical", and anyone who knows low-frequency vocabulary is assumed to have some knowledge of the discipline (Basturkmen & Shackleford, 2015, p. 88).

Disciplinarity does not seem to be clear-cut as some lexical items that have a technical sense in a particular discipline may not have that technical sense in other disciplines (Mudraya, 2006). Chung and Nation (20043 assert that when a disciplinary vocabulary item occurs in other disciplines, then a higher frequency of occurrence in a discipline can be its disciplinarity marker. Coxhead (2016) also states that vocabulary that occurs within a narrow range of a particular discipline is disciplinary vocabulary, and it may include specialised, technical, or semi-technical vocabulary. Following Coxhead (2016), in this study, the term 'disciplinary vocabulary' will be used to refer to vocabulary that is used in a disciplinary way, including low-frequency vocabulary, technical vocabulary, and academic (semi-technical) vocabulary.

Biggs (2012) argues that disciplinary vocabulary is specific to a certain disciplinary subject area and sometimes conveys important disciplinary concepts. Researchers have suggested that students' knowledge about disciplinary vocabulary can predict their performance in content classes and that students' lack of knowledge about disciplinary language may slow down their overall content learning (Biggs, 2017; Boyd et al., 2012;

Harmon, Hedrick, & Wook, 2005; Seethaler et al., 2011; Van der Walt, 2009; Van der Walt et al., 2008). Boyd et al. (2012) state that disciplinary vocabulary is essential for student success in academic subjects as well as the disciplines outside of school or university. Also, the ability to effectively communicate using the disciplinary language requires disciplinary content knowledge as well as a firm disciplinary vocabulary base (Riccomini et al., 2015). As argued by Dang, Coxhead, and Webb (2017), vocabulary knowledge is closely related to comprehending academic spoken English. In this respect, it is essential for students to learn to recognise and master vocabulary in a disciplinary way (Coxhead, 2016; Hong & Basturkmen, 2020). Therefore, content teachers need to recognise and understand many challenges that disciplinary vocabulary may present to their students (Monroe & Orme, 2002).

The literature claims that ESL students may learn disciplinary registers, including their associated disciplinary vocabulary, better in EMI classes than EAP classes as the learning of disciplinary language is firmly connected to the learning of content knowledge (Ardasheva & Tretter, 2017; Evans & Morrison, 2011; Marsh et al., 2000; Uchihara & Harada, 2018). In this regard, many researchers argue that disciplinary vocabulary has an even more important role in EMI settings (Nation, 2001; Riccomini et al., 2015; Stohler, 2006). Marsh et al. (2000) claim that ESL students in school settings may have challenges gaining a deeper conceptual understanding of a content subject if they do not have sufficient knowledge about associated disciplinary English vocabulary and the conventionalised ways of using it in a discipline. Evans and Morrison (2011) also argue that the lack of disciplinary vocabulary knowledge may impede all aspects of students' learning, including lecture and textbook comprehension, communication of their ideas in writings, and presentations in EMI classes. According to Ardasheva and Tretter (2017), it is challenging for ESL students to understand and learn disciplinary English vocabulary because they may not have encountered such words in their L1. In a similar vein, Uchihara and Harada (2018) argue that how well ESL students know the

disciplinary vocabulary in their L2 is a crucial factor for their successful performance in EMI classrooms.

To date, little research has been conducted to examine ESL students' development of disciplinary literacy in EMI. The present study aims to fill the gap by investigating the kinds of actions taken by content teachers to foster their students' disciplinary literacy and if such actions have effects on students disciplinary English development in EMI classes in two distinctive disciplines, Social Studies and Mathematics.

2.3 Language learning in classroom interaction in EMI

2.3.1 Theoretical framework for language learning in EMI

The language used in EMI is limited to English as a second language (L2), and English learning is an implied benefit of EMI (Airey, 2016; Kamaşak et al., 2020; Rose et al., 2020). Namely, students in EMI settings are expected to simultaneously acquire L2 (English) as they learn content knowledge, and classroom interaction plays an essential role in this process (Hong & Basturkmen, 2020; Macaro, 2018; Pica, 2002). SLA researchers have distinguished some stages in the L2 learning process (Richards & Renandya, 2002). The first stage is input; that is, any language resources used to begin the L2 learning process. The next stage, intake, is the part of input attended and comprehended by L2 learners. The third stage is the acquisition — the incorporation of new information into interlanguage. The last two stages are access and output, where L2 learners access interlanguage and produce the target language during communication. The following sections discuss the Input Hypothesis, the Noticing Hypothesis, the Output Hypothesis, and the Interaction Hypothesis, which offer theoretical support for language learning driven by classroom interaction in this study.

2.3.1.1 The Input Hypothesis

Input plays an important role in SLA. Early research in second language acquisition (SLA) emphasised that students need to be exposed to comprehensible input. Gass and Mackey (2006, p.5) define input as "language that is available to the learner through any medium (listening, reading, or gestural in the case of sign language)". They recognise input as a fundamental element that is "linguistic evidence" for learners to formulate hypotheses about the L2 system (p. 5). As Krashen's Input Hypothesis (1985, 1994) argued, students' language development depends on input that is a bit beyond students' current linguistic competence (*i*+1). In other words, students can only acquire L2 when they receive and comprehend messages when input is modified to help their comprehensibility. Krashen (1985, 1994) argues that teacher talk or foreigner talk helps make input comprehensible to learners.

2.3.1.2 The Noticing Hypothesis

Schmidt (1990, 2001) argues that attention to input is necessary for language acquisition. In his Noticing Hypothesis, Schmidt states that input needs to be noticed by learners in order for intake to occur for language learning (Schmidt, 2001). Moreover, Schmidt (2001) argues that "SLA is largely driven by what learners pay attention to and notice in the target language input, and what they understand the significance of the noticed input to be (p. 3-4)". The Noticing Hypothesis viewed 'noticing' and 'noticing-the-gap', which consists of learners' awareness of differences between their interlanguage and input, as crucial processes in L2 acquisition.

2.3.1.3 The Output Hypothesis

Output is defined as "the language that learners produce during meaning-focused interaction" (Loewen & Sato, 2018, p. 291). The Output Hypothesis (Swain & Lapkin, 1995, 1998) states that output is important in language learning as it triggers learners' noticing. Swain and Lapkin

(1995) argue that by producing the target language, learners can recognise their linguistic mistakes (noticing the gap), and in turn, they can produce syntactically more accurate and complex language. Many SLA researchers have argued that modified output is effective for learners to internalise new linguistic items and make the cognitive connection for themselves rather than merely perceive the items (De Bot, 1996; De La Fuente, 2002; Laufer, 2010; Pica et al., 1989). A number of interaction researchers have asserted that in order for the modified output to be effective, learners should notice the connection between their initial linguistic errors, the feedback, and their output (Gass & Mackey, 2006, 2007).

2.3.1.4 The Interaction Hypothesis

SLA research on interaction has been conducted within the Interaction Hypothesis (Long, 1991, 1996), which expanded on Krashen's claim (1985, 1994) that the ideal input for L2 learners is the input modified to be comprehensible for learners through interaction. The Interaction Hypothesis claims that interaction between learners and more proficient speakers is "a crucial site for language development" (Long & Robinson, 1998, p.22). The Interaction Hypothesis argues that interaction "facilitates language acquisition because it connects input (what learners hear and read); internal learner capacities, particularly selective attention; and output (what learners produce) in productive ways" (Long, 1996, p. 451). Gass (1997) claims that interaction is not only an opportunity for L2 practice but also "the means by which learning takes place" (p.104) and that interaction is a crucial means that allows learners "to focus attention on areas that they are working on" (p.130).

According to Loewen and Sato (2018), conversational interaction comprises four main components: input, negotiation, output, and noticing. Gass and Mackey (2006) argue that input is a necessary and essential component in all SLA theories, including the Interaction Hypothesis, and that it can be given to learners through various ways such as reading, listening, or even

gesture. Negotiation is the core of interaction as it makes input more comprehensible to language learners (Gass, 1997; Gass & Mackey, 2006). Negotiation is divided into two types, one is negotiation for meaning, and the other is the negotiation of form. The former refers to the process in which learners and their interlocutors seek to reach a mutual understanding when they recognise a breakdown in their communication by using clarification request, confirmation check, and comprehension check (Loewen & Sato, 2018; Long, 1996). The latter occurs to achieve linguistic accuracy (Ellis, Basturkmen, & Loewen, 2001a; Loewen & Sato, 2018; Lyster & Ranta, 1997). It usually involves teachers' pedagogical intervention, such as corrective feedback that occurs when teachers react to learners' linguistically incorrect utterance, although its meaning is understandable (Loewen & Sato, 2018). There are four key elements of negotiation of form, including elicitation, metalinguistic clues, clarification requests, or repetition of error (Lyster, 2001). Lyster (2001) argues that negotiation of form provides students with "timely opportunities to make important form-function links in the target language" (p.273) without any interruption of the flow of communication. Output is another crucial construct in the Interaction Hypothesis and recognised as a causal factor for L2 acquisition by a number of SLA researchers (Loewen & Sato, 2018; Gass & Mackey, 2006; Swain, 1995, 2005). By producing language, learners can notice the gap in their prior knowledge about the language, test their linguistic hypothesis, and enhance accuracy, fluency, and automaticity (Swain, 1995, 2005).

Lastly, interaction researchers regard attention as another important construct for L2 acquisition (Loewen & Sato, 2018; Gass & Mackey, 2015; Williams, 2001). It is believed that "the cognitive constructs of attention, awareness and the related construct of noticing are part of the interaction-L2 learning process" (Gass & Mackey, 2015, p.191). Attention to language during classroom interaction may play a more important role in EMI classes than ESL classes as the focus of EMI is entirely on teaching and learning content knowledge, not language.

2.3.2 Attention to language

2.3.2.1 Incidental attention to language

Literature has long argued the importance of content teachers' consideration of language in relation to their EMI teaching. In EMI, content learning through L2 poses many linguistic challenges to ESL students. Thus, content teachers are expected to support their students by making decisions about what language items to attend to and how (Gibbons, 2003). Previous studies in applied linguistics have examined attention to language in EMI settings and found that content teachers' attention to the language during their EMI teaching was frequent in both school and university settings (An et al., 2019; Basturkmen & Shackleford, 2015; Costa, 2012; Hong, 2021; Hong & Basturkmen, 2020; Mclaughlin & Parkinson, 2018).

Attention to language is defined as "the process that encodes language input, keeps it active in working and short-term memory, and retrieves it from long-term memory" (Robinson, 2003, p. 631). One distinction has been made between planned and incidental attention to language (Ellis 2001; Ferrokhi & Gholami, 2007; Hong & Basturkmen, 2020). Planned attention to language consists of teachers' or lecturers' prior decisions to target specific linguistic items (Ellis et al., 2001b; Hong & Basturkmen, 2020). By contrast, incidental attention to language occurs spontaneously when teachers or students focus transiently on the language during class interactions without any prior intention (Ellis et al., 2001b). Almost all EMI studies on how content teachers support students with language have dealt with one single type of attention to language, namely, incidental, unplanned attention to language. Yet, given that planned attention to language is also an indispensable part of the attention to language (Ellis, 2001), it is at least as important and effective as incidental attention to language in supporting students with language challenges in EMI settings.

Interaction productively links input, learners' selective attention to language, and their output (Long, 1996). To facilitate the L2 learning process during an interaction, Gass (1997)

suggests two interventions that teachers can take: making input more comprehensible and encouraging more output. According to Swain (2000), such a process of L2 learning can be investigated by focusing on interactional sequences, such as language-related episodes (LREs), which seem to enhance input from teachers (proficient speaker) and elicit more output from students.

2.3.2.2 Language-related episodes (LREs)

Long's (1996) Interaction Hypothesis claims that L2 acquisition can be facilitated by negotiation as it "connects input, internal learning capacities, particularly selective attention, and output in productive ways" (p. 451). Such negotiation is a type of Language-related episodes (Lyle, 2015), a construct that many studies on incidental attention to language have drawn on. Swain and Lapkin (1998) define LREs as any part of a dialogue in which classroom participants "talk about the language they are producing, question their language use, or correct themselves or others" (p. 326). More specifically, LREs are defined as "instances when teachers and learners talk about languages, such as grammar or vocabulary, or a feature of the discourse or phonological systems within communication that is primarily concerned with exchanging messages" (Basturkmen & Shackleford, 2015, p.89). According to Loewen and Sato (2018), LRE is an example of a negotiation of form that arises due to concern for linguistic accuracy. As Shekary and Tahririan (2006) argue, an LRE usually comprises a trigger, response, and recast. In general, the trigger for an LRE involves producing a linguistic error or raising a question about language use (Shekary & Tahririan, 2006). Sheckary and Tahririan (2006) also assert that each LRE always deals with a specific linguistic item and describes the whole process in which the item is initiated, noticed, negotiated, and resolved. LREs have served as a useful tool to record any incidental and unplanned changes of attention to language during classroom interaction (Basturkmen & Shackleford, 2015; Bancroft-Billings, 2020; Lee & Pyo,

2013; Rayati, Yaqubi, & Harsejsani, 2012; Sheckary & Tahririan, 2006). Jackson (2001) argues that LREs can be "a useful construct for understanding the nature of L2 production, and for exploring the contributions that output makes in learning a second language" (p.299). Ryoo (2009) also claims that LREs plays a facilitative role in students' L2 acquisition during interactions

Some studies on LREs have led to a distinction between pre-emptive and reactive LRE (Ellis et al., 2001b; Hong & Basturkmen, 2020). Pre-emptive LREs can be defined as "episodes that arise regardless of any perceived linguistic errors or linguistic questions" (Hong & Basturkmen, 2020, p. 5). Ells et al. (2001b) argue that pre-emptive LREs address either an actual or perceived gap in students' knowledge about language items. Reactive LREs, on the other hand, are defined as "episodes that arise in response to perceived linguistic errors or because a participant fails to comprehend something that another has said" (Hong & Basturkmen, 2020, p.5). In reactive LREs, the first discourse move that contains a linguistic error is the trigger (Ellis et al., 2001b). Another distinction that has been made is between teacher-initiated and student-initiated LREs; teacher-initiated LREs occur when teachers either ask questions about language items or provide unsolicited information about language items, and student-initiated LREs occur when students raise questions about language items (Basturkmen & Shackleford, 2015; Ellis et al., 2001b; Hong & Basturkmen, 2020).

Some empirical studies in the ESL context have shown that students' L2 proficiency affects the frequency and type of LREs. For example, Leeser (2004) examined the relationship between the way of grouping students by their relative L2 proficiency (high-high, high-low, or low-low) and the frequency and types of LREs in an undergraduate content-based geography class in a Spanish university. It was found that the group of high proficiency students initiated the most LREs, while the group of low proficiency students initiated the least amount of LREs. Moreover, high proficiency students initiated significantly more grammar-focused LREs than

low proficiency students, who attended to vocabulary the most. Leeser speculated that this finding could be because the low proficiency students were "struggling just to extract meaning from the passage" (p. 73). That is, lower proficiency students attended to vocabulary as it carried the most meaning, while high proficiency students who appeared to have more vocabulary knowledge could focus more of their attention on grammatical items. Based on the results of his study, Leeser suggests that low proficiency students may not benefit from LREs. A similar finding is reported by Kim and McDonough (2008) in their study into the Korean context. They examined if the occurrence and resolution of LREs varied when intermediate L2 learners performed dictogloss tasks with intermediate interlocutors compared to when collaborating with advanced interlocutors. Results showed that the L2 learners initiated LREs more often and resolved LREs more correctly when collaborating with advanced interlocutors than with intermediate interlocutors. Findings of these studies suggest that student-student interaction may have some effects on low L2 frequency students' learning when they are paired with those with relatively higher L2 proficiency. However, these studies did not demonstrate if LREs arising during task-based interaction resulted in students' L2 acquisition.

Some studies on LREs were conducted to examine the frequency and characteristics of LREs in classroom interaction in the ESL context and provided evidence of the effects of LRE on students' L2 acquisition. Ellis et al. (2001b) examined if students' uptake occurs in Focus on Form Episodes (FFEs), a type of LRE (Basturkmen & Shackleford, 2015), and which characteristic of FFE was associated with successful uptake in two communicative ESL classes in a private English language school in New Zealand. They found a total of 448 episodes in the 12 hours of classroom recordings with a high-frequency rate of 1 FFEs every 1.6 min. A majority of FFEs focused on grammar or vocabulary. One noticeable finding was that successful uptake, "a student's utterance that immediately follows the teacher's feedback" (Lyster & Ranta, 1997, p. 49), did occur in nearly 74% of the FFEs. Two factors, type and

complexity, were found to affect the level of uptake. Student-initiated, pre-emptive FFEs and teacher-initiated, reactive FFEs involved higher and more successful uptake than teacher-initiated, pre-emptive FFEs. Also, complex FFEs involved more uptake as well as more successful uptake than simple FFEs. However, given that successful uptake itself does not guarantee students' learning of the language item targeted in the FFEs, the study suggests further research to examine if students learn language from FFEs that incidentally arise in classroom interaction.

One study that investigated the effects of FFE on students' L2 learning is Loewen (2002). Loewen examined the occurrence of FFE and the relationship between the categories of FFEs and students' L2 learning in communicative ESL classes. He observed the 12 communicative ESL classes in a language school in New Zealand. A total of 1,373 FFEs were identified over a combined 32 hours of class recordings. The majority of them were teacher-initiated, reactive FFEs (73%), and also students initiated FFEs (26.6%). Most FFEs focused on vocabulary (43%) followed by grammar (33.3%) and pronunciation (22%), and spelling received the least attention (2.1%). Also, the vast majority of the FFEs occurred immediately after the trigger (89.9%), and simple and complex FFEs occurred at a similar frequency (53.5% and 46.5%, respectively). Around 75% of FFEs involved students' successful uptake in his data set. Loewen conducted tailor-made tests at two times — immediate and delayed — to examine the effects of FFEs on students' retention of information on linguistic items targeted in FFEs. In the study, FFEs were regarded as an indicator of students' lack of knowledge about the targeted language item, and thus, they were used as a pre-test. FFEs were found to be beneficial for students' L2 learning, particularly when students actively included the targeted linguistic items in their own production (uptake). Out of the 473 FFEs tested, the students responded correctly to around 60% of the test items in the immediate tests and nearly 50% in the delayed tests. One noticeable finding was that successful uptake was a significant predictor for students'

correct test item responses. Although the study examined only the two types of FFEs, teacher-initiated, reactive and student-initiated, pre-emptive, for the purpose of testing, Loewen reported that teacher-initiated, pre-emptive and student-initiated, reactive FFEs were also present in classroom interaction and that incidental attention to language was effective for students' L2 learning.

Farrokhi and Gholamy (2005) examined the frequency and types of LRE in teacher-student interaction in two meaning-focused ESL classes in a language school in Iran. The classes consisted of 12 undergraduate students with ages ranging from 19 to 34. The study found a total of 641 LREs from the 20 hours of classroom recordings with a rate of one LRE every 1.9 minutes. It was also found that pre-emptive LREs occurred far more frequently (73.8%) than reactive LREs (26.2%) and that the teachers initiated nearly 85% of the LREs. The results showed a low frequency of students' uptake (15.2%), and teacher-initiated, reactive LREs resulted in more uptake than pre-emptive LREs initiated by the teachers and students. Farrokhi and Gholamy suggest that despite the transient nature of LRE, students need more time to produce uptake during LREs.

In the South Korean HE context, Lee and Pyo (2013) investigated LREs arising in group discussion activities in an undergraduate EAP course, which focused on the development of students' academic listening and speaking skills. The study involved a total of 37 undergraduate ESL students who had Korean as their L1. Lee and Pyo observed and audio-recorded group discussions between the students in the EAP course for two months and identified LREs from the recordings of a total of 13 sessions of group discussions observed. They found three types of LREs: lexis-focused, pronunciation-focused, and grammar-focused LREs. The students initiated lexis-focused LREs most frequently (62%), followed by grammar-focused LREs (20%) and pronunciation-focused LREs (18%). The findings indicated that lexis-focused LREs occurred when the students attended to the definition of words, spelling, synonyms, or the usage

of words in a sentence. Pronunciation-focused LREs were initiated when the students self-corrected or corrected each other's incorrect pronunciation. Lee and Pyo conclude that LREs provide effective and productive L2 learning opportunities for students to develop their communicative skills. However, the study only examined classroom interaction between students, and whether the teacher also initiated any LREs to support the students' L2 acquisition was left unknown. Moreover, the study provides neither the total number of LREs identified nor the information on the time of the group discussion recordings, which could have been useful to examine the frequency of LREs in the context.

Using a similar methodology, Erlam and Pimentel-Hellier (2017) examined the frequency and characteristics of LREs in two foreign language classes (French and Spanish) in two secondary schools in New Zealand. They found a total of 292 LREs during 330 minutes of class recording with a rate of one episode every 1.1 minutes—much higher than the frequency found in the previous studies on LRE. They also found a much higher frequency of student-initiated LREs (83.2%) than teacher-initiated LREs (16.8%); however, this could be because they excluded pre-emptive LREs initiated by teachers and placed more voice recorders between students who sat together as a group to record peer-interaction. In the study, there were slightly more reactive LREs (57.2%) than pre-emptive LREs (42.8%), and again, less frequency of pre-emptive LREs may be due to the exclusion of teacher-initiated, pre-emptive LREs.

Lately, research in applied linguistics has investigated the frequency and types of LREs in classroom interaction in content classes (An et al., 2019; Bancroft-Billings, 2020; Basturkmen & Shackleford, 2015; Costa, 2012; Hong, 2021; Hong & Basturkmen, 2020; McLaughlin & Parkinson, 2018). A number of studies have confirmed the occurrence of LRE in EMI classes and found that most LREs focused on vocabulary. A study in the Italian HE context (Costa, 2012) examined the occurrence and types of pre-emptive FFEs in six EMI undergraduate lectures in natural and applied sciences that Italian L1 lecturers taught. The study

found 76 FFEs in approximately 18 hours of lecture recordings, and one episode occurred every 14 minutes. Most of the LREs focused on code-switching (35 episodes) followed by vocabulary (25 episodes), while grammar (4 episodes) received the least attention. A particularly important finding of the study was that the lecturer used code-switching to facilitate students' understanding of the lecture by translating words or phrases into L1 (Italian). However, the study only examined lecturer talk and did not examine any lecturer-initiated, reactive LREs that occur in response to students' linguistic errors or student-initiated LREs. Had the study included lecturers' reactive LREs and student-initiated LREs, there would have been more LREs identified in the data set.

Basturkmen and Shackleford (2015) examined the frequency and characteristics of LREs in undergraduate accounting classes of two lecturers in the HE context in New Zealand. They examined not only lecturer talk but also interactions between lecturer and students. They observed four lessons of two accounting classes, which consisted of around 60% of ESL students. A total of 164 LREs were identified from eight hours of lecture recording with a rate of one LRE every three minutes. They coded LREs for initiator (lecturer or student) and interactional type (pre-emptive or reactive), and linguistic categories. The lecturers initiated a great majority of the LREs (88.4%), and they did so more pre-emptively (55.2%) than reactively (44.8%). Student-initiated, reactive LREs had not been a focus of analysis in the previous studies. Results of the study revealed that students did initiate a few LREs (11.6%) both pre-emptively and reactively. Vocabulary (46%) received the most attention, followed by a conventional articulation of proposition in accounting (41%), discourse (6%) and grammar (3%). Basturkmen and Shackleford concluded that such episodes can be a crucial means by which content lecturers integrate their attention to language into their content teaching.

Drawing on the methodology used in Basturkmen and Shackleford (2015), McLaughlin and Parkinson (2018) examined vocabulary-focused LREs in the context of a carpentry training

programme in New Zealand. A total of 15 sessions of the three tutors' carpentry classes were observed, and 16 hours and 30 minutes of recordings were made. In their study, only the LREs focused on disciplinary vocabulary were identified. The study found that of a total of 123 vocabulary-focused LREs, nearly 80% were initiated by the tutors and that both the tutors and students initiated the LREs mostly pre-emptively (87%). One interesting category used for coding LREs was the ways to draw attention to the language, which comprised four types: giving explicit information, eliciting information (including asking a question), recasting (reformulating), and simply drawing attention. The predominant way that tutors shifted attention from content to language was by providing students with explicit information about lexical items (65%), as opposed to eliciting information from the students (9.3%). On the other hand, most student-initiated LREs (62%) were made when the students directly asked questions about lexical items.

Bancroft-Billings (2020) investigated types of technical legal English vocabulary used in a first-year Contract course in a law school in the United States. The study involved 25 first-year students and one Contract lecturer, and all had English as their first language. The data were collected from the transcripts of a total of 50-hour recordings of 40 lessons and were analysed quantitatively, using the corpus comparison method and qualitatively by examining LREs. The frequency of words that occurred in Contract class transcripts was compared to that found in a non-law academic corpus, and a total of 290 technical legal vocabulary were identified from the quantitative analysis. A total of 709 LREs were identified and coded for initiator (lecturer and student) and language event type (e.g., definition, language clarification, or language appreciation). In the study, the lecturer initiated far more LREs than the students, and he did so more frequently in lecturer talk (72.2%) than in his interaction with students (26.9%). The lecturer initiated most LREs to define disciplinary vocabulary (66.3%) either by explicitly providing them or by eliciting them from students. An additional analysis, a

comparison of the number of words between the keyword list and the list of the defined word during LREs, revealed that although there were more word types in the keyword list (290) than that defined in the LREs (218), interestingly, the degree of word technicality was found to be higher in the latter than former. Bancroft-Billings suggests that LRE can be used as an effective means to identify disciplinary vocabulary used in a content class and provide rich descriptions of how disciplinary language is discussed and conceptualised in content classes.

A study into the South Korean HE context (Hong, 2021) examined the frequency and types of LREs in an undergraduate computer programming lecture in a similar line of inquiry. Hong observed four lessons of a computer programming class of a Vietnamese L1 lecturer, who spoke neither English nor Korean as his L1. She found a total of 35 LREs from four hours of class recordings with a rate of one episode every seven minutes, and LREs ranged in length from six to 19 seconds. Similar to the findings of the previous studies, the lecturer in the study initiated almost all the LREs (91%) — mostly pre-emptively (94%). Also, most lecturer-initiated LREs focused on vocabulary (66%) followed by discourse (33%), and there were no grammar-focused LREs in the study. One interesting finding of the study was that the computer programming lecturer initiated vocabulary-focused LREs mostly to attend to spellings of technical terms while using a programming language for coding. Hong concluded that lecturers' strategies for attending to the same linguistic category might vary from discipline to discipline.

Recently, the focus of EMI research on LRE has shifted from HE to secondary education. An et al. (2019) examined LREs arising in science classes in EMI high schools in China. Two lessons of 15 English L1 teachers from seven schools were observed and video recorded for a total of 15 hours and 20 minutes of recordings. Unlike the findings of the previous studies reviewed above, the study found that only a small proportion of the class time (3%) was given to LREs. Still, about 80% of that time was given to LREs focused on vocabulary, followed by grammar (19.1%) and idiom (1.1%). Yet, the study left much to be

desired in that it did not provide information about initiator and interactional types of the LREs identified.

As preliminary research of the current study, Hong and Basturkmen (2020) investigated LREs in two EMI classes (economics and politics) in two different high schools in South Korea. They examined LREs incidentally arising in teacher-talk and teacher-student interaction. They observed six lessons of Korean L1 teachers' 50-minute economics classes in a public high school and five lessons of English L1 teacher's 50-minute politics classes in a private high school. Each class had 25 second-year high school students. The frequency and characteristics of LRE were examined. A total of 370 LREs were identified from around 9 hours and 40 minutes of class recordings and coded for three characteristics; initiator (teacher or student), interactional type (pre-emptive or reactive), and linguistic category (vocabulary, grammar, or discourse). Results of the study revealed that the occurrence of LRE was frequent in both content classes. One noticeable finding was that the frequency and types of LREs was not different significantly regarding the teachers' different L1 backgrounds or disciplinary areas; LREs occurred at a rate of about one LRE every 2.1 minutes in the economics class, accounting for 6% of class time, and around one LRE every 1.9 minutes in the politics class, accounting for 7% of class time. In both classes, the teachers initiated nearly all the LREs (90%), and the teachers and students initiated LREs more pre-emptively than reactively (87.3% and 12.7%, respectively). The results of the study showed that the majority of LREs focused on vocabulary (82.4%), followed by discourse (11%) and grammar (6.4%) in both classes. Interestingly, the study found that the economics teacher spent far more time on the vocabulary-focused LREs than the politics teacher. Hong and Basturkmen explained that the reason for such a result was because of the economics teacher's use of code-switching, which was not observed in the politics teacher's teaching practices. They also assumed that as an ESL speaker, the economics teacher might have had an "instinctive understanding of the potential level of (linguistic)

difficulty" that his students would encounter during his EMI classes (p. 7). Another noticeable finding was that although the focus of the study was incidental attention to language, both the teachers were observed to pay attention to language when they planned and prepare for their teaching to help the students, for example, by providing their classes with a glossary or wordlist of disciplinary vocabulary. Hong and Basturkmen suggest that the way EMI teachers perceive their roles in relation to their EMI teaching and their planned attention to language also need to be examined, along with incidental attention to language.

Drawing on and extending this body of research on attention to language — mainly on the works by Hong and Basturkmen (2020) and Loewen (2002) — this study examines both planned and incidental (unplanned) attention to language in EMI classes in a high school and university in South Korea. Also, this study investigates if incidental attention to language appears to lead to students' learning of language, particularly based on Loewen (2002). For the sake of clarity, in this thesis, LREs and FFEs will be considered as equivalent constructs.

2.5 Summary

This study aims to examine planned and incidental attention to language and the effects of incidental attention to language on students' language learning in EMI classes. Research on EMI has suggested that EMI students may encounter more linguistic challenges than students in ESL or other content classes taught in their L1 because they are expected to develop disciplinary literacy in their L2. This study draws on the three hypotheses from SLA, the Input Hypothesis, the Output Hypothesis, the Noticing Hypothesis, as well as the Interactional Hypothesis, as a theoretical background for language learning in EMI settings. In EMI, classroom interaction may play a crucial means for ESL students to acquire disciplinary registers.

Previous studies mentioned above have shown that language sometimes became a topic

of discussion that was primarily focused on disciplinary content in EMI classes; however, there has been little information about content teachers' or lecturers' attention to the language when they plan or prepare EMI teaching. Moreover, although many researchers have claimed that EMI is effective for ESL students' development of disciplinary English, little attention has been given to learning of language items attended to in EMI classes.

CHAPTER THREE: METHODOLOGY

This chapter aims to provide a detailed account of the research design and report a description of the data collection procedures and data analysis of the current thesis study. The purpose of this study was (1) to investigate and understand what types of language support content teachers and lecturers plan in relation to their disciplinary EMI classes and their thinking behind the support, (2) to investigate the extent and categories of language-related episodes (LREs) in which content teachers and lecturers attend to the language during classroom interaction, and (3) to examine students' learning of disciplinary language items targeted in LREs.

3.1 Research Design

3.1.1 Mixed methods

This research adopted a mixed-methods approach by combining qualitative and quantitative methods. One distinction between qualitative and quantitative research is that the former can be characterised as involving observing and enquiring, whereas the latter as measuring and controlling (Van Lier, 1988). However, the two different approaches are not necessarily exclusive and can be combined into another research approach, mixed methods (Dörnyei, 2007). Dörnyei (2007) has argued that the mixed methods approach increases the strengths of both qualitative and quantitative methods used in the study while overcoming their weaknesses. Moreover, it is particularly appropriate when researchers aim to obtain increased breadth and depth of understanding of a complex phenomenon and improve the validity of their research (Dörnyei, 2007; Johnson, Onwuegbuzie, & Turner, 2007; Clark et al., 2008). Creswell (2015, p. 2) defines mixed methods more precisely as "an approach to research in the social, behavioural, and health sciences in which the investigator gathers both quantitative and qualitative data, integrates the two, and then draws interpretations based on the combined strengths of both sets of data to understand research problems".

There are four major designs of mixed methods: triangulation design, explanatory design, exploratory design, and embedded design (Creswell & Clark, 2017). The triangulation design is used to combine "different but complementary data on the same topic" (Morse, 1991, p.122). This design involves collecting and analysing quantitative and qualitative data in parallel and combining them through direct comparison or synchronisation of the separate results (Creswell, 2012; Creswell & Clark, 2017; Clark et al., 2008). Whereas the triangulation design is carried out concurrently, the explanatory and exploratory designs are conducted sequentially. The explanatory design is used when qualitative data are needed to expand or explain quantitative findings (Clark et al., 2008). In this design, quantitative data collection and analysis precede those for qualitative data (Clark et al., 2008). The third type, the exploratory design, is used when a qualitative, in-depth exploration of a phenomenon is needed before any quantitative measurement or testing (Creswell, 2012; Creswell et al., 2003). A secondary quantitative phase of data collection and analysis is built on the initial qualitative results (Clark et al., 2008). The last type is the embedded design, in which one type of data has a supportive role to the other type to enhance the overall study (Creswell & Clark, 2017). One distinctive feature of the embedded design is that the two different types of data are not compared or contrasted with each other; they are employed only to address different research aspects (Clark et al., 2008). Of the four designs of mixed methods explained above, this study used the exploratory design, which is useful when little is empirically known about the research area (Creswell & Clark, 2017). This study involved two sequential phases for data collection: one initial qualitative phase and the other quantitative phase, as shown in Figure 1.

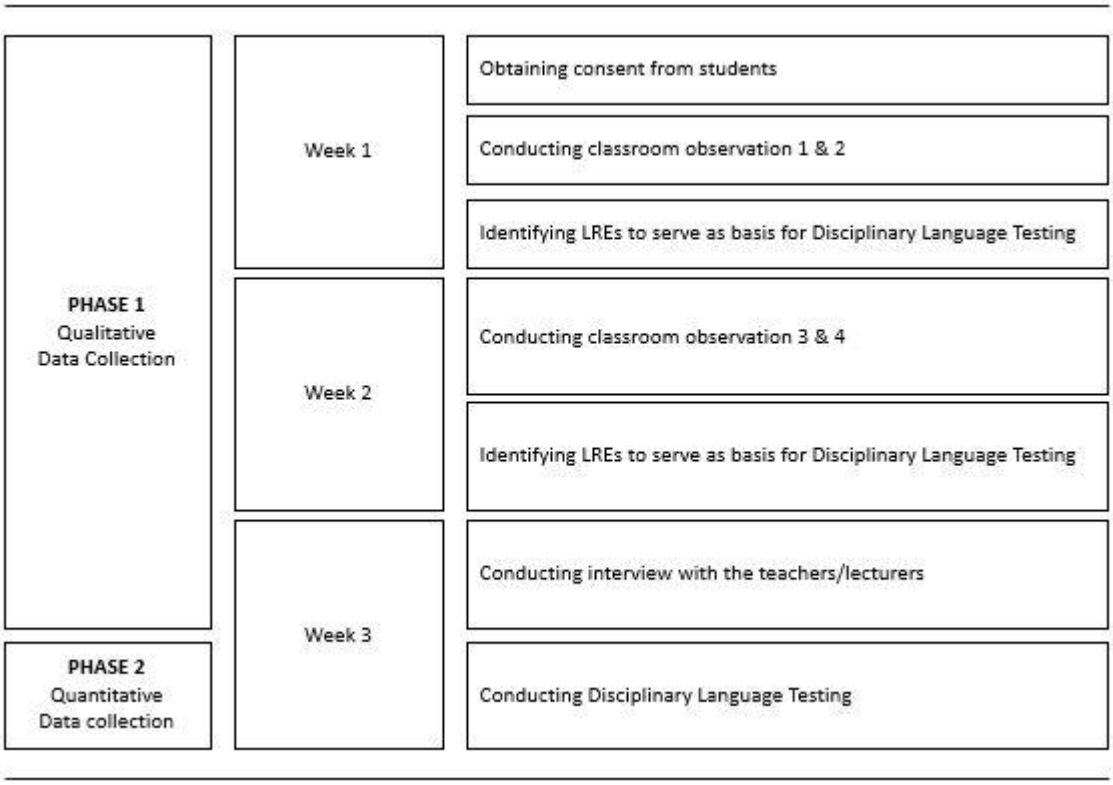


Figure 1. Data collection schedule

The research took place across two phases over 12 weeks (three weeks in each of the four classes). In Phase 1, qualitative data were collected from classroom observations and recordings and semi-structured interviews with the teachers and lecturers. In Phase 2, quantitative data were collected from the written language test.

3.1.2 Case study approach

The case study approach was chosen for this study. As has been mentioned in Chapter 2, there is a lack of research on teaching and learning of language in EMI classes in high school and university settings. When there is little known about a particular phenomenon, a detailed exploration of a few cases is appropriate because it draws less on the previous literature or prior empirical findings (Eisenhardt, 1989). The case study has been defined as a holistic and in-depth exploration of the complexity, particularity, and uniqueness of a single phenomenon or multiple phenomena (Dörnyei, 2007; Duff & Anderson, 2015). Thus, this study aims to explore

settings to gain an understanding with a comprehensive view using one or more methods (Cousin, 2005; Thomas, 2011). Cases are generally people, for example, in applied linguistics, teachers, students, or course coordinators; other entities such as a programme, an institution, or a country can be a representative case (Dörnyei, 2007; Duff & Anderson, 2015). This study involves two institutions: a high school and a university. Each institution includes two distinctive cases of content teachers/lecturers and their students.

When adopting a case study approach, one consideration is whether to analyse a single case or multiple cases to better understand a particular phenomenon (Duff & Anderson, 2015; Yin, 2014). A single case study allows a more in-depth exploration of phenomena focusing on a single research participant. On the other hand, a multiple case study investigates two or more related cases for a comprehensive understanding of a similar phenomenon (Duff & Anderson, 2015). There are three main features of a multiple case study in relation to this research as follows:

The first feature is uniqueness. A multiple case study involves several cases of a similar but unique phenomenon and explores those cases in detail to achieve an extensive understanding of their contexts (Duff & Anderson 2015; Yin, 2014). This study was classroom-based research conducted in two typical contexts, a high school and university, in South Korea, where content subjects were taught in English as a second language for the students.

The next feature is multiple data sources. A multiple case study enables researchers to explore the target phenomenon with multiple voices or perspectives to create in-depth descriptions and detailed interpretations (Duff & Anderson, 2015; Geertz, 1973; Gustafsson, 2017). In order to attain rich understandings of each case, this study used mixed methods for data collection, including classroom observation, document analysis, semi-structured interviews, and tailor-made written tests on disciplinary uses of language.

The last feature is reliable and robust evidence. With the similarities and differences found from a comparison between the cases, a multiple case study can draw more reliable and stronger conclusions and provide the literature with meaningful influences (Gustafsson, 2017; Mackey & Gass, 2005). In this study, each setting was treated as an individual case, and the similarities and differences between the settings were examined through cross-case analysis.

3.2 Participants

3.2.1 Research sites

Case study research involves two types of case sampling: random sampling and purposive sampling (Dörnyei, 2007). Purposive sampling is used when researchers select participants "who can provide rich and varied insights into the phenomenon under investigation so as to maximise what we can learn" (Dörnyei, 2007, p.126). This study used purposive sampling to select participants since it aims to examine pre-existing EMI classes.

The research took place at two different settings; one was Sokuk High School, and the other was the University of Seoul, both located in Seoul, South Korea. The pseudonyms, Sokuk High School (SHS) and the University of Seoul (UoS), were used to protect the institutions' anonymity. These research sites were chosen because they provided EMI classes within their official curricula.

3.2.2 Participant selection

A total of four EMI classes participated in the study. Two EMI classes, Economics (SA-E) and Mathematics (SA-M), with two content teachers (Kim and Glenn) and 50 students, were invited from SHS. Two EMI lectures, Accounting (ACC101) and Engineering Mathematics (EMT103), with two content lecturers (Chen and Luke) and 73 students, were invited from the UoS. The participants were part of pre-existing classes and selected based on their willingness to

participate in this study. After obtaining informal consents from the Principal of the high school and the Deans of two academic departments (Business and Mathematics) at the UoS, I asked their assistants to send out an invitation email, including the Participation Information Sheets (PIS), to teachers and lecturers who taught EMI classes. Teachers and lecturers who were interested in the research were asked to contact the researcher directly. Two teachers and two lecturers responded positively. I visited each class or lecture a week before the first day of observations to present an outline of the study to students and invite them to participate (See Appendix B for the PIS and Consent Form presented to the participants). All students from each class agreed to participate in classroom observations and recordings; however, some students did not agree to have their test results to be used (See Table 2). The teachers, lecturers and students were informed that the purpose of the study was to examine planned and incidental attention to language and the effects of LREs arising during classroom interaction; however, they were not given any further details of the study.

3.2.3 Teachers and lecturers

Two content teachers from SHS and two content lecturers from the UoS were invited for the study. Table 1 provides an overview of the teachers and lecturers and their teaching backgrounds. Pseudonyms were used for all the names of participants to preserve anonymity.

Table 1 Teacher and lecturer information

Institution	Name	Subject	Country of origin	L1	Educational background	Teaching experience	Time at institution
SHS	Kim	Economics	South Korea	Korean	BA. Social Science	8 years	3
	Glenn	Mathematics	Ireland	English	PGDip. Science & Maths Education	7 years	2
UoS	Chen	Accounting	China	Chinese	PhD. Economics & Business	6 years	6
	Luke	Mathematics	India	English	PhD. Applied Mathematics	7 years	7

3.2.4 Students

From SHS, a total of 50 students participated in this study: 27 students in Kim's Economics class (SA-E) and 23 students in Glenn's Mathematics class (SA-M). All students were in their second year, aged 17. They were Korean L1 speakers who had English as a foreign language. All students consented to participate in classroom observations and recordings, but 12 students in Kim's class and nine students in Glenn's class disagreed with having their test results to be used for research (partial-participants).

From the UoS, a total of 73 students participated in the study: 42 students in Chen's Accounting course (ACC101) from the Faculty of Business and 31 students in Luke's Engineering Mathematics course (EMT103) from the Faculty of Mathematics and Science. Both courses were first-year courses that were mandatory for all students in each faculty. One distinctive feature of Chen's Acc101 course was that it had 19 international students. The only demographic information gathered from Chen was their nationalities; 14 from China, three from Pakistan, and two from Germany. These students spoke neither Korean nor English as their L1. In Luke's class, all the students were Korean L1 speakers and had English as a foreign language. All students consented to participate in classroom observations and recordings, but 33 students in Chen's class and 23 students in Luke's class disagreed to make their test results available for research (partial-participants). Table 2 provides detailed information about each EMI class observed in this study.

Table 2 Students information

Institution	Class	Subject	Teacher	Number of students	Number of partial-participating students	Year (age)
SHS	SA-E	Economics	Kim	27	12	2nd (17)
	SA-M	Mathematics	Glenn	23	9	2nd (17)
UoS	ACC101	Accounting	Chen	42	33	1st (19~)
	EMT103	Mathematics	Luke	31	23	1st (19~)

3.3 Data Collection

3.3.1 Semi-structured Interview

RQ 1. What is the planned attention to language in two EMI settings?

To answer research question 1, data were collected from individual semi-structured interviews with the teachers and lecturers. Semi-structured interviews allow flexible data collection, in which an interviewer can lead the conversation to pre-identified topics and unexpected context-specific topics that the participants regard as necessary (Dornyei, 2007). Interviews with the teachers and lecturers aimed to understand the purpose, expectations, and anticipated outcomes of their planned attention to language (e.g., a glossary or word list) and their planned practices to support their students with language during their EMI teaching. An interview protocol (see Appendix C) was developed to elicit the teachers' and lecturers' perspectives of their role and purposes for providing planned attention to language. The initial interview topics were developed based on a review of documents obtained from the teachers and lecturers (e.g., course outline or lesson plan). The topics in the interview protocol were:

i. How the teachers or lecturers perceived their role
ii. What they saw as the functions of language support they provide

The semi-structured interview was held in person after the period of observation. It was conducted in the language that each participating teacher or lecturer was comfortable with for richer data. Interviews were conducted individually. Prior to the interviews, the teachers and lecturers were provided with the interview protocols and were asked to bring any documents that may be relevant to interview sessions. The teachers and lecturers had the opportunity to review their interview transcripts so that they could make any changes if they wished. All interviews were voice-recorded and transcribed, and the transcripts of the interview with the Korean L1 teachers were translated into English by the researcher.

The institutional and teachers' or lecturers' documents were collected and used for the triangulation of interview data (see Table 3). As Brown (2018) pointed out, data from semi-structured interviews have a possible weakness due to the personal nature of the interview. Therefore, such data should be triangulated through the review of relevant documents and carrying out multiple interviews with different interview participants. Also, documents provide interviewers helpful context for understanding and interpreting interview participants' responses (Brown, 2018).

Table 3 Documents related to EMI

Data type	Document
Institutional documents	Policies, guidelines, school education plans, & annual reports
Teacher's or lecturer's documents	Course outlines, syllabi, lesson plans, & teaching materials (e.g., handout)

3.3.2. Classroom observations and recordings

RQ2. What is the frequency and nature of Language Related Episodes (LREs) in disciplinary classes in these EMI settings?

To seek the answer to research question 2, data were collected from classroom observations and the recordings of the observed classes. Through the classroom observations, I aimed to gain an understanding of the teaching context, including the activities during the classes and the situations that unexpectedly occur. A total of four naturally occurring EMI classes were observed: two classes from SHS and two undergraduate EMI lectures from the UoS. These classes were recorded for four lessons each. I was present during all observations as a non-participant observer. I sat in the back of the classroom, observed the teachings, and took notes (See Appendix D for Observation Schedule).

For classroom observations and recordings, three wireless voice recorders were used to capture the classroom interactions. The first recorder was attached to the teacher's lapel for

recording teacher-student interactions as they go around the classroom. Two recorders were placed in the front and back of the classroom for recording teacher to class (teacher to whole-class and teacher to group of students) interaction.

To trace test participating students without collecting their names, student ID numbers, or any other personal information, I allocated numbers to all seats in the classroom by providing laminated number plates on the first day of the observation. I asked all students in each class to bring their number plates and place them on their desks for all four lessons observed so that I could trace them even if they changed their seats. During all observations, I was present to observe classroom interactions and make field notes without any contribution to classroom interaction.

During the observations, I sat in the back of the classes and took field notes. Field notes were made for each lesson observed; most of the notes taken during the observations consisted of the allocated number of the partial-participating students and the students who were engaged in those LREs either by making linguistic errors, to which the teachers or lecturers attended to or by making queries about language items. Also, I wrote field notes regarding the nature of the lessons observed, any notable classroom interactions that may not have been captured by the audio recording, and classroom activities. Copies of any teaching materials (e.g., handouts or lecture power-point slides) used during the lessons were also obtained from the teachers and lecturers.

3.3.3 Written disciplinary language testing

RQ3. Do students linguistic items from LREs in these settings?

To answer the last research question, a quasi-experimental design was added to the study. Quasi-experiments are appropriate when researchers cannot randomly assign student participants to orders of conditions (Dörnyei, 2007). A quasi-experimental design is used to

evaluate the effectiveness of a treatment, such as an educational intervention, and it involves a procedure of pre-test, treatment, and post-test on naturally occurring participants (Dörnyei, 2007; Loewen, 2004). In this study, data were collected from the naturally occurring groups using a tailor-made written test on language items that were focused on during the LREs. The purpose of the test was to find if a student who had had difficulty with a specific language item during a class appeared to have understood it and to examine which characteristics of LRE have effects on students' learning of the language items targeted in the LREs.

The tailor-made written language tests were conducted a week after the last observation was made for each EMI class. The test was administered to all students during normal class time and lasted no longer than 15 minutes. Although the test was given to the whole class, they were given the option to consent or not consent to having their test answers used in the research. Only the test answers of the test-participating students, who consented to having their test answers used for the research and also were responsible for the specific LREs, either by making a linguistic error or initiating a question about a language item, were used for analysis. The test answers of 77 partial-participating students, who consented to observations and recordings but not to having their test answers used, were not used. Also, even though students who audited or observed LREs may have benefited from the exposures, it was not possible to confirm in advance whether they had prior knowledge about the targeted language items. Therefore, in this study, test results of such students were not considered for the analysis.

All students were asked to write down their allocated numbers on the test papers. In this way, I could use the data of students who agreed to participate in the testing, track the responses of the individual students who engaged in specific LREs and exclude those of the partial-participating students. I matched the allocated numbers of the test participating students and the relevant test items for each student.

Generally, a pre-test is needed to determine students' prior knowledge about language

items before treatment; however, due to the incidental nature of LREs, it was not possible to predict which language items would be incidentally attended to before LREs occurred in the EMI classes observed (Loewen, 2002; Swain, 2001). Thus, it was decided to use the LREs as a type of pre-test as they indicate students' lack of prior knowledge about language items the LREs targeted. The test items were based on the LREs that occurred in the classes. Among four types of LRE, 'Teacher-initiated, reactive' and 'Student-initiated, pre-emptive' were used for the test because these two types of LRE resulted from either a linguistic error or question that a student makes, indicating the student's lack of prior knowledge about a language item. Once the LREs were identified, test items in relation to the language items targeted in the two types of LREs were constructed.

Written language test items were constructed in relation to language items targeted in LREs identified from each class's recordings. The test template was developed, drawing on Loewen (2005). Two types of test templates were devised and used in this study: suppliance and correction. Suppliance test included two sub-types: supply meaning and supply word. Suppliance test template was used for Student-initiated, pre-emptive LREs but also for some Teacher-initiated, reactive LREs containing linguistic errors which could act as hints for students. Correction test involved asking students to correct an incorrect sentence containing a language error made during the LREs. Correction test template was used for Teacher-initiated, reactive LREs. Detailed examples of each template are in Table 4.

Table 4 Test examples

Test template	Test rubric	LREs to be tested
Suppliance	Please fill in the blank with the appropriate word: C_____ returns to output Please provide the meaning of the following word: Intercepts	(S-initiated, pre-emptive, vocabulary, simple) S: Mr **? *Do I use constancy or constant?* T: It's *constant*. *Constant* returns to output. (S-initiated, pre-emptive, vocabulary, simple) S: Uh… Mr. **? *What do intercepts mean?* T: *They're the points where these graphs cross the x-axis or y-axis*.
Correction	The underlined word in the following sentence is incorrect or inappropriate. Please replace it with the correct or appropriate word. Total revenue is a sum of explicit cost, accounting profit, and depresment. S's answer: decreasement (incorrect)	(L-initiated, reactive, vocabulary, Simple) L: That is a sum of explicit cost and accounting profit and...? S: *Dep, depresment?* L: Pretty close. *Depreciation*.

3.3.4 Test reliability and validity

Establishing the reliability and validity of the tests is important for any type of language testing before the tests are administered to the actual test participants. To establish the reliability, a test-retest method, in which the same test is administered to the same participants using the same instruments, is often used. However, it was not possible to use the existing means of confirming reliability for testing students on language items that incidentally occur during classroom interaction (Loewen, 2002). Moreover, a test-retest method could not be used for establishing reliability due to the possibility of a loss of the validity of the test items. That is, the test items could not be trialled on students who had engaged in the LREs as they would have been aware of the language items to be tested. Also, the test items could not be trialled on other students because they may have had different knowledge of the targeted language items. Following Loewen (2002), I took an alternative approach to minimise the anticipated threats to test reliability, such as error variance, by maintaining the administration procedures carefully.

To minimise error variance due to the administration procedures, the questionnaires and directions for the test types were standardised and made as explicit as possible. To reduce the possibility of students' miscomprehension, the questionnaires and directions of the test were made as precise and simple as possible. I also asked the content teachers and lecturers to check the accuracy of the content of all the test items before conducting the test. I stood in the front of the classroom during the test. Content teachers or lecturers stood in the back of the classroom but were not involved in the process of tests. Students were told to raise their hands if they had difficulties understanding the intent of test items so that I could help them understand the directions by translating the direction into Korean.

Once the LREs were identified to examine the validity of the test templates, two experts in Applied Linguistics were convened as raters. Of the total 33 LREs tested, the raters were provided with a random sample of approximately 20% of the written test items (n = 7) and corresponding transcripts of the LREs upon which the test items were developed. They rated how well each item tested what was occurring in the LREs. A 4-point scale was used to indicate how appropriately each test item was made in relation to the LREs. The rating scale was 1 (inappropriate), 2 (somewhat inadequate), 3 (adequate), and 4 (highly appropriate). The cut-off point was 2.5; test items scoring above 2.5 were acceptable, and it was decided to modify or exclude items scoring below 2.5 for validity. The results from the validity rating are shown in Table 5.

Table 5 Validity ratings for test items

LRE number	Mean Score	Agreement on using
1	4.00	Yes
2	4.00	Yes
3	3.33	Yes
4	4.00	Yes
5	2.66	Yes (with a modification)
6	4.00	Yes
7	4.00	Yes
	3.14 (*sd* = .52)	

3.4 Data analysis

3.4.1 Data preparation

3.4.1.1 Transcription of class recordings

All the recordings of the observed classes were transcribed using transcription conventions adapted from Markee (2011). After each lesson observed, the entire recording of the lesson was transcribed verbatim in detail. As I transcribed the recordings, I identified the LREs that contained the linguistic items to be tested, referring to the field notes. The transcription of the recordings resulted in a total of 43,149 words (See Table 6).

Table 6 Length of class recordings and the total number of words

		Class length	Total length of class recordings	Total number of words
High school	Economics	50 min	3h 34m	14,176
	Mathematics	50 min	3h 23m	11,333
University	Accounting	120 min	8h	10,510
	Mathematics	90 min	5h 57m	7,130
Total			20h 54m	43,149

3.4.1.2 Transcription of interview recordings

The interview recordings were transcribed verbatim with the exception of taking measures to

preserve the confidentiality and anonymity of the participants by using pseudonyms. This resulted in 34 pages of typed transcripts with a total of 11,754 words. In order to ensure the accuracy of the account, this study employed member-checking (Creswell, 2012). The teachers and lecturers had the opportunity to review the interview transcripts so that they could make any changes if they wished. The transcripts of the interviews that were conducted in Korean were translated into English by the researcher. Table 7 shows detailed information about each interview recording.

Table 7 Length of interview recordings

	Teacher /Lecturer	Subject	Interview language	Words	Length of recordings (mins)
Sokuk High School	Kim	Economics	Korean	3,142	51
	Glenn	Mathematics	English	2,885	47
University of Seoul	Chen	Accounting	Korean & English	3,491	62
	Luke	Mathematics	English	2,236	73
Total				11,754	233

3.4.2 Analysis of semi-structured interviews

The data obtained from interviews were analysed qualitatively to illustrate their reasons for their planned practices. Thematic analysis was adopted following Braun and Clarke (2006). Thematic analysis has two approaches, inductive and deductive. The former refers to a data coding process without attempts to fit them into a pre-existing coding frame, whereas the latter is driven by the researcher's analytic interest in the area and allows the researcher to code for a specific research question. I used the deductive approach, which allowed me to begin the coding process with pre-determined themes reflecting the purposes of the research question: (1) teachers' or lecturers' perceived roles in relation to EMI and (2) the anticipated functions of planned language support. Also, I used the inductive approach to identify codes relevant to each

pre-determined theme.

To become familiar with the interview data, I first read the interview transcript of one participant line-by-line multiple times to come to a clear understanding of the teacher's or lecturer's views on language support and their planned practices. Then, I started coding interview data manually based on the pre-determined themes, the perceived role and the anticipated functions of planned language support. Any words, phrases, or paragraphs related to these themes were assigned the codes. I reviewed interview scripts and looked for markers related to my research questions (e.g., I think, I believe, my responsibility, it is because, or the reason is) and generated codes relevant to each theme, as shown in Figure 2.

Pre-defined theme	Data extract	Codes
Role of teachers/lecturers	…since it is engineering mathematics, application-oriented, **my job is** to *teach them where those mathematics are going to be used in real life.* So, **I think** *I need to teach them to think more mathematically,* **help them** *practice how to use those terms* and equations in relation to their future career in the field and *understand the subject.*	Teaching content Teaching content Supporting vocab learning Teaching content
The function of language support	I want them to *get out of their comfort zone* and expose themselves to new economics concepts, terms … because I wanted them to use it as *an immediate hint* when they work on exercises in the textbooks or read the text and come across new terms. But **I'm sure that** it's important to give them a glossary *prior to teaching* each lesson, *otherwise, I will spend all my time explaining the terms*.	Class engagement Class engagement Timing of provision Class time management

Figure 2. Data extract with themes and codes applied

In addition to data from interview recordings, I used available data from other sources for each teacher or lecturer, including classroom recording transcripts, field notes, and teachers' or lecturers' documents. I categorised codes identified from interview data according to the questions in interview protocols. At the same time, I examined the teachers' and lecturers'

planned practices in general with reference to the field notes and transcription of classroom recordings to find any codes that either corroborated or contradicted the codes from each participant's interview data.

3.4.3 Analysis of LRE

3.4.3.1. Identification of LRE

LREs were identified from the transcription of recordings of the lessons observed. In this study, an LRE started when a teacher- or student-produced an unsolicited query or advice about a linguistic item (e.g., Teacher-initiated or Student-initiated, pre-emptive LREs) or when a teacher or student responded to a problematic utterance produced by another participant either because its meaning was unclear or because it had a linguistic error (e.g., Teacher-initiated or Student-initiated, reactive LREs).

One LRE was composed of one linguistic item. To illustrate, the following excerpt demonstrates a dialogue from Kim's classes. While discussing economic content (calculating economics formula), Kim takes transitory, spontaneous, time outs from the discussion to focus his attention on language. He rephrases '*Q*' with '*the quantity'* and '*AFC'* with '*average fixed cost',* presumably to help his students better understand the acronyms. Also, he rephrases the words '*average total cost*' and '*average variable cost*' with their acronyms. Although these four language items occur within one single episode of teacher-talk, they were coded as four separate LREs because there were four distinctive linguistic targets, in this case, four different lexical items.

Excerpt

T: If you divide this by *Q, the quantity*, you will get the *average total cost, ATC,* and the *average variable cost, AVC,* and then *AFC, average fixed cost*.

3.4.3.2 Coding types and features of LRE

A total of 430 LREs were identified: 233 LREs from SHS and 197 LREs from the UoS. The LREs identified from the transcriptions of class recordings were coded for their types and characteristics drawing primarily on the analysis in the studies of Basturkmen and Shackleford (2015) and Hong and Basturkmen (2020). Each LRE was coded for initiator (teacher- or student-initiated), interactional types (pre-emptive or reactive), and linguistic categories (vocabulary, grammar, discourse, or disciplinary speak). Detailed information about each type and category is explained in the following sections.

3.4.3.2.1. Initiator and interactional type

Initiator type describes who initiated an episode. It includes two different categories: teacher-initiated and student-initiated. Interactional type demonstrates how an episode is initiated and is divided into two categories: preemptive and reactive. In this study, pre-emptive refers to "an unsolicited query or advice about a linguistic item" (Loewen & Reissner, 2009, p. 105). Teacher-initiated, pre-emptive LREs provide an indication of any linguistic items that the teachers assume may be problematic or challenging to students. Student-initiated, pre-emptive LREs were defined as episodes that occur when a student raises a query about a linguistic item by directly asking a question or based on intonation. Pre-emptive LRE begins at the moment a linguistic item is asked and ends when neither the teacher nor student addresses the linguistic item. Episode 3.1 illustrates a teacher-initiated, pre-emptive LRE in which the teacher uses an acronym, *k*, but immediately provides the economic term, *capital*, supposedly anticipating that some students might get confused with *k*.

Excerpt 3.1 (E1-18, T-initiated, pre-emptive)

T: You can see that Bob is on *the k, the capital*, that means capital is fixed in the short-run.

Reactive LREs refer to episodes that arise either in response to a problematic utterance or because a participant fails to comprehend what another has said (Ellis et al., 2001; Hong & Basturkmen, 2020). A reactive LRE starts at the moment a participant produces either a linguistic error or problematic utterance that another participant cannot comprehend and ends when neither of the participants addresses the error or utterance that has triggered the LRE. Episode 3.2 illustrates a teacher-initiated, reactive LRE in which the teacher reactively attends to a student's erroneous articulation of a formula in mathematics.

Excerpt 3.2 (M4-9, T-initiated, reactive)

T: And… what's the range?
S: *P bigger than q.*
T: *Uh, huh?*
S: *Y is greater than…?*
T: *Yes, and?*
S: *Ah, y is greater than or equal to q.*
T: *Yes, y is greater than or equal to q.*

3.4.3.2.2 Linguistic categories

Linguistic categories refer to whether episodes targeted vocabulary, grammar, discourse, or disciplinary speak, following Basturkmen and Shackleford (2015) and Hong and Basturkmen (2020). Vocabulary includes both single word and multi-word units. Multi-word units refer to lexical units formed by two or more words to denote disciplinary concepts. Examples of multi-word units include *marginal cost* from the economics class and *residual value* (accounting). The planned language support, such as glossary or wordlist that the teachers and lecturers provide their students, was used to identify technical vocabulary. Also, technical vocabulary was identified referring to *A Dictionary of Economics* (Black et al., 2017), *A Dictionary of Accounting* (Law, 2016), and *The Concise Oxford Dictionary of Mathematics* (Clapham &

Nicholson, 2014).

Discourse refers to instances when speakers refer to “the organisation of language above the level of the clause or sentence and to the connectivity of text”, including cohesive devices and discourse acts (Hong & Basturkmen, p. 4). Disciplinary speak refers to disciplinary expressions of propositional meaning or ideas in conventionalised ways that are meaningful and appropriate to a particular discipline. Descriptions and examples of each category are shown in Figure 3.

Focus	Definition	Example	Comments
Vocabulary	Word forms, multi-word units, denotations including technical terms, collocations, spelling, pronunciation, synonyms, antonyms, & abbreviation	T: It reflects the increase in the velocity. You know what I mean? ***The velocity, the speed***. T: We will be working on this number. ***What does MC stand for?*** C: ***Marginal cost.*** T: Good.	synonym acronym
Grammar	Syntactic and morphological aspects, articles, & verb tenses	S: For those ***who doesn't, who don't*** get how to figure this out, if there's something you add, you can just divide them with quantity…	verb form
Discourse	Organisation, reference, linking text elements, & lexical cohesion	T: You will be ***working with a small group to analyse a country we have not studied***. So, the idea here is that you are going to be kind of ***writing your own chapter for adding to methods of books***, kind of. T: Um, so… I've just calculated irrational expressions in the same way as ***yours***. S: *Huh*? ***What you mean?*** T: *In the same way as* ***your rational expressions***.	Organisation Reference
Disciplinary speak	Conventionalised ways of expressing propositional meaning or ideas in a discipline	T: Yeah. two x minus two (2x-2). So, this graph is shifted in which way…? S: ***To the x-axis.*** T: Again? S: (.) ***fourth axis?*** T: Yes, well, ***it shifted two units to the right or in the positive x-direction.*** T: Let say I own a car whose useful life is 10 years, and… S: ***You can't use that car anymore*** because of its useful life? T: Yes. ***In accounting, we say, 'the residual value for the car is zero'.*** T: Firms are responsible for corrective taxes. Because they…? S: Because, because they *did bad things*? T: Yes, ** just got the answer—anyone who *causes a negative externality or produces demerit goods in production or consumption.*	Mathematics speak Accounting speak Economics speak

Figure 3 Linguistic categories

3.4.3.2.3 Complexity

Complexity was divided into simple and complex. Simple LRE refers to an episode that consists of no corrective response (teacher-talk or self-correction) or one response of the teacher to either a language item that triggers an LRE (teacher-initiated, pre-emptive) or a student's linguistic error or question (teacher-initiated, reactive or student-initiated). LREs that involve a student's self-correction are also regarded as simple LRE. Complex LRE refers to an episode

that consists of either one teacher response to silence (teacher-initiated, pre-emptive) or more than one teacher response to a student's linguistic error or question (teacher-initiated, reactive or student-initiated). Figure 4 shows examples of simple and complex LREs.

	Types	Example
Simple	Teacher-talk (no response)	T: You can see that Bob is on ***the k, the capital***, that means capital is fixed in the short-run.
	Self-correction	S: For those ***who doesn't, who don't*** get how to figure this out, if there's add something, you should, you can just divide them with quantity…
	One teacher response to a trigger	T: We will be working on this number. ***What does MC stand for?*** C: ***Marginal cost.*** T: And the next one is…
		T: You can get the x-intercept in that one, too. S: ***X-intercept?*** T: ***Yes, intercept.*** If you look at the handout (wordlist)… ***it says 'the point that the graph crosses on the x-axis'.*** Okay? Let's move on to the next question.
Complex	Multiple teacher responses to a student's linguistic error	T: And… what's the range? S: ***P bigger than q.*** T: ***Uh, huh?*** S: ***Y is greater than…?*** T: ***Yes, and?*** S: ***Ah, y is greater than or equal to q.*** T: ***Yes, y is greater than or equal to q.***
	One teacher response to silence in teacher-talk	T: What does C stand for? Anyone? ***(silence)*** T: ...cost.

Figure 4 Complexity of LRE

3.4.3.3 Reliability of identification and coding LRE

To establish the reliability of the coding, a sample of 20% (n = 86) of the total LREs identified from four EMI classes were coded by a second-rater for initiator, interactional type, language categories, and complexity. The kappa reliability of coding for four categories of LRE was over 0.80, ranging from κ = .835 to .963, as shown in Table 8.

Table 8 Reliability and per cent agreement scores for coding

Categories	Per cent agreement	Kappa	*p*
Initiator	96.2	.935	.001
Interactional	97.3	.963	.001
Linguistic categories	95.9	.872	.001
Complexity	89.4	.835	.001

3.4.4 Analysis of Test Results

3.4.4.1 Distribution of tested LREs

A total of 33 LREs were tested; 23 LREs from SHS and 10 LREs from the UoS. Table 9 and 10 show the distribution of tested LREs in each setting. In this study, the test items used targeted linguistic items from teacher-initiated, reactive, or student-initiated, pre-emptive LREs. For the inferential test, the set number of the test items for each linguistic category was five or more. It was decided to exclude the two linguistic categories, discourse and grammar, from the test because (1) discourse category was difficult to test due to its nature, and (2) the number of testable grammar-focused LRE (n = 3) identified in both settings was less than five. Also, test results of the partial-participating students (n = 77) who disagreed to have their test results to be used for research were excluded from the analysis.

Table 9 Tested LREs from SHS

		T-initiated, reactive	S-initiated, pre-emptive	Total tested LREs	Total LREs observed
SA-E (Kim)	Lesson1	3	1	4	37
	Lesson2	0	0	0	43
	Lesson3	5	0	5	55
	Lesson4	2	1	3	27
	Total	9	2	12 (7.4%)	162
SA-M (Glenn)	Lesson1	3	0	3	17
	Lesson2	1	0	1	12
	Lesson3	3	1	4	26
	Lesson4	3	0	3	17
	Total	9	1	11 (15.2%)	71
Total		19	4	23(9.8%)	233

Table 10 Tested LREs from the University of Seoul

		T-initiated, reactive	S-initiated, pre-emptive	Total tested LREs	Total LREs observed
ACC101 (Chen)	Lesson1	1	0	1	44
	Lesson2	1	0	1	29
	Lesson3	0	1	1	47
	Lesson4	1	0	1	34
	Total	3	1	4 (2.5%)	154
EMT103 (Luke)	Lesson1	2	2	4	20
	Lesson2	1	0	1	12
	Lesson3	1	0	1	4
	Lesson4	0	0	0	7
	Total	4	2	6 (13.6%)	43
Total		7	3	10 (5.1%)	197

3.4.4.2 Scoring of test item responses

Analysis of the test data involved scoring students' abilities to respond to test items correctly. Students' test item responses were coded into two categories: correct and incorrect. The

student's response was scored as correct when a student produced a response, which correctly matched the language item targeted in the LRE. The response was scored as correct if students supplied the targeted linguistic items or corrected the linguistic errors they had made. Table 11 shows examples of students' correct test item responses.

Table 11 Examples of students' correct test item responses

No	Test Type	LRE tested	Test item
1	Correction	(T-initiated, reactive, vocabulary, complex) S: …and the firm needs to pay with *their K… Quantity…?* T: *Wait, what does K stand for?* S: *Quantity…?* T: *Nice try, but, actually, it's 'capital'*.	The following sentence contains an error. Please find out the error and correct it to improve the sentence: The acronym, *K*, stands for quantity. S's answer: *The acronym, K, stands for capital* (correct)
2	Correction	(T-initiated, reactive, vocabulary, complex) S: … and the graph will… *physi*… T: *The graph will?* S: It will *phy…* T: *It doesn't start with P. It starts with T.* S: *Oh, tran, tran… transited?* T: *It's translated, that is, it moves vertically or horizontally, right?* S: The graph is *translated* two units…	Please rewrite the underlined section in the following sentence correctly: The graph will be transited two units vertically. S's answer: *translated* (correct)
3	Supply word	(S-initiated, pre-emptive, vocabulary, simple) S: Mr **? *Do I use constancy or constant?* T: It's *constant*. *Constant* returns to output.	Please fill in the blank with the appropriate word: C_____ returns to output S's answer: *constant* (correct)
4	Supply meaning	(S-initiated, pre-emptive, vocabulary, simple) S: Uh… Mr. **? *What do intercepts mean?* T: *They're the points where these graphs cross the x-axis or y-axis*.	Please provide the meaning of the following word: Intercepts S's answer: *points that the graph crosses the axis* (correct)

The response was scored as incorrect when the student did not correctly provide the linguistic item targeted in the LRE or failed to provide any responses to the test item. Table 12 shows examples of students' incorrect test item responses.

Table 12 Examples of students' incorrect test item responses

No	Test Type	LRE tested	Test item
1	Correction	(L-initiated, reactive, vocabulary, Simple) L: That is a sum of explicit cost and accounting profit and...? S: *Dep, depresment?* L: Pretty close. *Depreciation*.	The underlined word in the following sentence is incorrect or inappropriate. Please replace it with the correct or appropriate word. Total revenue is a sum of explicit cost, accounting profit, and depresment. S's answer: decreasement (incorrect)
2	Correction	(T-initiated, reactive, Mathematics speak, Simple) T: Um… what would the range be for this? S: *y is equal or more than zero?* T: Yes, so, in that case, *y is greater than or equal to zero*.	The following sentence contains errors. Please find out the errors and correct it to improve the sentence: Y is equal or more than zero. S's answer: *y equals to or more than zero* (incorrect)
3	Correction	(T-initiated, reactive, vocabulary, simple) L: … what's the shape (of the graph) gonna look like? S: *Line…?* L: Yes, *linear*, good, good.	The following sentence contains an error. Please find out the error and correct it to improve the sentence: The shape of the graph looks like line. S's answer: (incorrect – no answer is given)
4	Supply word	(L-initiated, reactive, vocabulary, Simple) L: **, I think you have the answer. These two lines are called? S: *Perpen...* L: *Perpen, perpendicular, right?*	Please provide the synonym for the following word: Orthogonal *P*_____ S's answer: perpenal (incorrect)

3.4.4.3 Reliability of scoring test item responses

A random sample of 32% (n = 10) of the test items was scored by a second rater. The reliability level was $\kappa = .950$.

3.4.4.4 Descriptive statistics

Raw frequencies and percentages were calculated for the characteristics of LRE as well as students' test item responses. These statistics are presented for the entire sample and also for

each setting. To find any similarities or differences between the settings, percentages of students' test item responses were compared for each characteristic of LRE. It is suggested to use inferential statistics such as a T-test or ANOVA to compare two independent groups if there is statistical evidence of differences (Larson-Hall, 2016). These tests require dependent variables to be continuous (Larson-Hall, 2016). However, because the dependent variables in this study were categorical (correct and incorrect), it was not possible to perform such inferential statistics. Thus, it was decided to compare students' test item responses between the settings by using descriptive statistics.

3.4.4.5 Inferential Statistics

All inferential statistics were performed using the Statistical Package for the Social Sciences (SPSS) 27.0 for statistically significant relationships between the characteristics of LRE and students' correct test item responses. The analysis consisted of three phases: (1) an overall analysis of the relationship between LRE and test results; (2) a comparison of test results between the school and the university settings; and (3) a separate analysis for each setting.

When both the dependent and the independent variables are categorical, a relationship between the variables is usually examined by the Chi-square test. However, one assumption of the Chi-square text is that no more than 20% of expected cell counts be lower than five (Larson-Hall, 2016). If there are any cells that count less than five, Fisher's exact test (two-sided) should be used. As some cell counts were less than five, Fisher's exact test was performed on the raw data to determine if there were any significant differences in the relationships between the characteristics of LREs and students' correct test item responses. An alpha level of $p < .05$ was set for all Fisher's exact tests.

3.5 Ethical consideration

Before carrying out the study, Ethics approval was obtained from the University of Auckland Human Participants Ethics Committee (Appendix A). Participant information sheets for each participant groups with sufficient information about the aims, research procedures, and participants' rights were explained to all participants so that they could make decisions on whether to participate in the research (Appendix B). Pseudonyms were used for participants and the settings to protect their confidentiality and privacy. All the audio recordings and transcripts of classroom interactions were anonymised, and any content that might identify a speaker was not included in the transcripts. Moreover, all efforts were made to ensure the confidentiality of all participants. All participants were provided with full disclosure of the nature and intent of the study.

Another ethical issue in this study was the identification of the students who were responsible for the LREs to be tested. One of the aims of this study was to examine the effects of LREs on students' language learning. It was necessary to identify which students initiated LREs by making language errors or directly asking questions about language items during classes. Yet, it was possible that students responsible for LREs would feel humiliated if I identify them by their names during classroom observations. Thus, it was important not to let other students know who made language mistakes. Another ethical issue was the identification of partial-participants who consented to participate in classroom observation but did not consent to the test.

In order to solve these issues, I allocated numbers to all seats by providing laminated number plates before the lesson started in the first observation in each setting. I asked all students, including partial-participants, to bring their plates for all four lessons observed and place them on their desks. In this way, I was able to track the students involved in teacher-initiated, reactive and student-initiated, pre-emptive LREs, as well as partial-participants, who

only agreed to the classroom observation without having to collect their names or any other personal information. LRE data from partial-participating students were not used for the test. However, the test was given to the whole class. The reason that partial-participating students took the test was that the test was conducted during regular class/lecture time and that the students, who were responsible for the LREs tested, could not be specified.

3.6 Summary

This chapter has presented the research design and methods of data collection and analysis used in this study. Profiles of the participants and research context have been described, and the way the study address ethical considerations was also described. The following three chapters will present the results to the research questions.

CHAPTER FOUR: CASE ONE SOKUK HIGH SCHOOL

In Chapter One of this thesis, it was stated that the first major purpose of the research was to answer the first and the second research questions: *What is the planned attention to language in these EMI settings*, and *What is the frequency and nature of LREs in disciplinary classes in these settings?* This chapter reports the findings from the study conducted at Sokuk High School. It analyses two types of data from two case teachers, Kim, a Korean L1 economics teacher, and Glenn, an English L1 mathematics teacher. The pseudonyms, Kim and Glenn, were used to protect their anonymity. The chapter starts with brief background information of the high school and the general practice of EMI at the setting, followed by an analysis of the data collected from two teachers. Data from the two teachers are presented in separate sections, each of which is divided into two main parts: (1) teachers' views on providing language support and their planned practice and (2) incidental attention to language in classroom interaction.

The first part is based on the teacher's documents and interviews. The aim of the interview was twofold: to investigate types of planned attention to language and to investigate the teachers' thinking behind these practices or reasons for attending to language. Planned attention to language refers to teachers' attention to preselected linguistic items in anticipation of challenges that students may encounter during class. This consists of syllabi, lesson plans, glossaries or word lists of vocabulary that are provided to students. The topics in the interview schedule were:

i. How the teachers perceived their role
ii. What they saw as the functions of language support they provide

The second part is based on the recordings of classes observed. It examines the frequency and characteristics of incidental (unplanned) attention to language drawing on language-related episodes (LREs), instances where teachers and students "talk about the language they are producing, question their language use or correct themselves or others"

during teacher talk and teacher-student interaction in class (Swain & Lapkins, 1998: 326).

4.1 Overview of EMI at Sokuk High School

Sokuk High School (SHS) is a public school located in Seoul, South Korea. It was established in 2008 with a focus on international studies. The school aims not only to nurture well-rounded students but also to fill the gaps in educational inequality. Thus, it recruits more than 30% of the total number of students from low-income families every year. It is an EMI high school in which all subjects except the Korean language, Korean history, and other languages subjects are taught in English. The school follows the national curriculum and teaches the official academic subjects set by the Korean ministry of education (MoE). It also provides some Advanced Placement (AP) subjects to prepare students for the SAT, a standardised test used for HE admissions in the United States. As of 2020, there are four AP subjects (economics, calculus, human geography, and world history) included in the school's education curriculum. English is taught as a separate subject by ESL teachers.

The students are Korean L1 speakers who speak English as a foreign language (FL). All students are expected to have a high English proficiency that is equivalent to the Test of English as a Foreign Language Internet-based test (TOEFL iBT) minimum score of 60 and required to meet a sufficient level of competence in general English at school admission (SHS, 2019). The school evaluates candidates for admission based on the result of an interview with both content and ESL teachers in English and their English grades from middle school.

All teachers are required to meet high professional standards. It is mandatory for Korean L1 teachers to have an official teaching certificate for their subjects, at least three years of teaching experience, and high English proficiency. Out of 70 Korean L1 teachers, 42 (60%) hold a master's degree and nine (13%) doctorate degrees in relation to their teaching subjects. There are 11 non-Korean teachers, who are English L1 speakers comprising approximately 14%

of the total number of the teachers. In order to work at public schools in South Korea, English L1 teachers are required to hold a Bachelor of specialist subjects and optionally an official teaching certificate and are recruited by the Seoul Metropolitan Office of Education (SMOE). Eight out of 11 (73%) English L1 teachers hold a master's degree. These teachers have supportive roles for Korean L1 teachers that vary according to the subjects. In this school, co-teaching refers to two teachers, one Korean L1 teacher and one English L1 teacher, working together to plan, organise, and deliver the instruction.

Given that the term EMI was relatively new to education in South Korea, the term 'Bilingual Education' is used to refer to the teaching of content subjects in English in the school's official documents. The purpose of EMI stated in the school's official education plan is to "teach not only the English language but various content subjects in English to expose students to English" (SHS, 2018, p. 7). It is hoped that EMI improves students' oral communicative English proficiency as students interact with their teachers during classes. In the annual report of 2019 (SHS, 2019), the school presents a plan for supportive language programmes for all freshmen, such as an English camp and after school language programmes starting from the following year. The provision of such programmes aims to help students acquire basic communication skills in English so that they can be motivated to participate in EMI courses more actively.

The school provides a professional development programme called the '*EMI teacher development programme'* for Korean L1 teachers. The programme is outsourced to an external organisation that is specialised in ESL teacher training. In the programme outline (SHS, 2018), the aims are stated as to increase the Korean L1 teachers' confidence in using English for teaching and to improve their academic English for teaching. It is compulsory for all Korean L1 teachers to attend the programme regardless of their subjects. It is an annual programme that is provided for three hours per week over the ten weeks from September to December. The

programme involves various types of activities, such as group discussion, practice lesson planning, practice teaching, and peer feedback. The following is an example of the contents of the programme (Table 13).

Table 13 The content of the professional programme at SHS (SHS, 2018, p. 4)

Session	Description
Understanding classroom language	• Defining how lessons are started and finished • Identifying elements and phrases that can be used to start a lesson • Developing ways to promote social language when starting and finishing a class • Evaluating the success of language used to start and finish lessons
Understanding teacher language	• Identifying and categorise functions of teacher language • Modifying classroom language to suit the level of their learners • Recognising and utilise methods of elicitation • Producing content checking questions which help to improve learner understanding
Giving instructions, practice, and application	• Exploring different strategies to minimise verbal instructions but retain clarity • Analysing activities and break them down into basic steps

There is no collaborative work between EMI content teachers and ESL teachers who teach English as a separate subject. Also, the school does not have any professional programmes for English L1 teachers; however, the annual report of 2019 (SHS, 2019) states a need for such a programme to support English L1 teachers – most of whom have less experience of teaching their content subjects in EMI for ESL students.

An outline of the general practice of two different teaching methods for EMI at the high school setting is presented based on interviews and the school's official documents in the remainder of this section. Two different teaching methods, solo- and co-teaching, are used for EMI courses. Solo teaching refers to teaching by Korean L1 teachers, whereas co-teaching refers to two teachers, one Korean L1 teacher and one English L1 teacher, working together to plan, organise, and deliver the instruction (SHS, 2018). The co-teaching method is set up to teach only the second- and third-year students not only to prepare them for entrance examinations for universities overseas but to improve their English communicative skills (SHS,

2018). Table 14 shows a description of each teaching method. Recently, the school has planned to increase the number of co-taught EMI courses based on the results of an internal survey of second- and third-year students focusing on their perspectives towards co-taught EMI courses in 2017 (SHS, 2018). It was found that nearly 84% of the students perceived the co-teaching method as helpful for improving their general English skills. In order to encourage the use of the co-teaching method for their teaching, the school has created a guideline on three types of co-teaching for both Korean L1 and English L1 teachers, which can be modified by the teachers.

Table 14 Types of teaching methods at SHS (SHS, 2019)

Teaching method	Types	Description
Solo-teaching		
Co-teaching	Team teaching	• Two teachers teach in tandem with each other in every lesson • They divide a lesson to teach and share the responsibility of leading instruction during the lesson
	One teaches; one helps	• One teacher takes the lead in providing instruction while the other goes around the classroom to help students who have trouble with understanding
	Alternate teaching	• Two teachers divide up all chapters to be covered over a semester (e.g., one teaches odd-numbered chapters and the other even-numbered chapters) • Each teacher teaches individually

The following sections report findings from the study of planned and incidental attention to language in the content classes of two teachers, Kim and Glenn. Kim taught Economics (SA-E), and Glenn taught Mathematics (SA-M). Each of the case sections is divided into two parts: (1) the teacher's views on providing language support and his planned practice and (2) incidental attention to language during classroom interaction.

Kim's class (SA-E) included a total of 27 second-year students who were aged 17. The class met twice a week and was taught by solo-teaching. Glenn's class (SA-M) included 23 second-year students who were aged 17. It was taught by the two mathematics teachers, Glenn

and Yoon. The class met twice a week. Each teacher taught the class every other week; Yoon taught the odd-numbered chapters, and Glenn took the even-numbered chapters in the following weeks.

4.2 Kim, the first teacher

Kim is a Korean L1 speaker who uses English as a foreign language. He received his bachelor's degree with double majors in economics and education and passed the national employment exam for a teaching position. Kim did not have any experience of studying overseas, but during his undergraduate degree, he took at least one EMI lecture every semester. After teaching economics at public high schools for five years, in search of development and a challenge, he applied for a teaching position at Sokuk High School. Although he had no experience teaching economics in English before he moved to the school, he had above-average scores in all sections of TOEFL iBT.

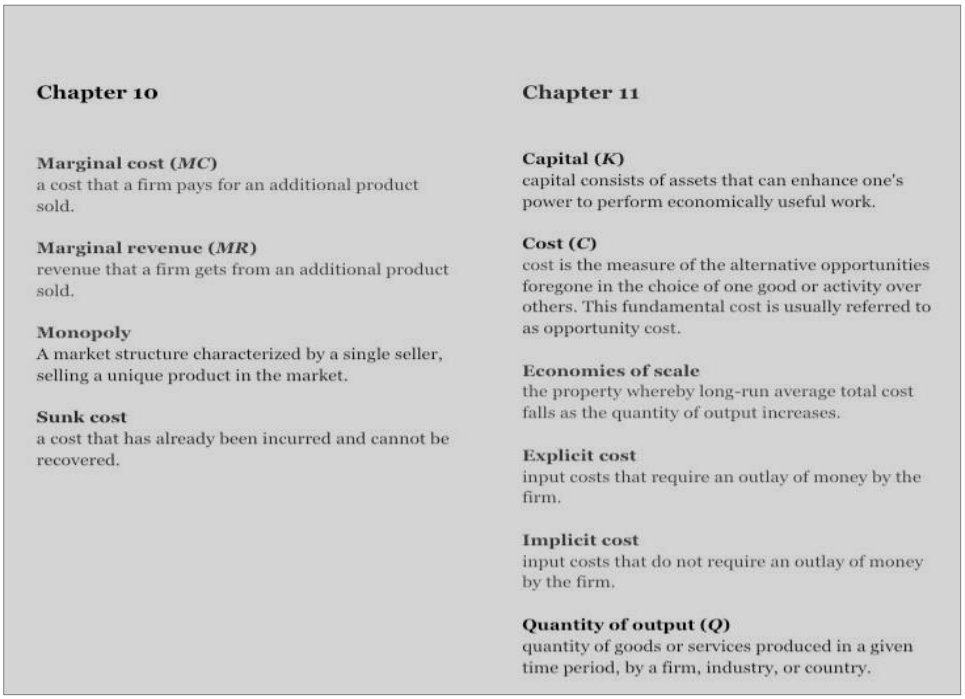
Kim had been teaching first- and second-year economics for three years since he started working at SHS. During the observed semester, he taught four economics classes, two for the first year and the other two for the second year, which met twice a week. I observed one of his second-year economics classes (SA-E) four times over the two weeks. Kim developed his own textbook in English, referring to the pre-existing textbooks written in Korean and the ones used at high schools in the United States and the United Kingdom. In order to improve his English proficiency in teaching, he took the professional programme provided by the school. In the interview, however, he critiqued the professional programme described in 4.1, saying that it focused too much on language and ESL teaching methods rather than teaching content in English, and he would like a programme that focuses more on the EMI teaching method for each subject.

4.2.1 Kim's views on providing language support and his planned practice

4.2.1.1 Types of language support

Through examining his teaching documents, Kim seemed to consider the English language at all stages of his EMI economics class. In the course outline of economics, Kim stated that the aim of learning the disciplinary ways of using vocabulary was "to learn to communicate using economic terms" and mentioned that he would mark students' correct use of economic terms in examination or writing assignments.

Kim provided two types of planned language support to the students: a glossary of new economic terms (see Figure 5) and small glosses of vocabulary in the textbook (see Figure 6). He developed a glossary for each chapter, which included English definitions and acronyms or abbreviations of five to ten economic terms (Figure 5).



Chapter 10

Marginal cost (*MC*)
a cost that a firm pays for an additional product sold.

Marginal revenue (*MR*)
revenue that a firm gets from an additional product sold.

Monopoly
A market structure characterized by a single seller, selling a unique product in the market.

Sunk cost
a cost that has already been incurred and cannot be recovered.

Chapter 11

Capital (*K*)
capital consists of assets that can enhance one's power to perform economically useful work.

Cost (*C*)
cost is the measure of the alternative opportunities foregone in the choice of one good or activity over others. This fundamental cost is usually referred to as opportunity cost.

Economies of scale
the property whereby long-run average total cost falls as the quantity of output increases.

Explicit cost
input costs that require an outlay of money by the firm.

Implicit cost
input costs that do not require an outlay of money by the firm.

Quantity of output (*Q*)
quantity of goods or services produced in a given time period, by a firm, industry, or country.

Figure 5 The glossary of economics terms

Each glossary was given to the class at the beginning of a lesson when a new chapter started. During my observations, I noted that Kim occasionally refers students to the glossary in his teaching, as seen in Excerpt 4.1.

Excerpt 4.1

T: We are now moving on to the new topic, the production functions, right? We will start with 'the growth activity from the market'... so, anyone had a look at the glossary I gave you last time?

(silence)

T: No? Then, can you guys take a look at it quickly?

In the above excerpt, Kim asks the students to take a brief moment to read the glossary before he explains a new economic concept. Sometimes, I observed that he used the glossary to check how well his students followed the class. In Excerpt 4.2, Kim explains the term 'opportunity cost', and he refers to the glossary.

Excerpt 4.2

T: So, the cost, in this case, is $1,200. Everyone got it? Am I talking about the cost that we need to pay for something here?

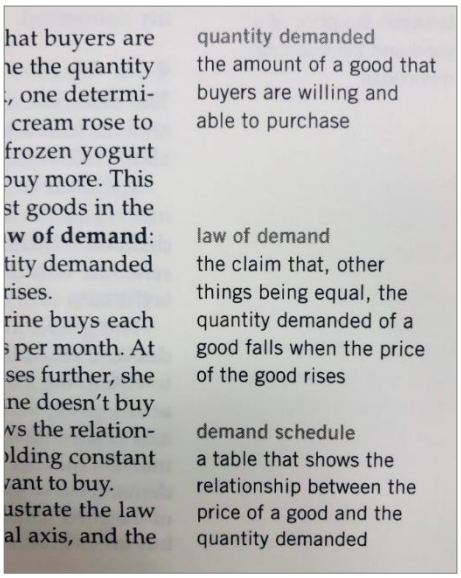
S: No.

T: Then can anyone explain what's the difference between 'cost' here and 'cost' we usually use?

(silence)

T: *What, what did I put in the glossary? Do you understand the definition there?*

Another way Kim helped his students with the language was by devising small glosses of definitions of economic terms on one side of pages in the textbook, as shown in Figure 6. The words in the glosses were multi-word units which Kim did not include in the glossary.


hat buyers are
ıe the quantity
, one determi-
cream rose to
frozen yogurt
ɔuy more. This
st goods in the
w of demand:
tity demanded
rises.
rine buys each
per month. At
ses further, she
ne doesn't buy
ws the relation-
ɔlding constant
vant to buy.
ustrate the law
al axis, and the

quantity demanded
the amount of a good that buyers are willing and able to purchase

law of demand
the claim that, other things being equal, the quantity demanded of a good falls when the price of the good rises

demand schedule
a table that shows the relationship between the price of a good and the quantity demanded

Figure 6 Glosses with economic terms

During my interview with Kim, I noted that he focused on his students' general English proficiency at the beginning of each year. According to him, he refers to the overall ESL subject grades of each class as he develops and modifies textbooks and handouts every year.

4.2.1.2 Reasons for provision of language support

4.2.1.2.1 How Kim perceived his role in relation to EMI

"A role model" for students

When I asked Kim in the interview about the role, he said that his understanding of himself was *a role model* because he also had experienced learning economics in English like his students. He described this role as "never a consideration" when he taught economics in Korean. He responded that although his main responsibility was to teach economics, he believed that he was also responsible for helping students express the content knowledge they learned in English accurately. He thought students learn through imitation during the class, and one of his ideas was that he models the language of economics, and students copy or imitate him. For example, in the following Excerpt 4.3, taken from the last observed lesson, Kim asks the students to

memorise some expressions he had used in describing a graph.

Excerpt 4.3

T: So, in this case, the graph depicts an increase in demand from D1 to D2. Please, please remember that you need to say, 'from one point to the other point' when you describe any graphs, not just 'D1 and D2', right?

A "facilitator": helping students overcome challenges in EMI classes

In our interview, Kim did not see himself as directly teaching English but as providing language support to his students, and he used the term 'facilitator' to express this. However, when questioned about his practices in this regard, he was vague and could not identify any specific practices. During the observation, I noted that Kim occasionally translated his English explanation into Korean or provided corresponding Korean words in teaching (code-switching) to facilitate students' understanding of content knowledge. Also, he sometimes allowed students to use Korean to express their thoughts, as in Excerpt 4.4 from the first observed lesson.

Excerpt 4.4

T: How do we calculate the DWL? **? Will you tell us the answer to question 3?

S: Uh… I don't know…

T: You don't have the answer? Or you don't know how to explain it in English?

S: I don't know how to say.

T: Okay, then, why don't you say it in Korean first? And then I will translate it into English.

In the interview, Kim reported that he considered students' general English proficiency as a prerequisite for taking EMI classes. It was because he thought students should be able to "distinguish important terms or expressions of economics" from English used outside of his economics class. He further explained that the ability to distinguish between general and disciplinary English vocabulary was what he regarded as "a starting point" for learning

"economical ways of using English", which relates to the concept of disciplinary literacy (Airey, 2016). During the interview, he often expressed his concerns about lack of support for students in relation to general English:

> *Although these students have passed the entrance exam, I think that's not enough. Especially, compared to other subjects like science or maths, students may find learning social science subjects in the foreign language much challenging… so, there should be supportive language programmes for students, and they don't have to be related to content subjects, just teaching basic English will do.*

Kim's belief that general English influenced the student' grades in economics seemed to lead him to adjust the level of English used for the textbook and reading materials to the level of students' English proficiency, referring to their English subject grades and advice from the ESL teachers to do so.

4.2.1.2.2 What Kim saw as the functions of language support he provided

To encourage students to "get out of their comfort zone".

In the interview, Kim talked about the way he considered his students' emotional aspects. He described the language support he provided as a "key assistant" for the students to "get out of their comfort zone" and engage in the class more actively. His belief seemed to relate to his first year of teaching at SHS. After seeing some of his students not participating in the class or even giving up on economics because of English, he started including small glosses of economic terms in the textbook as an "immediate hint" for students. When questioned about the reason for including economic terms in the glossary and glosses, he said that economic terms are the "starting point" at the high school level, where students learn economics for the first time.

Not to "sacrifice" the time for teaching content

During the interview, Kim talked about his expectation that the language support would help him manage class time more effectively. He said that he did not want to "sacrifice" the time for teaching economics due to spending too much time on language. Kim also described dealing with language within the limited class time as a "heavy pressure" for him. He explained these are the reasons why he stated that the students "must pre-read the glossaries before the class" in the course outline.

Kim further mentioned that he wanted his students to learn new general English vocabulary in the textbook or reading materials before each lesson because he could not "take care of" it while teaching his subject. In the observations, I noted that Kim often asked the students to skim through the following chapters and preview any unfamiliar words in the texts, as seen in Excerpt 4.5.

Excerpt 4.5

T: … so please skim through the chapter 6 before the next class, okay? () See if there's any words or sentences that you guys don't know, and please find the meaning for them.

4.2.2 Incidental attention to language

Through the examination of the data collected from the class observations and recordings of Kim's SA-E class, the frequency and types of language-related episodes (LREs) were examined. Section 4.2.2.1 presents the frequency of LREs in the data, and the nature of the LREs is examined in Section 4.2.2.2. (See Chapter 3, Section 3.4.3 for details about the system of analysis and codes.)

4.2.2.1 Frequency of LREs in the SA-E

Incidental LREs did occur fairly frequently and accounted for a considerable amount of class

time in the SA-E class. In total, 162 LREs were identified from the 3 hours and 34 minutes of the recordings of the observed lessons. Table 15 shows the number of LREs in each observation and the total number of LREs. The rate of LREs per minute was calculated, as shown in Table 15. In the SA-E class, one LRE occurred every 1.32 mins on average. A secondary analysis was made of the proportion of class time spent on the LREs. The length of an LRE was measured from the time the trigger occurred to the time the response ended. In Kim's classes, LREs ranged in length from 7 seconds to 122 seconds. The total time spent on LREs was 27.75 minutes, and LREs accounted for 12.9% of total class time.

Table 15 Frequency and the rate of LREs per minute in Kim's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
The number of LREs	37	43	55	27	162
The rate of LREs per minute	1.35	1.30	0.93	1.93	1.29
Total time spent on LREs (in minutes)	5.85	3.71	11.9	6.29	27.75

4.2.2.2 Characteristics of LREs in Kim's classes

All the LREs that occurred in the SA-E class were coded for four categories: initiator (teacher- or student-initiated), interactional types (pre-emptive or reactive), linguistic categories (vocabulary, grammar, discourse, or Economics speak), and complexity (simple or complex).

4.2.2.2.1 Initiator and interactional types

Initiator type refers to who initiates the LRE. Among 162 LREs identified from the four SA-E lessons, almost all the LREs were initiated by the teacher, Kim (96.2%). Few student-initiated LREs were identified (3.7%), as seen in Table 16.

Table 16 Initiator types of LREs in Kim's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	36	42	52	26	156 (96.2%)
S-initiated	1	1	3	1	6 (3.7%)
	37	43	55	27	162

Excerpt 4.6 from the third lesson observed illustrates a student-initiated LRE. During the discussion of long-run average cost (economic content), a student asks Kim about the meaning of a technical term, *constant returns to scale of output*. Kim then provides a formal definition of the term. Excerpt 4.7 shows a teacher-initiated episode. During the teacher-talk about economic content, Kim takes a brief time out to attend to a language item, *efficiently*, and then explains the meaning of the word.

Excerpt 4.6 (E3-24, S-initiated)

T: …what you take back, what you earn from the production.

S: So… *what that (constant returns to scale of output) means, actually?*

T: So, *the formal definition (of constant returns to scale of output) is the property whereby long-run average total cost rises as the quantity of output increases.*

Excerpt 4.7 (E3-12, T-initiated)

T: Because there are more machines available, it makes the production more *efficiently. Efficiently here means it can produce more products with less cost*. It makes SATC decreases.

Interactional type refers to whether the LRE occurs pre-emptively or reactively. In the data set from Kim's classes, pre-emptive LREs constituted 85.2% of the LREs (n = 133) and reactive the remaining 14.7% (n = 23). Kim initiated pre-emptive episodes far more frequently than reactive episodes, and the students almost never initiated reactive LREs, as shown in Table 17.

Table 17 Interactional types of LREs in Kim's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Pre-emptive	33	42	39	19	133 (81.4%)
	Reactive	3	0	13	7	23 (18.6%)
	Total	36	42	52	26	156
S-initiated	Pre-emptive	1	1	2	1	5 (83.3%)
	Reactive	0	0	1	0	1(1.7%)
	Total	1	1	3	1	6
Total		37	43	55	27	162

Most of the time, Kim initiated pre-emptive LREs to provide definitions, explanations, or synonyms of economic terms, presumably anticipating that some of his students might not be familiar with the terms. In Excerpt 4.8, during the discussion about economic graphs, Kim provides a less technical word, *a surrounding curve*, before he introduces a technical term, *an envelope curve*. Also, Kim often proactively attended to the language by asking questions to check the students' understanding of disciplinary uses of language. Excerpt 4.9 illustrates a teacher-initiated episode in which Kim directly asks the class about the full name of an acronym, *C*.

Excerpt 4.8 (E3-27, T-initiated, pre-emptive)

T: And this forms *a surrounding curve* () *more professional word for this is an envelope curve.*

Excerpt 4.9 (E1-19, T-initiated, pre-emptive)

T: So, this function can be written in other ways as below. Q equals p, c. *Again, what does c stand for?*

C: *Cost.*

T: *Yes, cost.*

Kim sometimes initiated LREs in response to linguistic errors that the students made. In Excerpt 4.10, a teacher-initiated, reactive LRE, during the discussion of an economic graph, Kim reacts to a students' linguistically incorrect utterance, *line*, and recasts it correctly, *linear*. Excerpt 4.11 illustrates another teacher-initiated, reactive LRE, in which Kim reacts to a student's linguistic error, *reverted*, and recasts it correctly, *inverted*.

Excerpt 4.10 (E3-36, T-initiated, reactive)

T: … what's the shape (of the graph) gonna look like?
S: *Line…?*
T: *Yes, linear*, good, good.

Excerpt 4.11 (E3-39, T-initiated, reactive)

T: At the beginning, ATC decreases and eventually, it increases. So, if you draw the graph, the ATC, it will be…?
S: Reverted?
T: …*inverted* U-shape, here.

Almost all the student-initiated LREs were pre-emptively made to ask the teacher about the definition of technical terms. Excerpt 4.12 illustrates a student-initiated, pre-emptive episode from lesson 3, in which a new chapter was introduced. A student asks Kim about the meaning of an economic term, *constant returns to scale of output*. Kim provides its formal definition referring to the glossary that he has provided to the class. Throughout all the lessons observed, only one reactive LRE was initiated by a student. In Excerpt 4.13, during the review of the previous lesson, a student tries to confirm his understanding of the item '*average total cost*' and asks if '*ATC*' might be the right acronym.

Excerpt 4.12 (E3-24, S-initiated, pre-emptive)

T: What you take back, what you earn from the production is...
S: *Can I ask you what constant return… thing means, actually?*
T: So, *the formal definition (of constant returns to scale of output) is* as you can see in the glossary I gave you… *the property whereby long-run average total cost rises as the quantity of output increases*.

Excerpt 4.13 (E3-3, S-initiated, reactive)

T: Quantity that is produced. We can get *average total cost*.

S: *ATC?*

T: *Yes, yes, ATC, average total cost*.

4.2.2.2.2 Linguistic categories

Analysis of linguistic categories of the LREs showed that both Kim and the students focused on vocabulary the most. As seen in Table 18, Kim initiated the vast majority of LREs focusing on vocabulary (83.3%) followed by economic speak (11.5%), which refers to the conventional way of articulating the ideas using language patterns associated with economic terms, and discourse (3.8%). Kim initiated grammar-related episodes infrequently (1.2%). As seen in Table 19, the students also initiated most of the LREs focusing on vocabulary (66.6%) and the rest focusing on grammar (33.3%). In Kim's classes, the students did not initiate any discourse- and Economics speak-related episodes.

Table 18 Linguistic categories of T-initiated LREs in Kim's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Vocabulary	31	39	41	19	130 (83.3%)
	Grammar	0	0	2	0	2 (1.2%)
	Discourse	2	0	1	3	6 (3.8%)
	Economics speak	3	3	8	4	18 (11.5%)
		36	42	52	26	156

Table 19 Linguistic categories of S-initiated LREs in Kim's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
S-initiated	Vocabulary	1	0	2	1	4 (66.6%)
	Grammar	0	1	1	0	2 (33.3%)
	Discourse	0	0	0	0	0
	Economics speak	0	0	0	0	0
		1	1	3	1	6

Kim frequently drew attention to technical terms or their meanings, and he did so by using elicitation similar to practices in ESL classrooms. In Excerpt 4.14, Kim asks the class the meaning of '*corrective*' in an economic term, corrective taxes. Kim often attended to economic speak, conventional ways of discourse in economics, as seen in Excerpt 4.15. During the discussion of economic entities responsible for corrective taxes (subject content), a student's response, '*they did bad things'*, gives rise to an LRE. Kim appears to respond to the student's contribution by reformulating it in a conventional way of articulating the idea in economics – '*Anyone who causes a negative externality or produces demerit goods in production or consumption'*.

Excerpt 4.14 (E4-14, T-initiated, pre-emptive, vocabulary-technical term)

T: *What does 'corrective' mean here?*
S: *To fix…?*
T: *Yes, yes.*

Excerpt 4.15 (E4-23, T-initiated, reactive, economics speak)

T: So, who's responsible for the corrective taxes?
S: Firms?
T: Firms are responsible for corrective taxes. Because they?
S: Because, because *they did bad things?*
T: *Yes,* ** just got the answer. *Anyone who causes a negative externality or produces demerit goods in production or consumption.* (.) Then, who will be collecting the corrective taxes?

On a few occasions, Kim initiated LREs focusing on grammar. In Excerpt 4.16, Kim reacts to a student's omission of the third person singular morpheme, -s, by reformulating her utterance – '*decreases or will decrease*'.

Excerpt 4.16 (E3-37, T-initiated, reactive, grammar)

T: What's gonna happen to the average total cost over time?
S: *Decrease*.
T: Yes, it *decreases or will decrease*.

In Kim's classes, the students generally initiated LREs to enquire about the meaning of technical terms or for self-correction of incorrect use of technical terms in their utterances. Excerpt 4.17 illustrates a student-initiated, pre-emptive episode focusing on vocabulary. A student notices a linguistic error, *constancy*, in her response to Kim's question and promptly corrects it. The students initiated only two grammar-related episodes, and they did so pre-emptively. In Excerpt 4.18, a student directly asks Kim about the word class of two lexical items, *marginal* and *average*, which are parts of a technical multi-word, *marginal average cost.*

Excerpt 4.17 (E1-36, S-initiated, pre-emptive, vocabulary)

T: What is the property whereby the long-term ATC becomes the same as the quantity of output changes?
S: *Constancy* return, oh, *constant* returns to output?
T: Right. It's constant returns to output.

Excerpt 4.18 (E2-38, S-initiated, pre-emptive, grammar)

S: *Isn't 'marginal' an adjective and 'average' a noun?*
T: *No, they are both adjectives*.

4.2.2.2.3 Complexity

In this study, complexity refers to the number of teacher's corrective responses to students' erroneous utterance in an LRE. Simple LRE refers to episodes with either one corrective response to a student's previous utterance or question or no response. Complex LRE refers to episodes with more than one corrective response to a student's previous utterance or question

or silence (See Chapter 3, Section 3.4.3). Most of the time, Kim initiated Simple LREs in which he either responded only once to correct students' language errors or questions or simply provided information about language items. However, he initiated a few complex LREs responding multiple times to correct students' language errors or to support their learning of language, as seen in Table 20. All the student-initiated LREs in Kim's classes were simple either because Kim gave only one corrective response to students' explicit questions regarding language or because students corrected their linguistic errors by themselves.

Table 20 Complexity of the LREs in Kim's classes

		Lesson 1	**Lesson 2**	**Lesson 3**	**Lesson 4**	**Total**
T-initiated	Simple	34	42	52	23	151 (96.8%)
	Complex	2	0	0	3	5 (3.2%)
	Total	36	42	52	26	156
S-initiated	Simple	1	1	3	1	6 (100%)
	Complex	0	0	0	0	0
	Total	1	1	3	1	6

In complex LREs, Kim often used elicitation. Excerpt 4.19 illustrates a teacher-initiated, pre-emptive LRE that involves multiple response moves between Kim and a student. In the discussion of a negative externality (subject content), Kim incidentally shifts his attention to a technical term by asking if the class remembers the term introduced in the previous lesson (Turn 1). Instead of immediately providing the answer, Kim elicits a student's response through multiple response moves (Turn 2 & 4) until she completes the multi-word, *marginal private benefit*. In Excerpt 4.20, a teacher-initiated, reactive, complex LRE, Kim takes a brief time-out to attend to a student's linguistically incorrect utterance, *combined function* (Trigger), and tries to elicit the correct word from the student (Turn 3). But as the student fails to notice the

linguistic error she made (Turn 4), Kim directly recasts it correctly, *composition function* (Turn 5).

Excerpt 4.19 (E4-17, T-initiated, pre-emptive, vocabulary, complex)

T: When there's a product that has a negative externality, this demand curve represents what?

(silence)

1 T: It's the keyword from the last lesson. Can anyone tell me what that is? () *Three words that start with 'marginal'.*

2 S: *Private?*

3 T: *Yes, marginal private. And then?*

4 S: *Benefit?*

5 T: *Benefit? Did you say benefit? Right. Marginal private benefit.*

Excerpt 4.20 (E1-21, T-initiated, reactive, vocabulary, complex)

1 T: So, what kind of function is this?

2 S: Um… *combined function?*

3 T: *Com….?*

4 S: *Combined function?*

5 T: *Composition function.*

Kim occasionally initiated complex LRE in response to the silence. In Excerpt 4.21, a teacher-initiated, pre-emptive LRE focused on vocabulary, Kim asks the class about the meaning of '*cost'* in economics and provides the answer after the silence, presumably expecting that his students do not know the disciplinary ways of using the word.

Excerpt 4.21 (E1-23, T-initiated, pre-emptive, vocabulary, complex)

T: *In economics, if there's no other explanation, the word 'cost' always means?*

(silence)

T: *It means 'opportunity cost'.* Why do I emphasise that? Because people usually don't take cost into consideration.

4.3 Glenn, the second teacher

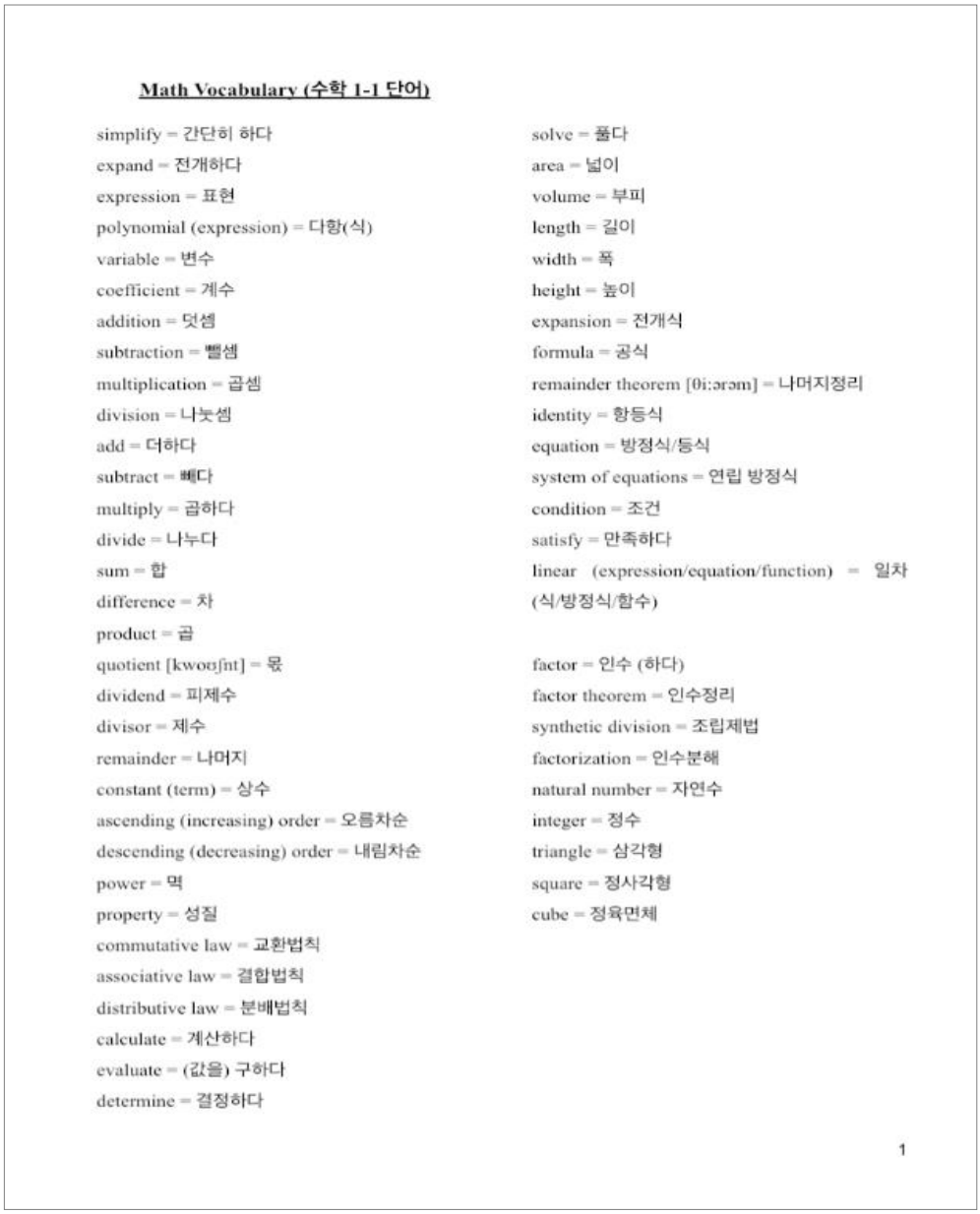
Glenn was an English L1 speaker from Ireland. He had a bachelor's degree with a double major in biology and physiology and a postgraduate diploma in science and maths education from a university in the United Kingdom. After receiving his postgraduate diploma, he worked for three years as a science and maths teacher at a secondary school in Ireland. He came to South Korea to apply for an ESL teaching position at an elementary school in Seoul. He taught ESL classes for Korean L1 students at the elementary school for two years and taught Korean L1 students aged 16 to 18 English writing at a private English academy. Glenn started teaching mathematics and biology at SHS in 2017.

During the observed semester, Glenn taught mathematics (SA-M) for second-year students twice a week. Because the textbook used for the SA-M class was written in Korean, Glenn developed handouts in English (see Figure 7).

4.3.1 Glenn's views on providing language support and his planned practice

4.3.1.1 Types of language support

For the SA-M class, Glenn provided a wordlist of mathematics terms which he developed with his Korean L1 co-teacher, Yoon. Unlike the glossary Kim developed, Glenn's wordlist included only corresponding Korean words for all mathematics terms in English used throughout the semester (Figure 7). The wordlist was distributed to the class at the beginning of each semester. The students were required to bring it to every lesson.



Math Vocabulary (수학 1-1 단어)

simplify = 간단히 하다
expand = 전개하다
expression = 표현
polynomial (expression) = 다항(식)
variable = 변수
coefficient = 계수
addition = 덧셈
subtraction = 뺄셈
multiplication = 곱셈
division = 나눗셈
add = 더하다
subtract = 빼다
multiply = 곱하다
divide = 나누다
sum = 합
difference = 차
product = 곱
quotient [kwoʊʃnt] = 몫
dividend = 피제수
divisor = 제수
remainder = 나머지
constant (term) = 상수
ascending (increasing) order = 오름차순
descending (decreasing) order = 내림차순
power = 멱
property = 성질
commutative law = 교환법칙
associative law = 결합법칙
distributive law = 분배법칙
calculate = 계산하다
evaluate = (값을) 구하다
determine = 결정하다

solve = 풀다
area = 넓이
volume = 부피
length = 길이
width = 폭
height = 높이
expansion = 전개식
formula = 공식
remainder theorem [θi:ərəm] = 나머지정리
identity = 항등식
equation = 방정식/등식
system of equations = 연립 방정식
condition = 조건
satisfy = 만족하다
linear (expression/equation/function) = 일차 (식/방정식/함수)

factor = 인수 (하다)
factor theorem = 인수정리
synthetic division = 조립제법
factorization = 인수분해
natural number = 자연수
integer = 정수
triangle = 삼각형
square = 정사각형
cube = 정육면체

1

Figure 7 The wordlist for the mathematics class

Glenn also included small glosses of mathematical terms in handouts like Kim did (Figure 8). Each gloss included mathematical terms with corresponding Korean words used in practice exercises that were located right next to the gloss in handouts. Also, Glenn included a section of the definition of some mathematics terms in handouts.

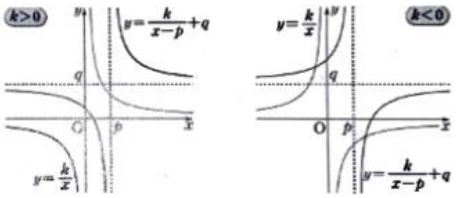
[Vocabulary]
radicand
근호 안의 값

[Definition]
For a function $y=f(x)$, when $f(x)$ is an irrational expression in x, this function is called an ***irrational function***.
For example, the functions $y=\sqrt{x-2}$, $y=\sqrt{x}+5$, $y=\sqrt{1-x^2}$ are all irrational functions.
In general, when the domain of an irrational function is not stated, the domain is the set of all real numbers that make the radicand greater than or equal to 0.
For example, the domain of the function $y=\sqrt{2x-1}$ is _____.

[Exercise 3] 교과서 p.232 문제3
Find the domain of the following functions.
(1) $y=\sqrt{6-2x}$ (2) $y=-\sqrt{3x+8}-5$

[Note]
If we translate the graph of $y=f(x)$ p units horizontally and q units vertically, then the equation of the translated graph is $y=f(x-p)+q$.

[How to draw the graph of a rational function $y=\frac{k}{x-p}+q$]
The graph of a rational function $y=\frac{k}{x-p}+q\,(k\neq 0)$ is translated ____ horizontally (in the direction of the x-axis) and _____ vertically (in the direction of the y-axis) from the graph of a function $y=\frac{k}{x}$.
In this case, the domain of the function $y=\frac{k}{x-p}+q$ is _____ and the range of this function _____. The asymptotes are the two lines _____.



[Vocabulary]
translation 평행이동
quadrant 사분면

For example, the graph of the function $y=\frac{1}{x-2}+1$ is translated 2 units to the right and 1 unit upward from the graph of the function $y=\frac{1}{x}$.
Thus, the graph can be drawn as in the figure on the right.
The domain of this function is _____ and the range of this function is _____.
The asymptotes are _____.

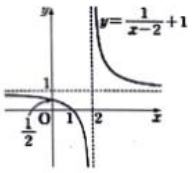


Figure 8 Glosses of mathematical terms

4.3.1.2 Reasons for provision of language support

4.3.1.2.1 How Glenn perceived his role

An instructor: "...it's like teaching Irish students Maths".

When I asked about his role in the interview, Glenn said he thought about himself as an instructor in relation to his EMI classes. The construction of his role as an instructor appeared to be connected with his experience of teaching mathematics at high schools in Ireland, which he described as "not so much different to teaching in Korea". Glenn believed that his

responsibility would be “to give them a good basis for further studying”, whether he works in South Korea or Ireland. He further explained that teaching students to use mathematics registers naturally and correctly was part of his responsibility as a mathematics teacher in both countries.

When questioned about any differences in his role between ESL classes and EMI classes, he said the difference between the two positions was simply “what to teach”. During the interview, Glenn repeatedly mentioned that he tried to keep the focus of his EMI class more on mathematics than English. In the observations, however, I noted that Glenn frequently focused on general English to help students comprehend written maths problems. In Excerpt 4.22 from the third lesson observed, Glenn asks the students if they know the difference in meaning between ‘a number of’ and ‘the number of’ while reading the written maths problems.

Excerpt 4.22

T: … so, do you guys know the difference between ‘a number of’ and ‘the number of’? We’ve discussed it last semester, right?

S: ‘a number of’ means ‘many’?

T: Yes, yes.

4.3.1.2.2 What Glenn saw as the functions of language support he provided

“A time-saver” for teaching

In my interview with Glenn, he talked about the effectiveness of the planned language support for managing class time. He described the wordlist as the “basic support” not only for students but also for teachers to secure enough time for teaching their content subjects. He believed focusing too much on English could sometimes break the flow of the class, especially when doing practice exercises:

> *I believe it’d be harder for students to learn maths in English because they have to practice maths exercises every lesson (…) if I don’t give them those sections (with maths terms), they will spend more time raising their hands and asking ‘what does this mean?’ when they are supposed to do the exercises.*

"A promise between the teacher and students."

In the interview, Glenn described the wordlist as a "promise between the teachers and students" to stick to the definitions of mathematical terms given in the wordlist. He believed that language support facilitated communication with the students by using the shared definitions of mathematical terms and registers in his class. Excerpt 4.23 from the third lesson observed is an example in which Glenn asks the students to stick to the meaning of the word, *translate*, written in the wordlist.

Excerpt 4.23

T: … and if you've read through the exercises, you probably saw the word 'translate' used in the problem, 'if you translate the graph of $y=f(x)$…'. What does 'translate' mean here? Anyone?

(silence)

T: Well, please have a look at the (word) list, everyone, and stick to that definition.

During the interview, Glenn often talked about his concern for his students' poor performance (grades) in his class. From his experience of teaching mathematics in two different countries, Glenn believed that students' learning of "conventional ways" of using language in mathematics was what decided their success in his classes regardless of their L1 background. He believed that by using the wordlist, the students could be repeatedly exposed to "unfamiliar" mathematics terms, distinguish them from other general English words, and recognise those terms in different word forms.

4.3.2 Incidental attention to language

Through the examination of the data collected from the observations and recordings of Glenn's SA-M class, the frequency and types of LREs were examined. Section 4.3.2.1 presents the frequency of LREs in the data, and the nature of the LREs is examined in Section 4.3.2.2.

4.3.2.1 Frequency of LREs in the SA-M

Incidental LREs occurred frequently and accounted for a fair amount of class time in Glenn's mathematics classes. In total, 71 LREs were identified from the 3 hours and 32 minutes of the recordings of the observed lessons. Table 21 shows the number of LREs in each observation and the total number of LREs. The rate of LREs per minute was calculated. In the SA-M class, one LRE occurred every 3.07 mins on average. In Glenn's classes, LREs ranged in length from 7 to 24 seconds. The total time spent on LREs was 13.01 minutes, and LREs accounted for 6.1% of total class time.

Table 21 Frequency and the rate of LREs per minute in Glenn's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
The number of LREs	17	12	25	17	71
The rate of LREs per minute	3.05	4.42	2.39	3.06	3.07
Total time spent on LREs (in minutes)	3.85	1.87	4.38	3.38	13.01

4.3.2.2 Characteristics of LREs in Glenn's classes

All the LREs from Glenn's classes were coded for four categories: initiator (teacher- or student-initiated), interactional types (pre-emptive or reactive), linguistic categories (vocabulary, grammar, discourse, or Mathematics speak), and complexity (simple or complex).

4.3.2.2.1 Initiator and interactional types

Among 71 LREs identified from the four SA-M lessons, Glenn initiated most of the LREs (91.5%), but the student did initiate a few LREs (8.4%), as seen in Table 22.

Table 22 Initiator types of LREs in Glenn's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	17	11	22	15	65 (91.5%)
S-initiated	0	1	3	2	6 (8.4%)
	17	12	25	17	71

In the data set from Glenn's classes, both the teacher and students initiated reactive LREs more frequently than pre-emptive LREs. Glenn initiated reactive LREs (64.6%) nearly twice as often as pre-emptive LREs (35.4%). In Glenn's classes, the students almost never initiated pre-emptive LREs, as shown in Table 23.

Table 23 Interactional types of LREs in Glenn's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Pre-emptive	5	4	9	5	23 (35.4%)
	Reactive	12	7	13	10	42 (64.6%)
	Total	17	11	22	15	65
S-initiated	Pre-emptive	0	0	1	0	1 (16.7%)
	Reactive	0	1	2	2	5 (83.3%)
	Total	0	1	3	2	6
Total		17	12	25	17	71

Glenn initiated most of the LREs in response to the students' erroneous utterances. Excerpt 4.24 illustrates a teacher-initiated, reactive LRE. It begins with a discussion of the domain of a rational function. A student's incorrect response '*x is… more or equal to three, and y is two'* gives rise to an LRE. He reformulates the student's utterance in a more conventional way of articulating the idea in the register of the mathematics classroom- *x is greater than or equal to three and y is greater than or equal to two*. Sometimes Glenn initiated LREs pre-emptively to introduce new technical terms or to explain the meaning of terms. In Excerpt 4.25, at the

beginning of the lesson, Glenn introduces a new technical term, *radicand*, and then directly asks the class about its meaning. Excerpt 4.26 illustrates another teacher-initiated, pre-emptive LRE, in which Glenn asks the class about the disciplinary use of English in mathematics while solving a maths problem. He models the conventionalised way of using English in mathematics for his students to give an answer.

Excerpt 4.24 (M4-8, T-initiated, reactive)

T: So, what's the domain of that?

S: *x is… more or equal to three, and y is two?*

T: Yes. *X is greater than or equal to three, and y is greater than or equal to two*.

Excerpt 4.25 (M3-1, T-initiated, pre-emptive)

T: *So, another word that could be new is radicand. Do you know what radicand is?*

Excerpt 4.26 (M3-14, T-initiated, pre-emptive)

T: *Do you know the English for solving this kind of problem?*

(silence)

T: *English is... 'difference of, difference of the two squares'.* So, in that case, *difference here means…* actually, in this case, *difference means subtraction.*

In Glenn's classes, the students initiated a few reactive LREs. In Excerpt 4.27, a student expresses her lack of comprehension of the lexical item, *numerable*, and then Glenn provides a synonym, *countable*, to support the student to understand the targeted item.

Excerpt 4.27 (M2-2, S-initiated, reactive)

T: So, if you have this, 'y equals 2x plus 3 over x plus 1', you can make 'x plus 1' *numerable,* too.

S: *Numerable?*

T: *Countable.* You can make 'x plus 1' *countable*.

4.3.2.2.2 Linguistic categories

Analysis of linguistic categories of the LREs showed that in Glenn's classes, the majority of the LREs focused on mathematics speak, which refers to the conventional way of articulating ideas using language patterns associated with mathematical terms. Table 24 indicates that Glenn focused most of his attention on mathematics speak (46.2%) followed by vocabulary (33.8%) and grammar (15.3%). Glenn initiated few discourse-related episodes (4.6%). The students attended to vocabulary (50%) the most, as seen in Table 25, and they rarely focused on the other language categories.

Table 24 Linguistic categories of T-initiated LREs in Glenn's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Vocabulary	5	6	8	3	22 (33.8%)
	Grammar	5	2	3	0	10 (15.3%)
	Discourse	2	0	0	1	3 (4.6%)
	Mathematics speak	5	3	11	11	30 (46.2%)
		17	11	22	15	65

Table 25 Linguistic categories of S-initiated LREs in Glenn's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
S-initiated	Vocabulary	0	1	0	2	3 (50%)
	Grammar	0	0	1	0	1 (16.6%)
	Discourse	0	0	1	0	1 (16.6%)
	Mathematics speak	0	0	1	0	1 (16.6%)
		0	1	3	2	6

The majority number of the teacher-initiated LREs focused on mathematics speak, all of which were reactively initiated to correct students' errors using the conventionalised way of articulating the idea in mathematics. In Excerpt 4.28, Glenn recasts a student's prior utterance,

y is equal or more than zero?, in a conventionally accurate way of expressing the range of a function.

Excerpt 4.28 (M4-3, T-initiated, reactive, mathematics speak)

T: So, y will have real value. Um, what would the range be for this?

S: *y is equal or more than zero?*

T: Yes, so, in that case, *y is greater than or equal to zero.*

In Glenn's classes, the students gave the most attention to vocabulary. In Excerpt 4.29, Glenn's use of a multi-word, *x-intercept*, draws a student's attention. The student expresses difficulty in comprehending the word, and then Glenn provides the formal definition referring to the wordlist of mathematical terms.

Excerpt 4.29 (M4-1, S-initiated, reactive, vocabulary)

T: You can get the *x-intercept* in that one, too.

S: *X-intercept?*

T: Yes, intercept. If you look at the handout (wordlist)… *it says 'the point that the graph crosses on the x-axis'*. Okay? Let's move on to the next question.

In Glenn's classes, grammar-focused and discourse-focused LREs were infrequent. Excerpt 4.30 is a student-initiated, reactive LRE focusing on the discourse that was captured as Glenn went around the classroom to help students solve a maths problem. In a discussion of the way to calculate an irrational expression, a student reacts to Glenn's use of the word, *did,* directly asking for clarification. Glenn then clarifies the item recovering – '*just calculated the rational expressions'*. Excerpt 4.31 shows a teacher-initiated, reactive LRE focusing on grammar. During a student's oral presentation about the way she solved a maths problem, her grammar mistake, '*are somewhat raise'*, draws Glenn's attention, and Glenn recasts it correctly.

Excerpt 4.30 (M3-12, S-initiated, reactive, discourse)

T: So, I've calculated this irrational expression in the same way as you *did* before.

S: *What?*

T: The same way as you *just calculated the rational expressions before.*

S: Ah, I see.

Excerpt 4.31 (M2-3, T-initiated, reactive, grammar)

T: Uh (.) k will be less than one.

S: So, *is denominators are somewhat raise*?

T: Yes, denominators *are somewhat rising*.

S: Yup, okay. And we only need to…

4.3.2.2.3 Complexity

Analysis of the complexity of the LREs in Glenn's classes revealed that Glenn sometimes spent quite some time to deal with language issues during teaching. Nearly 16% of the teacher-initiated LREs were complex, suggesting that Glenn made more than one response to correct students' ill-formed utterances or to support students' learning of targeted language items, as shown in Table 26.

Table 26 Complexity of the LREs in Glenn's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Simple	11	11	21	12	55 (84.6%)
	Complex	6	0	1	3	10 (15.3%)
		17	11	20	15	65
S-initiated	Simple	0	1	3	1	5 (83.3%)
	Complex	0	0	0	1	1 (16.7%)
			1	3	2	6

Similar to the way Kim initiated complex LREs, Glenn initiated all the complex LREs when he focused his attention on Mathematics speak using elicitation. In Excerpt 4.32, a student's response, '*p and q?*', gives rise to an episode (Trigger). Instead of immediate correction, Glenn encourages the student to reformulate her prior response in a more conventional way of articulating the idea (Response 2 & 4). The episode ends when he finally adds '*if p is positive*' to render a more precise articulation (Response 6). Excerpt 4.33 is a teacher-initiated, pre-emptive LRE focusing on vocabulary, which was captured while Glenn went around the classroom during the class activity. Glenn asks a student if he knows the name for the value inside the roots, and instead of providing the answer directly, he tries to elicit it from the student (Response 2). When the student fails to give the correct word, *radiant*, Glenn recasts it correctly, *radicand* (Response 4).

Excerpt 4.32 (M1-10, T-initiated, reactive, mathematics speak, complex)

T: So, what are the asymptotes of y equals k over x minus <> q?

1 S: *P and q?*

2 T: *Yeah, but can you say that more precisely?*

3 S: Uh... *X equal p…*

4 T: *And?*

5 S: *…and y equal q.*

6 T: *Yes.* So, *if p is positive, x equals p, and y equals q.*

Excerpt 4.33 (M3-3, T-initiated, pre-emptive, vocabulary, complex)

S: … and the number inside the root is 7.

T: Yes, the value inside the roots*, what's the name for that?*

1 S: *Uh… I don't know.*

2 T: *We've learned it last week. Ra:*

3 S: *Radiant?*

4 T: *Radicand, the radicand.* Now, let's move on to…

4.4 Summary

In Case One, Sokuk High School, both planned and incidental attention to language was identified in the EMI classes of the two content teachers, Kim and Glenn. In their planned practice, the teachers provided their students with language support in the form of a glossary or wordlist and small glosses in textbooks or handouts. Both teachers considered learning the disciplinary register largely as learning of disciplinary vocabulary, and their language support also focused on vocabulary. Kim, an ESL speaker, appeared to consider students' general English proficiency when preparing his teaching, whereas Glenn, an English L1 speaker, did not.

A total of 233 LREs were identified in the school setting; there were more LREs identified in Kim's economics class than Glenn's mathematics class. LREs frequently occurred during the classroom interactions in both classes; however, the frequency of LREs was higher in Kim's classes (1 LRE every 1.32 minutes) than in Glenn's classes (1 LRE every 3.07 minutes). LREs accounted for 12.9% of the total class time in Kim's classes and 6.1% in Glenn's classes. Both Kim and Glenn initiated nearly all the LREs identified in their classes (98.1% and 91.5%, respectively). One difference regarding the initiator type was found between the classes; Kim initiated LREs mostly pre-emptively than reactively (81.4% and 18.6%, respectively), whereas Glenn initiated LREs more reactively than pre-emptively (64.6% and 35.4%, respectively). In both classes, the majority of LREs focused on vocabulary or disciplinary speak; however, both teachers paid little attention to grammar and discourse. Regarding the complexity of LRE, almost all LREs were simple in both classes; yet, findings showed that the frequency of complex LREs was higher in Glenn's mathematics classes than Kim's economics classes (16% and 3.1%, respectively).

CHAPTER FIVE: CASE TWO THE UNIVERSITY OF SEOUL

This chapter reports the findings from the study conducted at the University of Seoul (UoS) in order to answer the first and the second research questions: *What is the planned attention to language in these EMI settings*, and *What is the frequency and nature of LREs in disciplinary classes in these settings?*. It analyses two types of data from the two lecturers, Chen, a Chinese L1 accounting lecturer, and Luke, an English L1 mathematics lecturer. The pseudonyms, Chen and Luke, were used to protect their anonymity. The chapter begins with brief background information of the university and the general practice of EMI at the setting, followed by the analysis of the data collected from the lecturers. Data from the two lecturers are presented in separate sections, each of which is divided into two main parts: (1) the lecturer's views on providing language support and his planned practice and (2) incidental attention to language in classroom interaction. The first part is based on the lecturer's documents and interviews. It aims to investigate the types of planned attention to language and the lecturer's thinking behind these practices or reasons for attending to language. The topics in the interview schedule were:

i. How the lecturers perceived their role
ii. What they saw as the functions of language support they provide

The second part is based on the recordings of classes observed. It examines the frequency and characteristics of LREs identified from the classroom recordings (See Chapter 3, Section 3.4, for details about the system of analysis and codes).

5.1 Overview of EMI at the University of Seoul

The University of Seoul (UoS) is a private university located in Seoul, South Korea. It consists of seven faculties, Arts, Law, Education, Global Studies, Business, Engineering, and Mathematics and Sciences. Since the first introduction of EMI to Global Studies and Business in 2006, the university has expanded its scope to other faculties. Although the exact number of

EMI courses provided in the UoS was not shown in any of the official documents, it is mandatory for all the faculties to provide at least 20% of their courses in EMI (UoS, 2020). The annual report of the university (UoS, 2020) states that all faculties are, at their discretion, to determine which subjects are to be taught in English except for Korean studies and language studies other than English (e.g., Japanese or French).

As of 2020, there are 188 international lecturers (27% of the total 690 lecturers) who are from overseas and use Korean as a foreign language. Around 13% of the total number of undergraduate students are international students who have Korean as a foreign language (UoS, 2020). All students are expected to have a high English proficiency that is equivalent to the TOEFL iBT minimum score of 65 or the International English Language Testing System (IELTS) overall score of 5.5 (UoS, 2020).

The university offers a supportive language programme called '*Individualised English Education Programme*' for all freshmen. The stated aim of the course is to help students become confident in using academic English for undergraduate-level study. All first-year undergraduate students who do not have English as their L1 are required to do a computer-based English proficiency assessment before registration, and then they are allocated to an English for Academic Purposes (EAP) course according to their assessment results. The assessment consists of academic reading, writing, and listening tasks and is scored on a five-band scale; one is the lowest and five is the highest. Students take their allocated EAP course throughout their first year. The courses are taught by English L1 EAP instructors, all of whom have a bachelor's degree in majors related to either language teaching or linguistics. There is no collaborative work between EMI lecturers and EAP instructors. Also, the university does not have any professional programmes for EMI lecturers. The following is an example of the contents of the EAP programme (Table 27).

Table 27 The content of the EAP programme at UoS (UoS, 2019)

Lesson	Description
Strategies for reading academic texts	• Identifying words or phrases connected with the topic in the text • Identifying your purpose of reading • Finding specific information • Making course notes
Strategies for writing academic texts (1)	• Writing a crafted text using researched material in EAP • Using linking words and phrases (Coherence)
Strategies for writing academic texts (2)	• Exploring different citation styles (in-text citations) • Paraphrasing and summarising for various sections of research reports • Exploring ways to avoid plagiarism

In the following sections, findings from the study of planned and incidental attention to language in the undergraduate EMI classes of two lecturers, Chen and Luke, are reported. Chen taught the first-year Accounting course (ACC101), and it had a total of 42 students, 19 of whom were international students. Luke taught the first-year Engineering Mathematics course (EMT103), which consisted of 31 Korean L1 students.

5.2 Chen, the first lecturer

Chen is a Chinese L1 speaker who uses both English and Korean as foreign languages. He received both a MEcon and PhD in Economics and Business from a private university in South Korea. From his experience of studying and working in South Korea for nearly 15 years, Chen had near-native command of Korean. He also had advanced levels in all sections of TOEFL at the time he applied for a lecturer position at the University of Seoul (UoS).

Chen had been teaching undergraduate EMI accounting courses at the UoS for six years. During the observed semester, he taught two undergraduate accounting courses, one for first-year students and the other for fourth-year students, which met twice a week. All the teaching materials (e.g., textbooks) used in Chen's classes were written in English. I observed his first-year accounting course (ACC101) over the two weeks (a total of eight hours of recording). It

was a compulsory EMI course for all the first-year students in the Faculty of Business, regardless of their L1 background. All students in Chen's classes had English as L2 and were taking EAP courses. In the interview, Chen critiqued the EAP courses described in 5.1, saying that he would like them to be more discipline-related.

5.2.1 Chen's view on providing language support and his planned practice

5.2.1.1 Types of language support

Through examining the lecturer's documents, Chen appeared to consider the linguistic aspect when planning and preparing his accounting course. In the course outline, Chen stated the language-related aim of his course was "to become familiar with the use of accounting language to generate reports about the entity".

Chen provided the class with planned language support largely by focusing on disciplinary uses of vocabulary in accounting. He included one or two power-point slides containing definitions of accounting terms marked with blue colour in the lecture slides for each lesson (see Figure 9 & 10). In those slides, Chen included English definitions and sometimes synonyms of accounting terms that he felt were new to some of the students. Chen also gave the class a quiz on new accounting terms at the end of each lesson to have students review the terms and their definitions (see Figure 11).

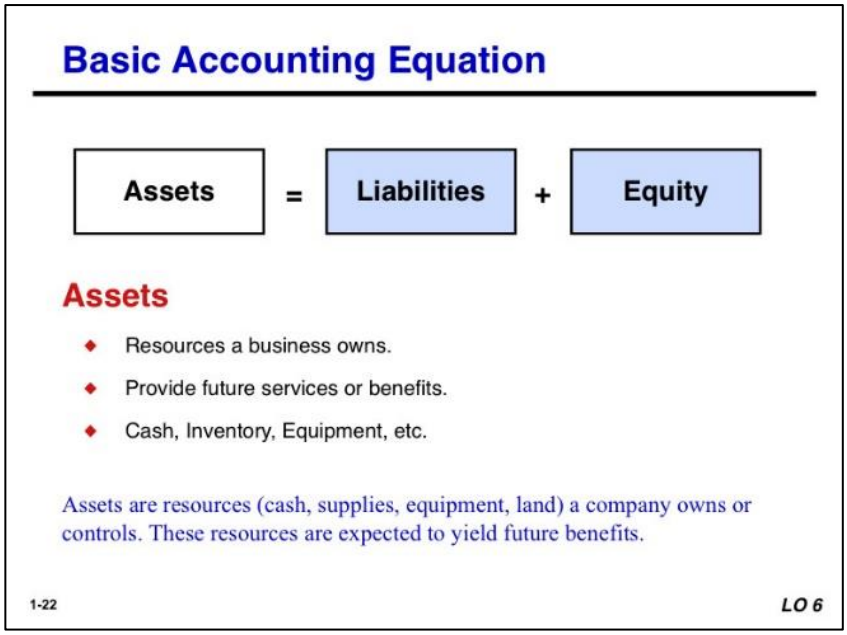


Figure 9 The slides of the definitions of technical terms in Chen's classes (texts in blue)

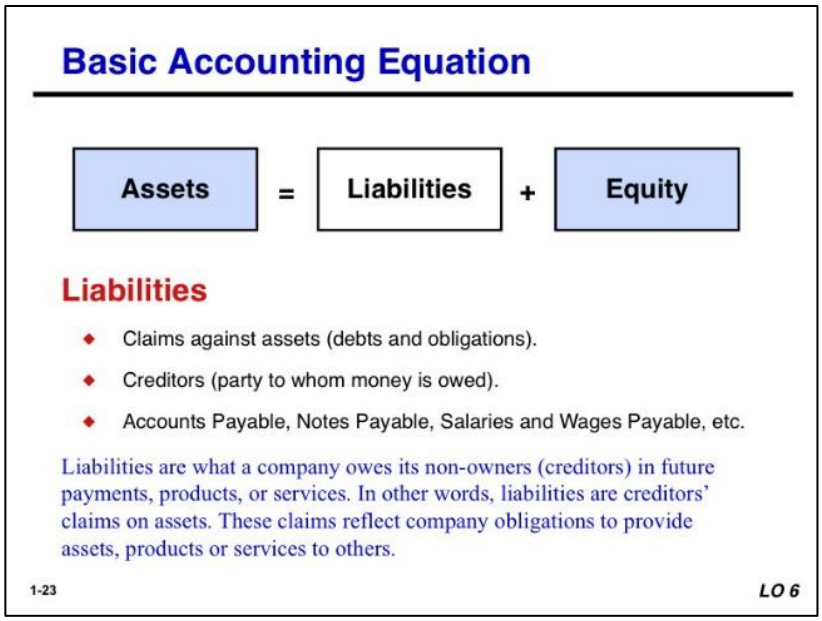


Figure 10 The slides of the definitions of technical terms in Chen's classes (texts in blue)

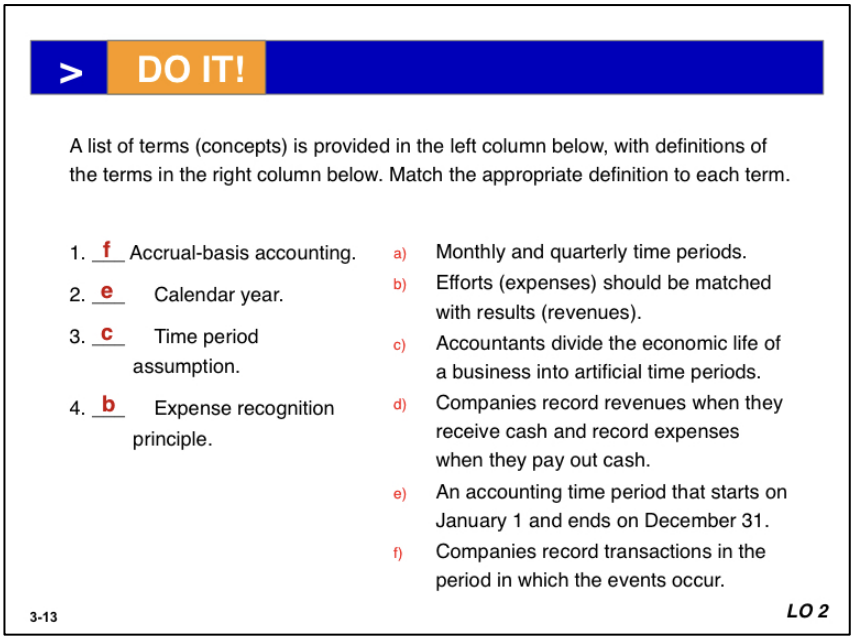


Figure 11 Quiz on technical terms in Chen's classes

5.2.1.2 Reason for provision of language support

5.2.1.2.1 How Chen perceived his role in relation to EMI

An accounting lecturer: to "bridge the gap between content, English, and students".

When asked about how he perceived his role in EMI teaching, Chen reported that he saw himself as an accounting lecturer who "bridges the gap between content, English, and students". Chen said that he was well aware of the linguistic challenges that his first-year students may have. When questioned about his practices in this regard, Chen mentioned that he tried to check how well students understood the lecture as often as possible and occasionally translated his English oral explanation into Korean or Chinese to help his students' lecture comprehension. He said that his experience as a Chinese student taking EMI courses at a Korean university had helped him become more aware of the linguistic challenges for his students, especially when in their first year of university. Chen believed that his first-year accounting course had two components, accounting content and English as a foreign language and that supporting his students with English was also a part of his responsibility.

5.2.1.2.2 What Chen saw as the functions of language support he provided

"A guide" for the novice students in accounting

In the interview, Chen described his ACC101 course as a "fundamental" for students' future careers because undergraduate students were usually expected to "master" conventionalised ways of using terms and expressions in accounting during the first year. He believed that he needed to take steps to support his students to become able to use technical accounting terms confidently and fluently and also to understand them correctly. He thought the planned language support, power-point slides introducing new technical terms, acted as *a guide* for his students to distinguish technical terms from general English words more efficiently and to learn how those terms were used in sentences:

> *I think that it (accounting) is a combination of numbers, and these (technical) terms, which means students should be able to use accounting terms fluently with confidence and understand them more correctly.*

5.2.2 Incidental attention to language in classroom interaction

Based on the data collected from the classroom observations and recordings of Chen's ACC101 lecture, an analysis of the frequency and characteristics of LREs was made. Section 5.2.2.1 presents the frequency of LREs in the data, and Section 5.2.2.2 reports the nature of LREs. (See Chapter 3, Section 3.4.3 for details about the system of analysis and codes.)

5.2.2.1 Frequency of LREs in Chen's classes

Incidental LREs occurred quite often in the ACC101 classes. As shown in Table 28, in Chen's accounting classes, a total of 154 LREs were identified from the eight hours of the recordings of the observed lessons. The rate of LREs per minute was calculated; one LRE occurred around every 3.12 minutes on average. A secondary analysis was made of the proportion of class time spent on the LREs. The length of an LRE was measured from the time the trigger occurred to

the time the response ended. In Chen's classes, LREs ranged in length from 5 to 98 seconds. The total time spent on LREs was 17.38 minutes, and LREs accounted for 3.62% of the total class time.

Table 28 Frequency and the rate of LREs per minute in Chen's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
The number of LREs	44	29	47	34	154
The rate of LREs per minute	2.73	4.14	2.55	3.53	3.12
Total time spent on LREs (in minutes)	5.02	3.22	5.13	4.01	17.38

5.2.2.2 Characteristics of LREs in Chen's classes

All the LREs from Chen's classes were coded for four categories: initiator, interactional types, linguistic categories, and complexity.

5.2.2.2.1 Initiator and interactional types

Of 154 LREs identified from the four ACC101 lessons, nearly all the LREs were initiated by the lecturer, Chen (98.1%). The students initiated few LREs (1.9%), as shown in Table 29.

Table 29 Initiator types of LREs in Chen's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	43	29	45	34	151 (98.1%)
S-initiated	1	0	2	0	3 (1.9%)
	44	29	47	34	154

In Chen's classes, almost all the LREs occurred pre-emptively. As shown in Table 30, around 97.4% of the lecturer-initiated LREs and all the student-initiated LREs occurred pre-emptively. Chen initiated few reactive LREs (2.6%) during his accounting teaching.

Table 30 Interactional types of LREs in Chen's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Pre-emptive	42	28	45	32	147 (97.4%)
	Reactive	1	1	0	2	4 (2.6%)
		43	29	45	34	151
S-initiated	Pre-emptive	1	0	2	0	3
	Reactive	0	0	0	0	0
		1	0	2	0	3
		44	29	47	34	154

Excerpt 5.1 is a lecturer-initiated, pre-emptive LRE, in which Chen directly asks the class about the meaning of an accounting term, '*residual value'*. He then provides its definition as well as the synonym of the term, '*salvage value'*. Chen initiated a few reactive LREs in response to linguistic errors that his students had made. Excerpt 5.2 illustrates a lecturer-initiated, reactive LRE. During the individual classroom activity, Chen reacts to a student's incorrect use of an accounting term, '*account payment'*, and then rephrases it correctly – *account payable, right?*.

Excerpt 5.1 (A2-9, L-initiated, pre-emptive)

L: *What does residual value mean, here?* Anyone?

(silence)

L: *That means remained value of an asset or salvage value.*

Excerpt 5.2 (A1-5, L-initiated, reactive)

L: Are you sure? Cash? On your account?

S: Account *payment*?

L: Account *payable,* right?

In Chen's classes, all the student-initiated LREs occurred pre-emptively. In Excerpt 5.3, a student asks about the disciplinary way of using a technical term, '*complementary'*, in sentences. Chen first provides the meaning of the term and then some examples of the

disciplinary use of the term in accounting.

Excerpt 5.3 (A3-14, S-initiated, pre-emptive)

S: *How, how do we use that English word 'complementary'?*

L: All right. So, 'complementary' *means* any products or service to complement other products, to accompany, right? *You can simply say 'cars and gas are complementary goods' or 'gas is a complement for car's'.*

5.2.2.2.2 Linguistic categories

Analysis of the linguistic categories of LRE showed that Chen initiated most of the LREs to focus on vocabulary (84.8%), followed by accounting speak (8.6%), and discourse (6.6%), as shown in Table 31. Vocabulary includes multi-word units. Accounting speak refers to the conventionalised way of articulating disciplinary ideas using language patterns associated with accounting terms. This includes enhancement or extension of student-initiated utterances in a more technical way (See Section 3.4.3 for detailed information). Excerpt 5.5 below is an example of an LRE focused on accounting speak. In Chen's classes, the student-initiated LREs were mostly focused on vocabulary (66.6%) followed by accounting speak (33.3%), as shown in Table 32. Neither the lecturer nor the students initiated grammar-focused LRE in any of Chen's classes that were observed.

Table 31 Linguistic categories of T-initiated LREs in Chen's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
	Vocabulary	36	26	40	26	128 (84.8%)
	Grammar	0	0	0	0	0
T-initiated	Discourse	5	1	3	1	10(6.6%)
	Accounting speak	2	2	2	7	13(8.6%)
		43	29	45	34	151

Table 32 Linguistic categories of S-initiated LREs in Chen's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
S-initiated	Vocabulary	1	0	1	0	2 (66.6%)
	Grammar	0	0	0	0	0
	Discourse	0	0	0	0	0
	Accounting speak	0	0	1	0	1 (33.3%)
		1	0	2	0	3

Excerpt 5.4 illustrates a lecturer-initiated, pre-emptive LRE focused on vocabulary (a multi-word unit). While solving an accounting problem, Chen attends to a multi-word, '*on account'*, used in a question and then immediately provides the meaning of the word. Excerpt 5.5 shows a lecturer-initiated, vocabulary focused LRE, this time, reactively. During the discussion of the total revenue formula (subject content), a student's ill-formed answer, *'Dep, depressment?'*, draws Chen's attention, and he rephrases it with the correct accounting term, '*depreciation'*.

Excerpt 5.4 (A3-9, L-initiated, pre-emptive, vocabulary)

L: Second question. *What does 'on account' mean, here? It means 'not using cash to pay for the equipment, using my credit, instead'*.

Excerpt 5.5 (A2-3, L-initiated, reactive, vocabulary)

L: That is a sum of explicit cost and accounting profit and...?

S: *Dep, depressment?*

L: Pretty close. *Depreciation*.

Excerpt 5.6 is a lecturer-initiated, pre-emptive LRE focused on discourse. While reading the handouts, Chen attends to the reference word, *them*, and clarifies it– *[w]hat I mean by 'them' here is, the products*. Excerpt 5.7 is a lecturer-initiated, reactive LRE focused on accounting speak. Chen responds to a student's utterance by modelling a conventionalised way of articulating an idea in accounting – *[i]n accounting, we say, 'the residual value for the car*

is zero'.

Excerpt 5.6 (A3-18, L-initiated, pre-emptive, discourse – reference)

L: … you buy the materials and make products with them and sell *them*. *What I mean by 'them' here is* () *the products*. You sell *the products*.

Excerpt 5.7 (A4-8, L-initiated, reactive, accounting speak)

L: Let say I own a car whose useful life is 10 years, and…

S: *You can't use that car anymore* because of its useful life?

L: Yes. *In accounting, we say, 'the residual value for the car is zero'*.

As shown in Table 5.5, in Chen's classes, students only initiated vocabulary-focused LREs. Excerpt 5.8 illustrates a student-initiated, pre-emptive LRE, in which a student directly asks a question, *'[d]o net earnings mean net income?'*, to make sure what she has understood is correct.

Excerpt 5.8 (A3-27, S-initiated, pre-emptive, vocabulary)

S: Professor. *Do net earnings mean net income?*

L: *Yes, yes. They are the same, and you can also call it (net income) net earnings.*

5.2.2.2.3 Complexity

In this study, complexity refers to the number of teacher's responses in an LRE. Simple LRE refers to an episode that has either one lecturer response to a previous utterance (students' linguistic errors or questions) or no lecturer response (e.g., lecturer-initiated, pre-emptive). Complex LRE refers to an episode that has either multiple lecturer responses to a previous utterance or one lecturer response to silence. (See Section 3.4.3 for detailed information.) Nearly all the LREs observed in Chen's classes were simple LREs, which had either only one response by Chen to a previous utterance or no response (lecturer-talk), as shown in Table 33.

Table 33 Complexity of the LREs in Chen's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Simple	42	28	45	34	149
	Complex	1	1	0	0	2
	Total	43	29	45	34	151
S-initiated	Simple	1	0	2	0	3
	Complex	0	0	0	0	0
	Total	1	0	2	0	3

The Excerpts below show different types of simple LREs observed in Chen's classes. Excerpt 5.9 is a simple LRE that does not involve any corrective response (lecturer-talk), in which Chen rephrases the technical term '*revenue'* with '*money*' presumably to help the students understand better. Excerpt 5.10 shows another simple LRE, this time with a corrective response that Chen makes to recast a student's utterance '*money*' in a more technical way, '*the cash*'.

Excerpt 5.9 (A1-24, L-initiated, pre-emptive, vocabulary, simple)

L: You receive the *revenue* first, receive the *money* first, and that's it.

Excerpt 5.10 (A4-3, L-initiated, reactive, vocabulary, simple)

L: What does 'cash basis' mean here?

S: Focus on *money.*

L: Yes, focusing on *the cash* only.

All the complex LREs were initiated by Chen and occurred in response to silence. Excerpt 5.11 is a lecturer-initiated, pre-emptive LRE focusing on vocabulary, in which Chen asks the class about the meaning of a technical term, *underestimate*, and then provides it after the silence, presumably anticipating that his students do not know the meaning of the term.

Excerpt 5.11 (A1-41, L-initiated, pre-emptive, vocabulary, complex)

L: Or you can also say you underestimate your revenue or your assets. So, *what does underestimate mean?*

(Silence)

L: *You mistakenly think that you already have received the money, right?*

5.3 Luke, the second lecturer

Luke was an English L1 speaker from India who did not speak Korean to any degree. He had a PhD in Applied Mathematics from a private university in South Korea. He started working as a lecturer at the UoS in 2012 and had been teaching EMI mathematics courses since then. During the observed semester, Luke taught two undergraduate mathematics courses, one for first-year students and the other for fourth-year students. I observed his first-year Engineering Mathematics course (EMT103), which was a mandatory course, four times over the two weeks, and a total of five hours and 57 minutes of recordings were made. All students in Luke's class were Korean L1 speakers who had English as a second language. All the teaching materials (e.g., textbooks) used in Luke's classes were in English.

5.3.1 Luke's view on providing language support and his planned practice

5.3.1.1 Types of language support

For the EMT103 course, Luke provided the class with planned language support that was largely focused on technical terms. He added lecture notes containing definitions of mathematics terms to the power-point slides used for each lesson, and these slide notes were shown when printed out (see Figure 12).

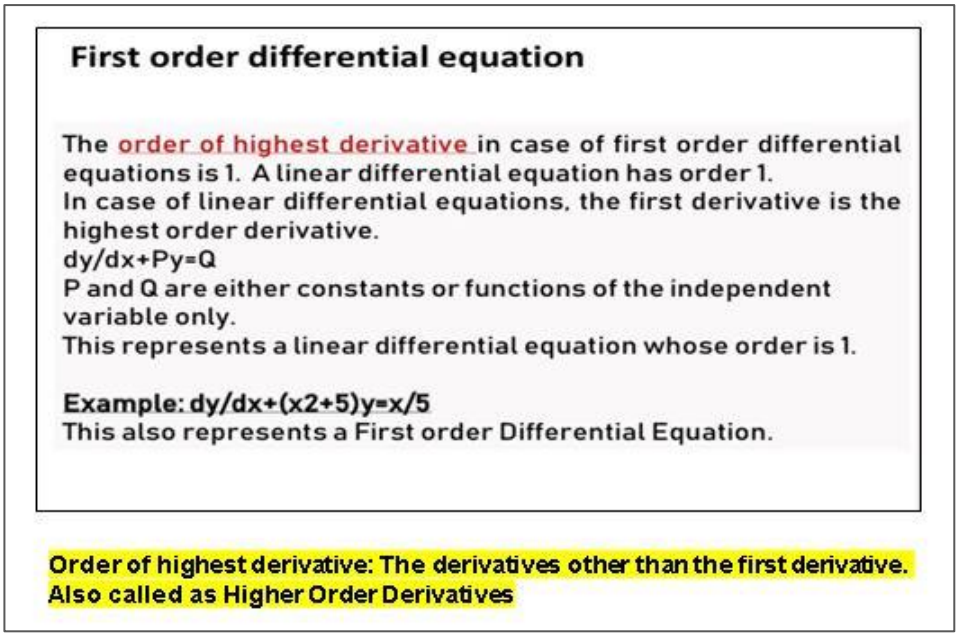


Figure 12 Lecture notes including definitions of mathematical terms (highlighted part)

5.3.1.2 Reason for provision of language support

5.3.1.2.1 How Luke perceived his role in relation to EMI

A trainer: "to prepare students for future careers".

When questioned about how he saw himself in EMI teaching, Luke reported that he perceived his role as *a trainer* who prepares students for their future careers and helps them become competitive in the global job market. Luke believed that he was responsible for supporting his students to be fluent in using mathematics terms and expressions in English so that they could "think more mathematically and talk more mathematically" and "communicate with others in the same industry". During the interview, Luke often emphasised the importance of using English for teaching and learning his subject. He believed that his Korean L1 students should "master" technical terms and expressions in English before graduation for a successful international job search. In this regard, Luke thought his course should provide an opportunity for his Korean L1 students to practice using "mathematical language" in English.

5.3.1.2.2 What Luke saw as the functions of language support he provided

"Sign" that highlights the importance of technical terms

In my interview with Luke, he described the language support, the power-point lecture notes, as a "sign" that emphasises the importance of certain mathematics terms that he wished his students to remember. Although Luke thought it would be more effective for students to search for definitions of mathematics terms on their own, he believed that he should sometimes directly take steps to highlight some of the more important terms:

> *I don't think it's necessary to give them (students) definitions of all the words because it's their responsibility to study those terms by themselves […] The reason I use those notes is to point out which terms are more important than other terms.*

In the interview, Luke noted that he did not provide any or this kind of support to the fourth-year students. When questioned about the reason for his decision, he talked about his intention to focus solely on content in his fourth-year courses. Luke also reported that he expected his students to become "highly skilful" at "using mathematics language" without any language support by the time they reached their fourth year.

5.3.2 Incidental attention to language in classroom interaction

5.3.2.1 Frequency of LREs in Luke's classes

Incidental LREs occurred in Luke's EMT103 course. As shown in Table 34, in Luke's classes, a total of 43 LREs were identified from the 5 hours and 57 minutes of recordings of the four lessons observed. One LRE occurred around every 8.3 minutes on average. In Luke's classes, LREs ranged in length from 7 to 21 seconds. The total time spent on the LREs throughout the observed lessons was 6.71 minutes, and LREs accounted for 1.9% of the total class time.

Table 34 Frequency and the rate of LREs per minute in Luke's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
The number of LREs	20	12	4	7	43
The rate of LREs per minute	4.5	7.5	22.5	12.9	8.3
Total time spent on LREs (in minutes)	2.74	1.9	0.7	1.37	6.71

5.3.2.2 Characteristics of LREs in Luke's classes

LREs identified from Luke's classes were coded for four categories: initiator, interactional types, linguistic categories, and complexity.

5.3.2.2.1 Initiator and interactional types

In EMT103 lessons observed, almost all the LREs were initiated by the lecturer, Luke (93.0%), and the students initiated very few LREs (6.9%), as seen in Table 35.

Table 35 Initiator types of LREs in Luke's classes

	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	18	12	3	7	40 (93.0%)
S-initiated	2	0	1	0	3 (6.9%)
Total	20	12	4	7	43

In Luke's classes, more pre-emptive (76.7%) than reactive LREs (23.3%) occurred, as shown in Table 36. Luke initiated pre-emptive LREs far more frequently than reactive LREs (77.5% and 22.5%, respectively). The students also initiated LREs more pre-emptively (67%) than reactively (33%).

Table 36 Interactional types of LREs in Luke's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	**Pre-emptive**	11	11	2	7	31 (77.5%)
	Reactive	7	1	1	0	9 (22.5%)
		18	12	3	7	40
S-initiated	**Pre-emptive**	2	0	0	0	2 (67%)
	Reactive	0	0	1	0	1 (33%)
		2	0	1	0	3
Total		20	12	4	7	43

Excerpt 5.10 illustrates a lecturer-initiated, pre-emptive LRE from Luke's classes. While solving a mathematics problem, Luke takes a brief time out to attend to the name of a mathematical symbol, the Kronecker delta (δ_{ij}), and its spelling. In Excerpt 5.11, a lecturer-initiated, reactive LRE focused on vocabulary due to a student's incomplete utterance gives rise to an LRE. Luke attends to it by rephrasing it with a complete term in response to her attempt – *Perpen, perpendicular, right?.*

Excerpt 5.10 (EM4-4, L-initiated, pre-emptive)

L: This type of delta is *called 'Kronecker delta'. It's k, r, o, n, e, c, k, e, r.*

Excerpt 5.11 (EM1-21, L-initiated, reactive)

L: So, the Sin comes from the orthogonal formula. **, I think you have the answer. These two lines are?

S: *Perpen…*

L: *Perpen, perpendicular, right?*

5.3.2.2.2 Linguistic categories

Analysis of the linguistic categories of LRE showed that the great majority of the LREs Luke initiated focused on vocabulary (87.5%), followed by mathematics speak (7.5%), and discourse (5%), as seen in Table 37. Mathematics speak refers to the conventional way of articulating

ideas using language patterns associated with mathematics terms. This includes reading mathematics formulas and enhancement or extension of student-initiated utterance in a more technical way. The students initiated the majority of the LREs focused on vocabulary (66.6%), followed by discourse (33.3%), as shown in Table 38. Neither the lecturer nor the students initiated grammar-focused LREs in any of Luke's classes that were observed.

Table 37 Linguistic categories of T-initiated LREs in Luke's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
T-initiated	Vocabulary	14	12	2	7	35 (87.5%)
	Grammar	0	0	0	0	0
	Discourse	2	0	0	0	2 (5%)
	Mathematics speak	2	0	1	0	3 (7.5%)
		18	12	3	7	40

Table 38 Linguistic categories of S-initiated LREs in Luke's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
S-initiated	Vocabulary	2	0	0	0	2 (66.6%)
	Grammar	0	0	0	0	0
	Discourse	0	0	1	0	1 (33.3%)
	Mathematics speak	0	0	0	0	0
		2	0	1	0	3

Excerpt 5.12 shows a discourse-focused LRE, in which Luke attends to the reference, '*this one'*, in his question. He then immediately asks the class the same question again, this time with a clarification, '*this formula'* seemingly to make the reference clear. In Luke's classes, all the lecturer-initiated, mathematics speak-focused LREs occurred reactively in response to students' poor or erroneous articulation of his idea in mathematics. Excerpt 5.13 illustrates a lecturer-initiated, reactive, mathematics speak-focused LRE. Luke reacts to a student's ill-formed

utterance of the conventionalised way of articulating the proposition, *X is same to 1 pi, 2 pi*, by using recast – *X equals to 1pi and 2 pi* – and then returns to continue his explanation of a mathematics formula.

Excerpt 5.12 (EM1-6, L-initiated, pre-emptive, discourse)

L: So, you see this coefficient. Do you know how *this one* comes up? (.) Anyone? Do you know how *this formula* comes up?

Excerpt 5.13 (EM1-9, L-initiated, reactive, mathematics speak)

L: …so, what's your answer?

S: *X is same to 1 pi, 2 pi…*

L: Yes, that's perfect. *X equals to 1 pi and 2 pi.* So, this is the formula...

In Luke's classes, the students initiated few LREs focusing on vocabulary and discourse. Excerpt 5.14 is a student-initiated, pre-emptive, vocabulary-focused LRE, in which a student directly asks Luke about the meaning of a mathematics term, '*yield'*, while solving a math problem. In Excerpt 5.15, a student-initiated, reactive LRE focusing on discourse, a student reacts to the reference word, *it*, in Luke's question by asking if that word refers to what is written in the textbook, '*this p?*'. Luke then clarifies it – [y]es, how do we call that p?

Excerpt 5.14 (EM1-10, S-initiated, pre-emptive, vocabulary)

S: Professor? *What does 'yield' mean?*

L: *'To give'. To give a result. Like 3 plus 4 yields 7.*

Excerpt 5.15 (EM3-0, S-initiated, reactive, discourse-reference)

L: Wait, how do you call *it*?

S: *This p?*

L: Yes, how do we call *that p*?

5.3.2.2.3 Complexity

Almost all the LREs observed in Luke's classes were simple LREs, which had either one lecturer response to a previous utterance or no lecturer response (e.g., lecturer-initiated, pre-emptive), as shown in Table 39. There was only one complex LRE, which had one lecturer response to silence.

Table 39 Complexity of the LREs in Luke's classes

		Lesson 1	Lesson 2	Lesson 3	Lesson 4	Total
L-initiated	Simple	17	12	3	7	39
	Complex	1	0	0	0	1
		18	12	3	7	40
S-initiated	Simple	2	0	1	0	3
	Complex	0	0	0	0	0
		2	0	1	0	3

In Excerpt 5.17, a lecturer-initiated, reactive, mathematics speak-focused LRE, Luke gives one corrective response to a student's error in using conventionalised way of articulating the proposition in mathematics. Excerpt 5.18 illustrates a complex LRE, in which Luke first pre-emptively attends to a mathematics term, '*orthogonal'* and then responds to the silence by providing its definition.

Excerpt 5.17 (EM1-9, L-initiated, reactive, mathematics speak, simple)

L: … and the answer is?

S: *X is same to 1 pi, 2 pi…*

L: Yes, that's perfect. *X equals to 1 pi and 2 pi*. So, this is the formula.

Excerpt 5.18 (EM1-16, L-initiated, pre-emptive, vocabulary, complex)

L: Again, *what does orthogonal mean?*

(silence)

L: *Orthogonal means?*(.) *It means perpendicular, okay? They are synonyms.*

5.4 Summary

In the University of Seoul, both planned and incidental attention to language was identified in the EMI classes of the two content lecturers, Chen and Luke. In their planned practice, the lecturers did provide their students with language support by adding separate power-point slides or slide notes that contained definitions of technical terms. Both lecturers construed learning the disciplinary register mostly in terms of learning disciplinary uses of vocabulary, and their language support also mostly focused on technical terms. They both believed that dealing with the disciplinary register was integral to their EMI teaching, and they saw a need to help their students "master" disciplinary language during their undergraduate years.

In the to and fro of classroom interaction, both the lecturers and students initiated LREs in both classes. A total of 197 LREs were identified in the university setting; there were more LREs identified in Chen's accounting classes than Luke's mathematics classes. The frequency of occurrence of LREs varied between the classes; LREs occurred far more frequently in Chen's classes (one LRE every 3.12 min) than in Luke's classes (one LRE every 8.3 min). LREs accounted for 3.6% of the total class time in Chen's classes and 1.9% in Luke's classes. In both classes, the lecturers initiated almost all the LREs, and they did so more pre-emptively than reactively (91.1% and 8.9%, respectively). A similar pattern in the linguistic categories of LRE was seen across the two classes, with around 83% of episodes focused on vocabulary. Both lecturers initiated vocabulary-focused LREs the most (84.6%), followed by disciplinary speak (9.1%) and discourse (6.3%). One interesting finding was that there was no grammar-focused LRE identified in any of the classes observed. Lastly, almost all the LREs observed in both classes were simple LREs, in which the lecturers provided only one corrective response to students' linguistic errors or no response. There were few complex LREs observed, and all of them were initiated by the lecturers in response to the silence.

CHAPTER SIX: STUDENTS' LEARNING OF LANGUAGE

This chapter is concerned with the third research question: *Do students learn language from LREs in EMI classes?* It aims to investigate the effectiveness of LREs on students' learning of language items targeted in the LREs in the EMI classes observed. The purpose of the analysis is to determine if LREs are effective for students' learning and whether specific characteristics of LREs (type, linguistic categories, and complexity) are significantly related to students' learning as evidenced by correct responses to the test items. In Section 6.1, data collected in the two settings, the high school and the university, are analysed together to examine students' learning of language in general, followed by Section 6.2, in which data from each setting are compared. In Section 6.3 and 6.4, data from each setting are analysed separately.

6.1 The effectiveness of LREs on language learning

6.1.1 Distribution of tested LREs

A total of 33 LREs identified from the school and university settings were tested; 23 LREs from the school setting and 10 LREs from the university setting, as shown in Table 40. (See Section 3.4 for detailed information for data analysis.)

Table 40 Tested LREs

	Teacher (subject)	Number of tested LREs
Sokuk High School	Kim (Economics)	12
	Glenn (Mathematics)	11
	Total	23
The University of Seoul	Chen (Accounting)	4
	Luke (Mathematics)	6
	Total	10
Total		33

6.1.2 Overall result for learning

Overall, the students appeared to learn the language items targeted in the LREs; 21 out of the 33 test items were responded to correctly (64%) by the students. As has been stated, the test language items were items from student-made linguistic queries or error corrections during class interactions. That the students correctly responded to most of the test items is an important finding because this suggests that learning had occurred in the EMI classes.

6.1.3 Relationship between the characteristics of LRE and students' test item responses

6.1.3.1 Relationship between type and test item responses

The relationship between the type of LRE (teacher-initiated, reactive and student-initiated, pre-emptive) and students' test item responses was analysed. Student-initiated, pre-emptive LREs were found to be more effective for students' learning than teacher-initiated, reactive LREs. Graph 1 shows the percentage of students' correct test item responses for the different types of LRE; 14 out of the 26 test items based on teacher-initiated, reactive LREs were correctly responded to (53.8%), and all the seven test items based on student-initiated, pre-emptive LREs were correctly responded to (100%) by the students.

Graph 1 Percentage of correct test item responses for the type of LRE

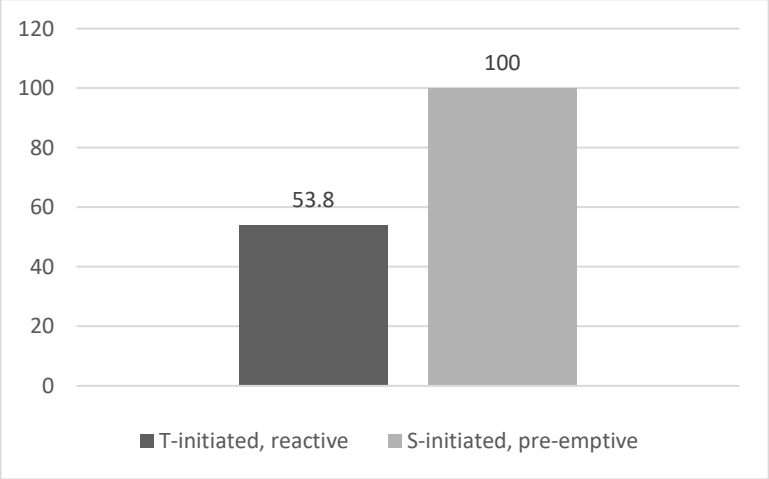


Table 41 shows the results of Fisher's exact test (two-sided) performed on the frequency of students' correct and incorrect test item responses. The test revealed a statistically significant difference between the different types of LRE, p = .032, indicating that correct test item responses occurred significantly more frequently when student-initiated, pre-emptive LRE were tested.

Table 41 Type of LRE and test item responses

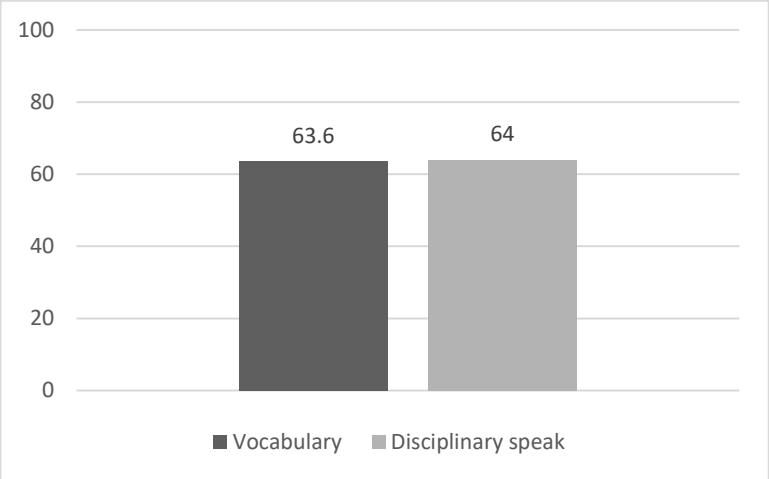
Type	Test score *n* (%)		Fisher's exact *p*
	Correct	Incorrect	
T-initiated, reactive	14 (53.8%)	12 (46.2%)	.032*
S-initiated, pre-emptive	7 (100%)	0	

p <.05

6.1.3.2 Relationship between linguistic categories and test item responses

The relationship between the two most frequent linguistic categories of LRE (vocabulary and disciplinary speak) and students' test item responses were analysed. Overall, fairly similar percentages of correct test item responses were found for both linguistic categories, as seen in Graph 2; 14 out of the 22 test items on vocabulary were responded to correctly (63.6%), and seven out of the 11 test items on disciplinary speak were responded to correctly (64%) by the students.

Graph 2 Percentage of correct test item responses for linguistic categories



Fisher's exact test (two-sided) performed on the frequency of correct and incorrect test item responses for the two linguistic categories of LRE was not significant, $p = 1.00$, as shown in Table 42. This suggests that LREs had a similar effect on students' learning of vocabulary and disciplinary speak.

Table 42 Linguistic categories of LRE and test item responses

Linguistic categories	Test score *n* (%)		Fisher's exact *p*
	Correct	Incorrect	
Vocabulary	14 (63.6%)	8 (36.4%)	1.00
Disciplinary speak	7 (64%)	4 (36%)	

6.1.3.3 Relationship between complexity and test item responses

The relationship between the complexity of LRE and students' test scores was analysed. In this study, complex LRE refers to an episode that has either multiple teacher/lecturer responses to a previous utterance or one teacher/lecturer response to silence. Graph 3 shows the percentage of correct test item responses for simple and complex; 10 out of the 21 test items based on

simple LREs were responded to correctly (47.6%), and 11 out of the 12 test items based on complex LREs were responded to correctly (91.7%) by the students.

Graph 3 Percentage of correct test item responses for complexity

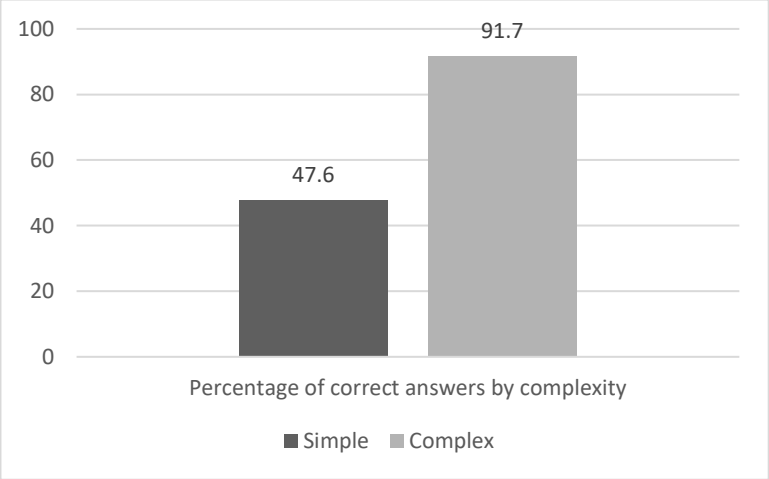


Table 43 shows the results of Fisher's exact test (two-sided) performed on the frequency of correct and incorrect test item responses for the complexity of LRE. The test revealed a statistically significant difference in the frequency of correct and incorrect answers, $p = .022$, indicating that the complexity of LRE significantly relates to students' correct test item responses. That is, complex LRE appeared to have resulted in more correct test item responses than simple LRE.

Table 43 Complexity of LREs and test item responses

Language categories	**Test score *n* (%)**		**Fisher's exact *p***
	Correct	Incorrect	
Simple	10 (47.6%)	11 (52.4%)	.022*
Complex	11 (91.7%)	1 (8.3%)	

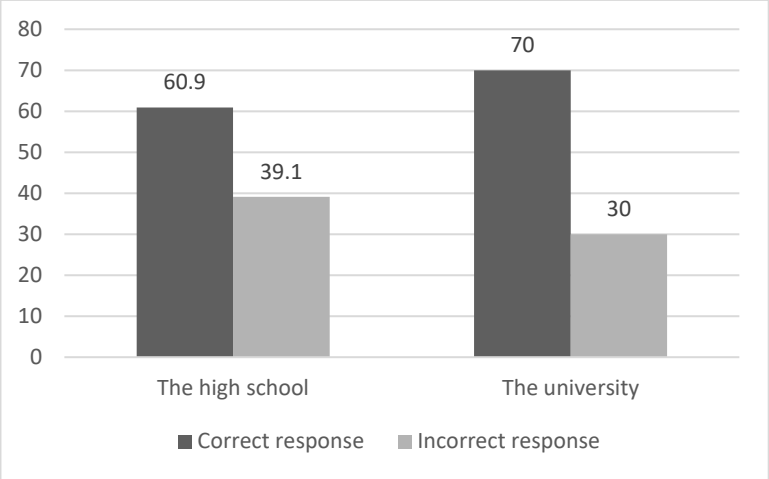
*$p<.05$

6.2 Comparison between the school and university settings

6.2.1 General comparison of students' test item responses between the settings

Students' test item responses were compared between the school and university settings. Given that more than 60% of the test items were responded to correctly by the students in both settings, as shown in Graph 4, it appeared that LREs were effective for students' learning of language in both settings. One difference between the settings was that the percentage of students' correct test item responses in the university setting was slightly higher than in the school settings; the students in the school setting correctly responded to 14 out of 23 test items (60.9%), and those in the university setting correctly responded to seven out of 10 test items (70%).

Graph 4 Distribution of correct and incorrect test item responses in each setting



To test for statistically significant differences between the two settings on the frequency of correct and incorrect test item responses, Fisher's exact test (two-sided) was performed. Again, it should be noted that Fisher's exact test was used due to the small number of incorrect test item responses (n = 3) in the university setting. Despite the different percentages of correct test item responses shown in Graph 9, the test did not show any statistically significant differences between the settings on the frequency of correct test item responses, p = .0710, suggesting that LREs were equally beneficial for students to learn the language items targeted in the LREs

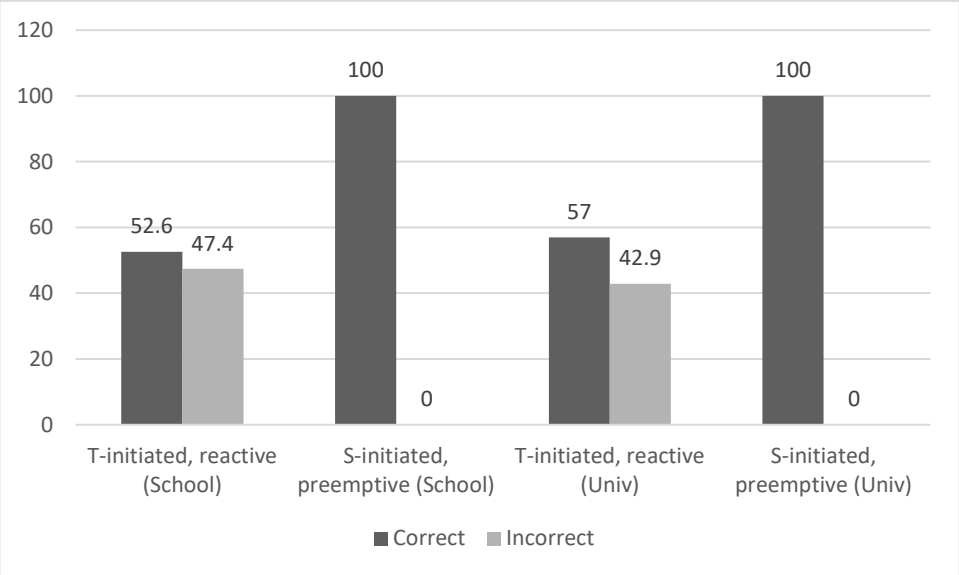
regardless of setting.

6.2.2 Comparison of students' test item responses according to the characteristics of LRE

6.2.2.1 Comparison of test item responses for the type of LRE

Percentage of students' test item responses in each setting were compared for the type of LRE. Graph 5 shows the percentage of students' correct and incorrect test item responses for the different types of LRE in each setting. A similar pattern of students' test item responses for the type of LRE was found in both school and university settings; student-initiated, pre-emptive LRE resulted in more students' correct test item responses than teacher-initiated, reactive LRE did in both settings. Another noticeable similarity between the settings was the fact that the students in both settings correctly responded to all the test items based on student-initiated, pre-emptive LREs.

Graph 5 Test item responses for type of LRE in each setting



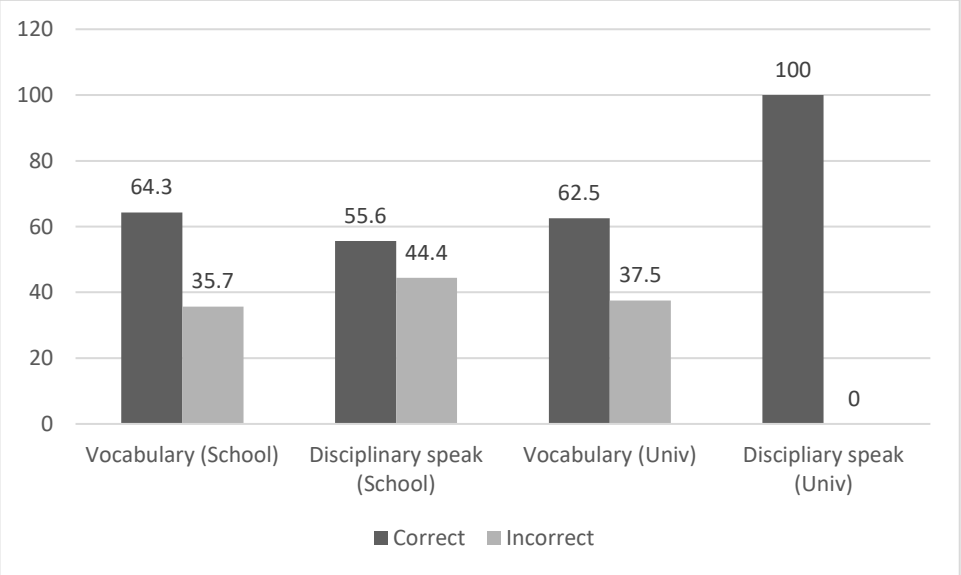
6.2.2.2 Comparison of test item responses for the linguistic category of LRE

Percentage of students' test item responses in each setting were compared for the linguistic

category of LRE. Graph 6 shows the percentage of students' test item responses for the two linguistic categories (vocabulary and disciplinary speak) of LRE. A fairly similar percentage of students' correct test item responses for vocabulary was found in the two settings; the students in the school setting correctly responded to nine out of 14 test items (64.3%), and those in the university setting correctly responded to five out of eight test items (62.5%).

Regarding disciplinary speak, the percentage of correct test item responses in the university setting was far higher than that in the school setting; the students in the school setting correctly responded to five out of nine test items (55.6%), and the students in the university setting correctly responded to all the two test items (100%).

Graph 6 Test item responses for linguistic categories of LRE in each setting

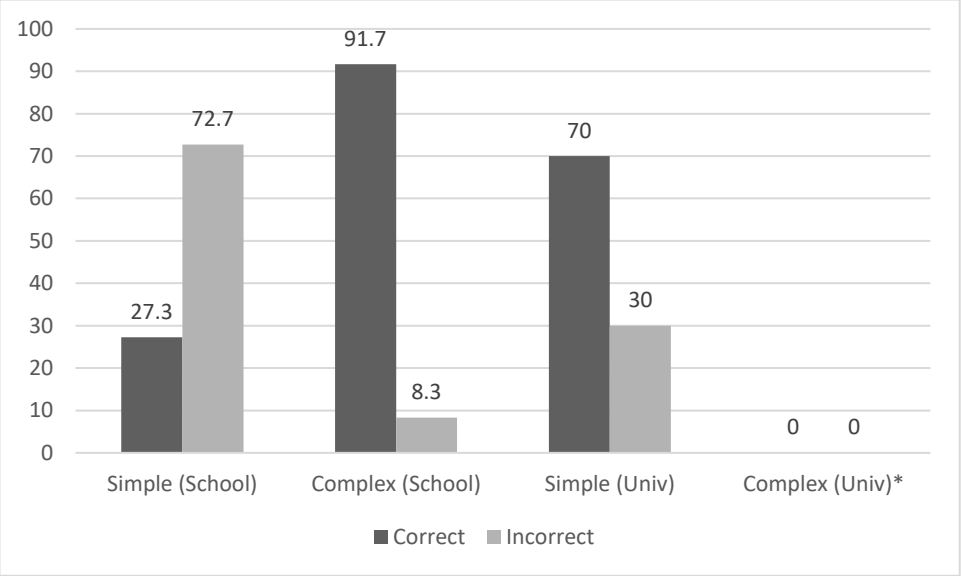


6.2.2.3 Comparison of test item responses for the complexity of LRE

Percentage of students' test item responses in each setting were compared for the complexity of LRE. As has been stated, all the test items in the university setting were based on simple LREs, and thus students' responses to the test items based on complex LRE could not be compared. One noticeable difference was that simple LREs led to more than twice the correct

test item responses in the university setting than in the school setting (70% and 27.3%, respectively), as shown in Graph 7.

Graph 7 Test item responses for the complexity of LRE in each setting



* No complex LREs tested in the University setting

6.3 The effectiveness of LREs on language learning in the school setting

6.3.1 Overall findings in the school setting

In the school setting, the students appeared to learn from the LREs; fourteen out of the 23 test items were responded to correctly (60.9%) by the students. That is, in the test, more than half of the test-participating students could correct linguistic errors that they had made, or they could provide correct words or meanings of words that they had questions about during the LREs. This suggests that LREs appeared to be effective for students' learning of the language items targeted in the LREs in this school setting.

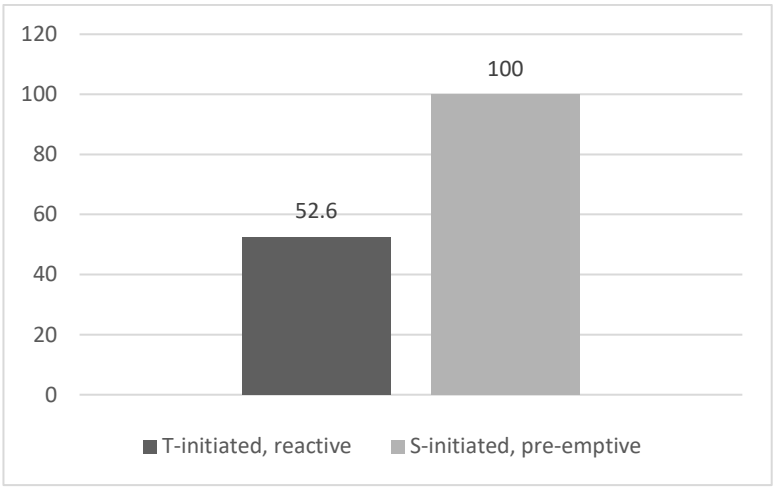
6.3.2 Relationship between the characteristics of LREs and students' test item responses

6.3.2.1 Relationship between type and test item responses

The relationship between the type of LRE (teacher-initiated, reactive and student-initiated, pre-

emptive) and students' test item responses in the school setting was analysed. In this setting, student-initiated, pre-emptive LREs appeared to be more effective for students' learning of the targeted language items than teacher-initiated, reactive LREs. As shown in Graph 8, 10 out of the 19 test items, based on teacher-initiated, reactive LREs, were responded to correctly (52.6%), and all four test items, based on student-initiated, pre-emptive LREs, were responded to correctly (100%) by the students.

Graph 8 Percentage of correct test item responses for Type in SHS



Due to the low cell count for student-initiated, pre-emptive LRE, it was decided to use Fisher's exact test. Table 44 shows the results of Fisher's exact test (two-sided) performed on the frequency of correct and incorrect test item responses. The test did not show any statistically significant differences between the types of LRE, suggesting that the different types of LRE equally affected or did not affect students' correct responses in this school setting.

Table 44 Type of LRE and test item responses in SHS

	Type	Test score *n* (%)		Fisher's exact *p*
		Correct	Incorrect	
SHS	T-initiated, reactive	10 (52.6%)	9 (47.4%)	.127
	S-initiated, pre-emptive	4 (100%)	0	

6.3.2.2 Relationship between linguistic categories and test item responses

The relationship between the two linguistic categories (vocabulary and disciplinary speak) and students' test item responses was analysed. As seen in Graph 9, in the school setting, nine out of the 14 test items based on vocabulary-focused LREs were responded to correctly (64.3%), and five out of the nine test items based on disciplinary speak-focused LREs were responded to correctly (55.6%) by the students.

Graph 9 Percentage of correct test item responses for linguistic categories in SHS

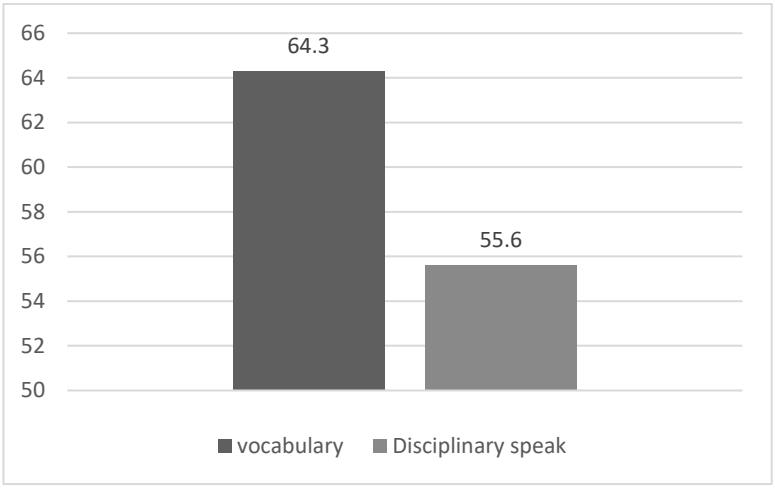


Table 45 shows the results of Fisher's exact test performed on the frequency of correct and incorrect responses for the linguistic categories. The test did not show any statistically significant differences between the linguistic categories, p = 1.00, suggesting that the LREs

equally affected or did not affect the different linguistic categories.

Table 45 Linguistic categories and test item responses in SHS

	Lg. categories	Test score *n* (%)		Fisher's exact *p*
		Correct	Incorrect	
SHS	Vocabulary	9 (64.3%)	5 (35.7%)	1.00
	Disciplinary Speak	5 (55.6%)	4 (44.4%)	

6.3.2.3 Relationship between complexity and test item responses

The relationship between the complexity of LRE and students' test item responses was analysed. In the school setting, complex LREs appeared to be more effective than simple LREs. As shown in Graph 10, three out of the 11 test items based on the simple LREs were responded to correctly (27.3%), and 11 out of the 12 test items based on the complex LREs were responded to correctly (91.7%) by the students.

Graph 10 Percentage of correct test item responses for complexity in SHS

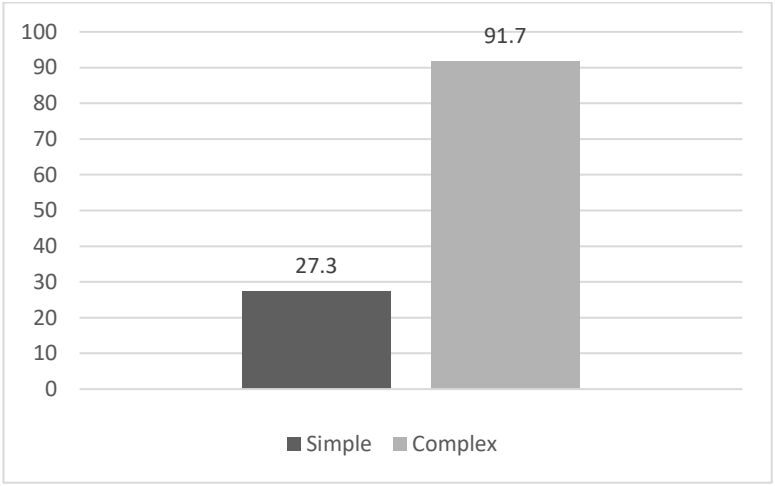


Table 46 shows the relationship between the complexity of LRE and students' test item responses. Fisher's exact test was performed on the frequency of correct and incorrect

responses and revealed a highly statistically significant difference between simple and complex LREs (p = .004) in the school setting, indicating that the complex LREs were significantly more effective for students' learning of the targeted language items than simple LREs.

Table 46 Complexity and test item responses in SHS

	Complexity	Test score *n* (%)		Fisher's exact *p*
		Correct	Incorrect	
SHS	Simple	3 (27.3%)	8 (72.7%)	.003**
	Complex	11 (91.7%)	1 (8.3%)	

**p<.005

6.4 The effectiveness of LREs on language learning in the university setting

6.4.1 Overall findings in the university setting

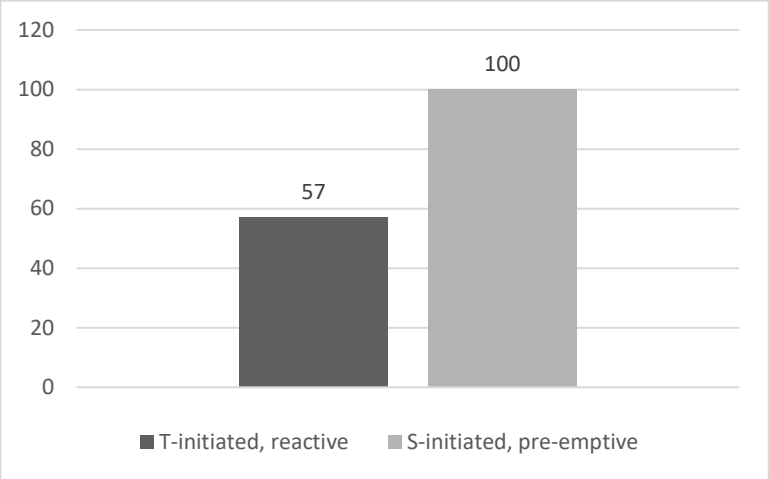
In the university setting, the students appeared to learn from the LREs in general; they answered correctly to seven out of the 10 test items (70%). Namely, most of the test participating students from this setting could correct linguistic errors that they had made or provide correct words or meaning of words, which they had questioned during the LREs. This suggests that LREs appeared to be effective for students' learning of language in this university setting.

6.4.2 Relationship between the characteristics of LRE and students' test item responses

6.4.2.1 Relationship between type and test item responses

The relationship between the type of LRE (teacher-initiated, reactive or student-initiated, pre-emptive) and students' test item responses in the university setting was analysed. As shown in Graph 11, in the university setting, all three test items, based on student-initiated, pre-emptive LREs, were responded to correctly (100%), and four out of the seven test items based on teacher-initiated, reactive LREs were responded to correctly (57%) by the students.

Graph 11 Percentage of correct test item responses for type in the UoS



Due to the low cell count for student-initiated, pre-emptive LREs, Fisher's exact test (two-sided) was used. Table 47 shows the results of Fisher's exact test (two-sided) performed on the frequency of correct and incorrect test item responses. The test showed no statistically significant difference between the two different types (p = .475), suggesting that both teacher-initiated, reactive and student-initiated, pre-emptive LREs were equally effective or ineffective for students' learning of language in this university setting.

Table 47 Type of LRE and test item responses in UoS

	Type	Test score *n* (%)		Fisher's exact *p*
		Correct	Incorrect	
UoS	T-initiated, reactive	4 (57%)	3 (42.9%)	.475
	S-initiated, pre-emptive	3 (100%)	0	

6.4.2.2 Relationship between linguistic categories and test item responses

The relationship between the two linguistic categories (vocabulary and disciplinary speak) that LRE focused on and students' test item responses was analysed. Graph 12 shows the percentage of correct answers for each linguistic category in the university setting; five out of the eight test items based on vocabulary-focused LREs were responded to correctly (62.5%), and all two test items based on disciplinary speak-focused LREs were responded to correctly (100%) by the students.

Graph 12 Percentage of correct test item responses for linguistic categories in the UoS

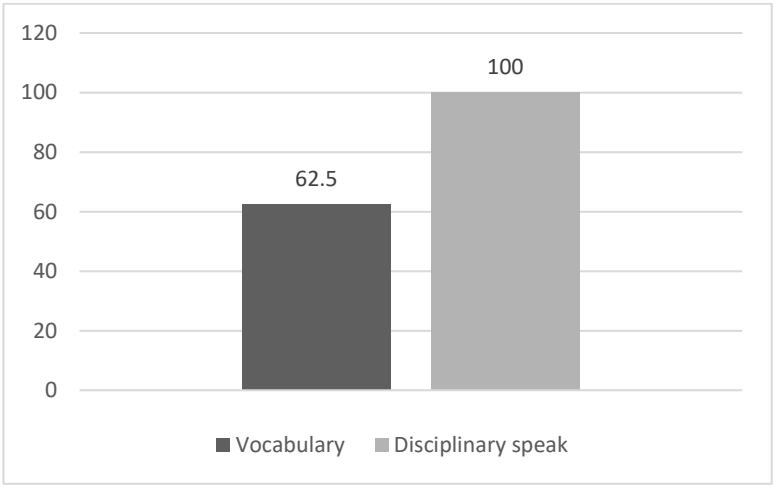


Table 48 shows the results of Fisher's exact test (two-sided) on correct and incorrect test item responses for the linguistic categories. The test did not show any statistically significant differences between the different linguistic categories (p = 1.00), suggesting that the LREs had equally affected or not affected the different linguistic categories in this university setting.

Table 48 Language categories and test item responses in UoS

	Lg. categories	Test score *n* (%)		Fisher's exact *p*
		Correct	Incorrect	
UoS	Vocabulary	5 (62.5%)	3 (37.5%)	1.00
	Disciplinary speak	2 (100%)	0	

6.4.2.3 Relationship between complexity and test item responses

The relationship between the complexity of LRE and students' test item responses was analysed. In the university setting, the complexity of all the tested LREs was simple; seven out of the 10 test items based on the simple LREs were correctly responded to (70%) by the students.

Again, all the test items from the university setting were based on simple LREs. When the variable is a constant, no inferential statistics can be computed (Fisher, 1970). As there was one complexity type of the LREs tested in this setting, it was decided not to perform statistical analysis for complexity and test item responses.

6.5 Summary

The results reported in this chapter suggest that LREs were effective for students' learning of language in the EMI settings. Overall, the students did appear to learn the language items targeted in the LREs; they correctly responded to 21 out of the 33 test items (64%). Two characteristics of LRE, type and complexity, were found to be statistically significantly related to students' correct test item responses. Student-initiated, pre-emptive LREs resulted in more students' correct test item responses than teacher-initiated, reactive LREs (p = .032). Complex LREs resulted in more students' correct test item responses than simple LREs (p = .022).

The data from each setting were compared. The test did not show any statistically significant differences between the two settings based on the frequency of students' correct test item responses, suggesting that LREs were equally effective for the students regardless of the

setting. A similar level of the frequency of correct test item responses for the type of LRE was seen from both settings; student-initiated, pre-emptive LREs resulted in more correct test item responses than teacher-initiated, reactive LREs.

Lastly, the analyses were conducted for each setting. In the school setting, the students correctly responded to 14 out of the 23 test items (60.9%). The test showed a highly statistically significant relationship between the complexity of LRE and students' correct test item responses in this school setting. That is, complex LREs were more effective to lead to students' correct test item responses than simple LREs. In the university setting, the students correctly responded to seven out of the 10 test items (70%). Although univariable analyses found no statistically significant association between the characteristics of LRE and students' test item responses, the descriptive statistics showed that student-initiated, pre-emptive LREs and disciplinary speak-focused LREs resulted in more of students' correct responses to the given test items in this setting.

CHAPTER SEVEN: DISCUSSION

In the introduction to this thesis, it was stated that the major motivation for the research had been the lack of empirical information about how content teachers and lecturers support their students with language and students' learning of the language used in EMI classes in the South Korean context. A recent study in EMI high school settings in South Korea (Hong & Basturkmen, 2020) found that content teachers frequently took time out from the discussions of disciplinary content to attend to language issues that arose incidentally in their teaching; however, it was beyond the scope of the study to investigate content teachers' planned attention to language and also the extent of students' learning of the language items targeted in LREs. The present study has aimed to investigate content teachers' and lecturers' planned attention as well as incidental attention to language and the effectiveness of LREs on students' language learning across a range of disciplines in two different settings – Sokuk High School (SHS) and the University of Seoul (UoS) – in South Korea.

The present chapter discusses the key results of the research in light of the findings and the relevant literature that underpins this study. In Section 7.1, planned and incidental attention to language in the EMI classes is discussed. Section 7.2 discusses the effectiveness of LREs on students' learning of language. The following Section 7.3 compares and discusses the findings between the high school and university settings.

7.1 Attention to language in EMI classes

The literature suggests that learning the language of a discipline is part of learning disciplinary content knowledge (Fang, Schleppegrell, & Cox, 2006). The way content knowledge is constructed through language differs across disciplines, and thus, learning the disciplinary ways of using language can be challenging for students, especially students in EMI settings for whom English is a second language (Airey, 2018; Schleppegrell, 2020; Shanahan & Shanahan, 2017;

Woodward-Kron, 2008). To date, however, there has been limited information about the way content teachers and lecturers support their students with linguistic challenges in the EMI context. This study provides evidence that planned and incidental attention to language does occur in EMI settings. The results of this study indicated that all the content teachers and lecturers did attend to the language to support their students not only when planning or preparing for their teaching but also during their teaching regardless of setting and discipline. These are crucial findings as they show that the content teachers and lecturers in this study appeared to view the language as a constitutive part of their disciplinary content teaching and recognised that the teaching of disciplinary literacy has to be embedded in the disciplinary study, not just as a decontextualised appendage (Fang & Coatoam, 2013; Shanahan & Shanahan, 2017). Moreover, they seemed to have combined two general methods that previous research on disciplinary literacy has suggested for students' disciplinary literacy development: direct teaching of preselected linguistic items and provision of meaningful context (Monroe & Orme, 2002). For example, the teachers' and lecturers' planned language support included preselected vocabulary with definitions, which can be regarded as direct teaching. Also, by initiating LREs, they seemed to offer opportunities for students to negotiate an understanding of disciplinary registers from a meaningful context.

7.1.1 Planned attention to language

Planned attention to language refers to teachers' and lecturers' attention to preselected linguistic items in anticipation of challenges students may encounter during class. Researchers have long argued that planned attention to language is intensive as it includes prior decisions made by teachers to target specific linguistic items (Ellis, 2001; Farrokhi & Chehrazad, 2012). Yet, until recently, EMI research has mostly been focused on incidental attention to language, while planned attention to language has received little attention (e.g., An et al., 2019;

Basturkmen & Shackleford, 2015; McLaughlin & Parkinson, 2018; Hong, 2021; Hong & Basturkmen, 2020). This study confirmed that all four content teachers and lecturers in the EMI context provided at least one type of planned language support to their students; the schoolteachers provided two types of language support, a glossary or wordlist and small word glosses included in the textbook or handouts, and the university lecturers included some power-point slides or slide notes containing definitions of technical terms in the lecture slides. One crucial finding regarding planned attention to language is that it focused solely on disciplinary vocabulary preselected by the teachers and lecturers, suggesting that they may have believed that disciplinary vocabulary learning was the basis for content learning. This will be discussed more with the findings related to language categories of LRE in Section 7.1.2.3.

The reason for providing planned language support can be explained by the way the content teachers and lecturers perceived their roles in relation to their EMI classes. Researchers in the EMI field have long raised questions as to who is responsible for providing linguistic support to students in EMI settings (Airey, 2014; Galloway & Ruegg, 2020; Macaro, 2018). Evidence was found to suggest that all the teachers and lecturers in this study recognised the need for proactive language support for their students because they were relatively new to the discipline. One important role that all shared and described in the interview was to support students' learning of the disciplinary register as well as its associated vocabulary and to develop their students' disciplinary literacy. This finding is in line with Basturkmen (2018), who also found that accounting lecturers in the HE context believed they had an important role to play in students' learning of the accounting register. The teachers and lecturers in this study seemed to be aware of the intrinsic role of language in teaching and learning disciplinary content.

Another explanation would be that the teachers and lecturers both perceived the language they used in the classes as different from the language used outside the classroom. In the interview, they expressed their concerns about the difficulties faced by their students

learning disciplinary ways of using language – the students were not familiar with these ways in a foreign language. Thus, they may have felt the need to guide their students to know such differences prior to content learning, causing them to preselect some disciplinary terms that students might not be familiar with.

One finding worth further discussion regarding planned attention to language is that the teacher's or lecturer's different L1 backgrounds appeared to influence whether or not they attend to students' general English proficiency in relation to their EMI teaching. In interviews, only Kim and Chen, ESL speakers, reported that they considered their students' general English proficiency when planning their teaching, even though they did not have any knowledge about ESL teaching. One explanation can account for their L1 background and experience of taking EMI lectures as ESL students. Kim and Chen appeared to have an instinctive understanding of the potential level of difficulty that their ESL students might have with following their classes taught in English.

7.1.2 Incidental attention to language

7.1.2.1 Occurrence and frequency of LREs

The present study provides confirmatory evidence of LREs in the EMI classes not only in the university setting but in the school setting, which previously has scarcely been studied. In all four EMI classes, language was found to be a "topic worth discussing (Basturkmen & Shackleford, 2015, p. 4)". Like previous studies on LREs in HE contexts (Basturkmen & Shackleford, 2015; Costa, 2012; Hong, 2021) and high school contexts (Hong & Basturkmen, 2020), LREs, the moments in which attention was drawn to the language during the discussion of content, were very common and frequently occurred in the to and fro of classroom interaction. The content teachers and lecturers appeared to use LREs to integrate their attention to language into incidental content teaching practices in subtle and transient ways. Similarly, disciplinary

literacy research argues that students' disciplinary literacy can be developed as students interact with content teachers or academics who are experts in a discipline (Moje, 2015; Shanahan & Shanahan, 2008). By initiating LREs, the teachers and lecturers seemed to modify the information about language items, drew students' attention to language through the realisation of a gap in students' knowledge, and provided corrective responses to students' inaccurate use of the language during classroom interactions. Also, in the EMI classes in this study, students appeared to use LREs arising in teacher-student interactions as opportunities to ask their teachers or lecturers for help with linguistic issues or address a gap that they noticed in their target language input.

Another interesting finding is that there was a difference between the settings regarding the frequency of LRE; LREs occurred more frequently in the school setting (one LRE every 2.19 min) than in the university setting (one LRE every 6.11 min). Also, despite the relatively short class time, a considerably higher proportion of class time was spent on LREs (around 9.5%) in the school setting than in the university settings (around 2.8%). This can be explained by the gap in the linguistic repertoire of students that the schoolteachers anticipated may have been greater than the gap anticipated by the university lecturers. Also, given that the school had a clear aim for EMI, preparing students academically for universities overseas, the schoolteachers may have been held more accountable for their students' learning progress than the university lecturers and thus felt the need to pay more attention to language as often as possible during their teaching to support their students' learning. Both schoolteachers were observed to begin their classes by reviewing disciplinary terms or expressions from the previous lessons, whereas the lecturers in the university setting did not.

Another explanation for the difference in the frequency of LREs between the settings could be that the teachers and lecturers may have had different degrees of expectations regarding students' autonomy of learning. In interviews, both the lecturers mentioned the

importance of students' self-study of technical terms or expressions before coming to classes, which was not mentioned and so may not be assumed by the schoolteachers. Hence, the schoolteachers may have thought that their classes would be the only context where students learn the disciplinary language and thus tried to convey as much linguistic knowledge to students as possible within the given class time.

Findings indicated that in both settings, the proportion of the class time spent on LREs in Social Science classes, Kim's economics and Chen's accounting classes (12.9% and 3.62%, respectively), was more than twice as long as that in Mathematics classes, Glenn's and Luke's mathematics classes (6.1% and 1.9%, respectively). This similar difference in the proportion of the class time spent on LREs between the classes in each setting may be due to the differences in disciplinary areas. This explanation can be supported by reference to research in Social Studies classes (Hong & Basturkmen, 2020) and Science classes (An et al., 2019); LREs accounted for only 3% of the class time in science classes in An et al. (2019), which is considerably less than 6.5% of the class time in economics and politics classes found in Hong and Basturkmen (2020).

7.1.2.2 Type of LREs

It was found that initiator and interactional types of LRE did not differ markedly regarding the teacher's or lecturer's L1 background or settings. The teachers and lecturers initiated nearly all the LREs (a range from 91.5% to 96.4%). The students too initiated LREs in both settings, although they did so much less frequently (a range from 1.9% to 8.4%) than the teachers or lecturers. These findings were not surprising given that many studies on LREs have shown a lower incidence of student-initiated LREs as opposed to teacher-initiated LREs in other EMI contexts (An et al., 2019; Basturkmen & Shackleford, 2015; Costa, 2012; McLaughlin & Shackleford, 2018; Hong, 2021; Hong & Basturkmen, 2020). In general, it is teachers or

lecturers rather than students who lead the class discussion and direct the topics in it. The teachers and lecturers in this study directed attention to language, perhaps because they had greater knowledge about the conventionalised way of using language to deliver disciplinary meanings than their students. It is possible that the teachers and lecturers initiated LREs far more frequently than the students due to the instruction style of the classes in this study; the observed classes were mainly teacher- or lecturer-fronted and did not have many class activities which would have allowed students to practise disciplinary registers. In both settings, the students usually initiated LREs when they directly asked questions about linguistic items while participating into class activities such as group discussion or solving practice exercises. Had students in this study been given more opportunities for productive language use in classes, there would have been more student-initiated LREs.

The results suggest that the teachers and lecturers were aware of the linguistic issues students would have with using and understanding the language of discipline; they initiated LREs more pre-emptively than reactively, reflecting the findings of previous studies (Basturkmen & Shackleford, 2015; McLaughlin & Parkinson, 2018; Hong, 2021; Hong & Basturkmen, 2020). Almost all pre-emptive LREs initiated by teachers or lecturers involved their anticipation of a linguistic gap. This finding may relate to how the teachers and lecturers viewed their roles. During interviews, the teachers and lecturers reported that they were aware of the distinctive nature of the language of their disciplines, they recognised that the register might cause learning challenges, and believed they had a responsibility to proactively support their students' learning of this register.

As these were content classes, not language classes, the teachers and lecturers may perhaps have been less concerned with correcting students' linguistic errors – especially grammar mistakes – than with teaching content or these errors were not seen as important as they did not impede communication. Although there were some occasions where the students

made grammar mistakes, during observations, neither the teachers nor lecturers intervened to correct them. All believed that grammar was general English that was not closely related to content learning, and thus dealing with grammar was ESL teachers' responsibility, not theirs.

It is also possible that the teachers and lecturers may have thought that attending to students' linguistic errors would impede the flow of the class or demotivate students to learn. The low frequency of reactive LREs can be explained by the finding from Glenn's mathematics class. When comparing the results from each class, reactive LREs occurred more than twice as often as pre-emptive LREs in Glenn's class, a finding which stood in contrast to observations of teaching in the other classes. Glenn was observed to give at least two to three mathematics questions that students had to solve in every lesson. The reactive LREs were usually initiated by Glenn to attend to the students' incorrect use of conventionalised ways of expressing mathematical symbols or formulas during class activities. If there were more class activities in the other classes, there would have been more reactive LREs initiated by the teacher or lecturers to attend to students' linguistic errors. He may have instinctively felt the need to correct students' linguistic errors during his teaching more than the other teacher and lecturers who did not have such experience.

7.1.2.3 Linguistic focus of LREs

In terms of linguistic categories of incidental attention to language, the results showed that across all disciplines, incidental attention to language in these EMI settings was focused mainly on disciplinary vocabulary and disciplinary speak. In general, the majority of the LREs in both the school and the university settings focused on vocabulary (67.2% and 85% respectively), corroborating the findings of studies on LREs not only in EMI settings (An et al., 2019; Costa, 2012; Basturkmen & Shackleford, 2015; Hong & Basturkmen, 2020) but also in ESL classes (Loewen, 2002) that vocabulary-focused LREs accounted for the largest percentage of the total

LREs in their data. Given that all the planned language support in both settings was also focused on vocabulary, the teachers and lecturers in this study appeared to construe learning of disciplinary register primarily as learning of disciplinary vocabulary.

That vocabulary received the most attention may have been because the teachers and lecturers thought that disciplinary vocabulary was at the core of disciplinary literacy. In interviews, all reported their beliefs that students who were new to a discipline should first acquire disciplinary vocabulary to succeed in their studies, reflecting the claim that disciplinary vocabulary acquisition is a major contributor to comprehension in most disciplinary areas as well as a predictor for success in their studies (Riccomini et al., 2015; van der Walt, 2009). Moreover, the teachers and lecturers may have thought vocabulary would be a good starting point for students, who used English as L2, to be introduced to a new disciplinary way of using language; had they were taught through their L1, the teachers or lecturers may have drawn more attention to other linguistic categories. One final explanation for the large amount of incidental attention given to vocabulary could be because the teachers and lecturers thought that provision of planned language support alone would not guarantee students' successful vocabulary acquisition as well as an adequate understanding of new content knowledge. The schoolteachers were observed to begin their classes by reviewing the disciplinary terms that were taught in the previous lessons.

Disciplinary speak received the second-most attention in both the school and the university settings (24.8% and 8.1%, respectively). In this study, disciplinary speak-focused LREs occurred mostly when the teachers and lecturers highlighted, modelled, or demonstrated conventional ways of expressing propositional ideas or thoughts in their disciplines. In this way, they appeared to be acculturating their students into their disciplinary discourse community. This result supports the hypothesis that EMI can provide the opportunity for ESL students to acquire disciplinary content as well as the ways of using language that is meaningful to a

discipline (Airey & Larsson, 2018; Fang et al., 2006).

Another noticeable finding regarding disciplinary speak is that the frequency of disciplinary speak found in Glenn's mathematics class (46.2%) was considerably higher than the frequencies found in the other classes (a range from 7.5% to 13.7%). The literature on mathematics education recognises the potential of students to learn how to articulate mathematical ideas in school settings (Ofsted, 2006). Yet, limited information has been available regarding how mathematics teachers approach this task in EMI settings. This study provides empirical evidence for understanding how the mathematics schoolteacher in an EMI setting helped students with conventionalised ways of expressing ideas in mathematics during his teaching. The finding can be explained with what Glenn reported in the interview. He explained that it is crucial to explicitly and repeatedly teach conventionalised expressions of mathematical formulas regardless of students' L1 background. Also, he was aware of his frequent intervention to help students with reading aloud mathematics formulas correctly during his teaching. Moreover, given that Luke, the mathematics lecturer, did not focus on mathematics speak as much as Glenn did, nor did he mention teaching it in the interview, the educational level seemed to affect the degree to which teachers or lecturers perceive the importance of teaching mathematics speak. Perhaps, Glenn believed that students should be fully familiar with and learn the conventionalised way of using language in mathematics in school before the transition to HE. In particular, since his students were preparing for college entrance exams in English speaking countries, he may have paid more attention to disciplinary speak to help students use it correctly. Likewise, Luke, the mathematics lecturer, may have expected that his students would have already mastered the disciplinary way of using language in mathematics in school.

By contrast, the results indicated that the teachers and lecturers did not construe grammar and discourse as part of the language of the discipline. There were relatively few

discourse-focused LREs and grammar-focused LREs in both settings; around 5% of the LREs in both settings were focused on discourse, similar to 6% in a HE setting reported by Basturkmen and Shackleford (2015). Grammar received the least or no attention in both settings, a finding consistent with previous studies of LREs in school (An et al., 2019; Hong & Basturkmen, 2020) and HE (Basturkmen & Shackleford, 2015; Costa, 2012) settings. These findings could be attributed to the teachers' and lecturers' understanding of the language used in their EMI classes. In interviews, while the teachers and lecturers reported that they thought vocabulary and disciplinary speak are the linguistic features closely related to content learning, they perceived grammar as general English to be taught by ESL teachers. Moreover, Kim and Chen, who were ESL speakers, reported that they were not confident about correcting students' grammar mistakes both in writing and spoken production as they did not have any knowledge about language teaching. Yet, their perception of grammar is in contrast with the claim that grammatical and discoursal features are also disciplinary registers and that students need to learn the way of using grammar, which varies from discipline to discipline (Fang et al., 2006; Schleppegrell, 2002). As these were content teachers and lecturers, it is unlikely that they would have been aware of the importance of other components of language competence, including discourse competence or grammar. Moreover, the professional programme that the schoolteachers received did not deal with various components of language competence. Had the professional programme included any information about how a stretch of discourse cohesiveness and coherence can facilitate students' learning in EMI classes, the teachers possibly would have attended to discourse more.

Another possible explanation may reside in the lack of opportunities for students to produce stretches of languages in written or spoken production. For example, in the school setting, the students did not have any written assignments in their classes, and the university students were given only one or two short written assignments. Schleppegrell's (2002) suggests

that students need support in drawing on appropriate grammatical and discoursal elements as they use the language of discipline as students' infelicitous grammatical choices would present an inappropriate stance or make writing that lacks cohesion or fails to represent meanings intended. If the students were required to do more writing or oral presentations in their disciplines, the teachers and lecturers probably would have intervened to highlight or correct discoursal features as well as grammar.

7.1.2.4 Complexity of LREs

The results suggest that the content teachers and lecturers did not spend much time on language during their teaching. The complexity of nearly all the LREs found in this study was simple (96.1%). The only study that has investigated the complexity of LRE is Loewen (2002), although it examined the ESL context. In contrast with the results of this study, the results of Loewen indicated that LREs were almost evenly distributed in simple and complex (53.5% and 46.5%, respectively) in communicative ESL classes. Given that these were content classes, the relatively low frequency of complex LREs found in this study is not surprising. The content teachers and lecturers in this study may not have wanted to spend too much of class time dealing with language issues during their teaching, reflecting the findings of McLaughlin and Parkinson (2018) that all tutors in their study avoided spending too much time on language in carpentry classes. This interpretation can be supported by the reason for providing planned language support, as reported in interviews, that the teachers and lecturers in this study used language support in order to secure enough class time for content teaching. It is also possible that they may have felt that taking multiple responses to deal with language would be disruptive of the flow of the discussion of disciplinary content.

7.2 Students' learning of language in EMI classes

Another important finding of this study was that students' learning of language occurred in all four EMI classes. The analysis of the written test results showed that the students were able to respond correctly to 64% of the test items. To date, little information about students' learning of language items that are taught in EMI classes has been available even though the literature has claimed that EMI is effective for students' simultaneous learning of content and language (Macaro, 2018; Rose et al., 2020). To the best of my knowledge, this study is the first to investigate students' learning of linguistic items that were explicitly focused on during the course of classroom interaction in EMI classes. The findings of this study provide confirmatory evidence that students can acquire the language items targeted in the LREs arising in EMI classes. These findings of this study support the claim of the Interaction Hypothesis that conversational interaction between learners and fluent speakers is one crucial factor for learners' language acquisition and that input that is modified by teachers during class interaction is beneficial for students' language acquisition as the modifications are individualised for each student and delivered at the moment when such modifications are needed (Gass & Mackey, 2006; Kartchava, 2018; Long, 1996). LREs arising in the course of classroom interactions are generally considered to be beneficial for learners' L2 acquisition (Doughty, 2001, 2003; Ellis, 2001; Norris & Ortega, 2000; Williams, 2001).

A statistically significant difference was found for the type of LRE ($p = .032$). Student-initiated, pre-emptive LREs (100%) resulted in more students' correct test item responses than teacher-initiated, reactive LREs (53.8%) across all the four EMI classes even though the former occurred far less frequently than the latter. That is, the students acquired more linguistic items targeted in the student-initiated LREs, which involved their attempts to initiate explicit attention to the items, than the items targeted in the teacher-initiated LREs that contained the teachers' or lecturers' attempts to respond to students' linguistic errors. This is an important

finding that may run counter to the teachers' and lecturers' beliefs reported in interviews that they should take pre-emptive action to reduce potential linguistic challenges before students face the challenges and raise questions. The finding suggests that in order for students to learn disciplinary register better, their noticing is crucial, supporting SLA researchers' claim that teachers' and lecturers' external attention to a linguistic item does not necessarily reflect actual gaps in students' knowledge of the language or match students' internal attention to the item (Ellis et al., 2001; Schmidt, 2001, 2012) and that students are more likely to learn linguistic items that they proactively seek to understand (William, 2001). The student-initiated LREs can be seen as instances when students notice gaps in their knowledge about linguistic items and as their attempts to address the perceived gaps.

Another statistically significant difference was found for the complexity of LRE (p =.022). The results indicated that complex LREs (91.7%) resulted in more students' correct test item responses than simple LREs (47.6%), suggesting that complex LREs appeared to be more beneficial for students' acquisition of the linguistic items. It should also be noted that in the interviews, the teachers and lecturers reported that they did not want to spend too much time on language. However, the findings suggest that the more the teachers or lecturers made responses to students' previous utterances (linguistic errors), the better the students learned the targeted linguistic items. Complexity is an important characteristic as it is related to the level of explicitness of LRE as well as the degree to which students notice the linguistic items targeted in LREs. In other words, in complex LRE, teachers or lecturers take multiple turns to clarify what is being targeted and induce students to recognise the targeted linguistic items. Given that complex LREs occurred far less frequently than simple LREs in both settings, this is a noteworthy finding that suggests it would be the quality rather than the frequency or amount of LRE that plays a decisive role in students' successful learning of the linguistic items in EMI contexts. In all the complex LREs used in the test described in Chapter 6, the teachers had

initially endeavoured to elicit linguistic information rather than provide linguistic information directly and immediately. Thus, for EMI students, mere attention to language did not appear to be enough despite the high frequency of the simple LREs; even with the relatively low frequency, complex LREs, which consists of in-depth attention to the language, can be more effective for students' learning than simple LREs. Content teachers or lecturers may need to scaffold students' language learning by allowing them enough time to notice what is being attended to or the gaps in their knowledge.

Interestingly, that complex LREs resulted in a higher rate of correct test item responses than simple LREs in this study contrasts with the findings of Loewen (2002), who found that simple and complex LREs were equally beneficial for students' learning of L2 in ESL classes (46.2% and 50.5% respectively). This difference can be explained with the focus of the classes in this study. As these were content classes with the focus on learning disciplinary content, it is unlikely that the students in this study were primed to notice the gap between their knowledge about linguistic items and the teachers' responses and recognised the need to accept the teachers' instantaneous corrective responses on their language mistakes, unless the teachers took multiple turns to elicit responses from them.

Even though the percentage of correct test item responses for simple LREs seemed relatively low, it should be noted that the targeted language items were addressed incidentally during the content subject classes. One noticeable and encouraging finding is that simple LREs were effective for students' learning of the linguistic items despite the transient nature of simple LREs. That is, even simple LREs that arose very briefly on language items seemed to be effective for students' learning of the items.

7.3 Comparison of findings between the settings

7.3.1 Anticipated function of planned language support

The anticipated function of planned language support was different between the school and university settings. The schoolteachers used planned language support to promote students' class participation. In interviews, the schoolteachers reported that they believed it was the distinct nature of the language used in classes, rather than students' English proficiency, that hindered the students' active class engagement. Many EMI researchers suggest that content teachers or lecturers should make an effort to encourage students to participate in class more actively in order to understand students' progress more clearly (Chuang, 2015; Macaro et al., 2019). Also, researchers argue that productive skills (writing and speaking) are as crucial as receptive skills (reading and listening) and should not be neglected in the development of disciplinary literacy (Fang & Coatoam, 2013; Shanahan & Shanahan, 2012). This finding shows that planned language support can be a practical strategy for content teachers or lecturers who endeavour to encourage students to engage in class in EMI contexts.

On the other hand, the university lecturers were found to use language support mainly to highlight some essential disciplinary terms. This is evidenced in the lecturers' responses in their interviews that they thought they needed to focus on some important disciplinary terms, a finding that supports Chung and Nation's (2003) suggestion that teachers need to help students to gain the skills of identifying and recognising disciplinary vocabulary.

7.3.2 Frequency of complex LREs

When comparing the results from each setting, a difference in the frequency of complex LREs was found between the settings. Although class time was shorter in the school setting than in the university setting, the schoolteachers appeared to initiate complex LREs far more frequently (9.3%) than the university lecturers (1%). In the school setting, complex LREs usually occurred

when the teachers elicited information about language items from the students. On the other hand, in the university setting, complex LREs only occurred in response to silence. A possible explanation relates to the content of the professional programme provided at SHS. The programme included information about teaching methods of elicitation (See Chapter Four, Section 4.1), and it is likely that the schoolteachers learned the importance of elicitation from the programme. This finding could also be explained with reference to the different expectations that the teachers and lecturers had about students' linguistic repertoire. The gaps in students' linguistic repertoire that the schoolteachers expected would have been larger than that the lecturers anticipated. Thus, the schoolteachers may have felt more need to scaffold their students' learning of disciplinary registers and making language input more comprehensible for their students by taking more time (turns).

7.3.3 The effects of simple LREs on students' language learning

When comparing the students' test item responses for simple LREs between the settings, simple LREs appeared to result in more students' correct test item responses in the university setting than in the school setting; the percentage of correct test item responses for simple LRE was higher in the university setting than in the school setting (70% and 47.6%, respectively). This finding can be explained by students' motivation for disciplinary language acquisition. It has been argued that motivated learners may learn better than unmotivated learners as they pay more attention to information (Gardner, 1988; Schmidt, 2012). Schmidt (2012) claims that attention to language results in more noticing, and motivated learners may achieve enhanced learning as they endeavour to comprehend the information about the noticed language. As the university students in this study committed to the discipline they had chosen, it is likely that they were more motivated to learn new disciplinary linguistic items than the school students who studied various disciplinary subjects.

7.4 Summary

This chapter has discussed the findings from the previous chapters. The content teachers and lecturers in this study perceived that dealing with the language was a part of their EMI teaching. All were aware of the intrinsic role of the language in teaching and learning disciplinary content and attended to the language when planning as well as teaching. Both planned language support and incidental LREs focused mostly on vocabulary, suggesting that the teachers and lecturers construed disciplinary register acquisition largely as the learning of disciplinary vocabulary. Moreover, they seemed to believe that disciplinary vocabulary acquisition is the basis of students' disciplinary literacy development.

That the teachers and lecturers initiated LREs far more frequently than their students and that they did so mostly pre-emptively rather than reactively can perhaps be because they felt the need for proactive intervention to minimise any linguistic challenges that the students would encounter. The LREs focused mostly on vocabulary and disciplinary speak regardless of the setting and discipline. This suggests that the teachers and lecturers perceived that those linguistic categories were closely related to their disciplines. However, they thought discourse and grammar were related to general English and were to be taught by ESL teachers; thus, they paid relatively little attention to these linguistic categories.

This chapter has also discussed the effects of LREs on students' language learning in the EMI classes observed. This study confirmed that students' language learning occurred in both EMI settings by providing evidence that the students learned the linguistic items targeted in the LREs arising in the to and fro of class interaction in all four EMI classes. That student-initiated, pre-emptive LREs were more beneficial for students' learning of targeted linguistic items than teacher-initiated, reactive LREs suggests that students' noticing of a gap in their knowledge is crucial for language learning in EMI contexts and that teachers' or lecturers' reactive attention to students' linguistic errors does not always reflect actual gaps in students'

knowledge. Also, the students in this study learned the linguistic items better when they were encouraged to elicit the information than when they were immediately given the information by their teachers or lecturers. Altogether, the findings suggest that it is crucial that students are given enough time to recognise the target linguistic items and notice the gap in their knowledge for successful and effective acquisition of disciplinary language – especially in EMI classes. Yet, this does not necessarily mean that teacher-initiated, reactive LREs and simple LREs were not beneficial, at least for the university students. In light of this discussion, Chapter 8 presents the final conclusions and implications of this study.

CHAPTER EIGHT: SUMMARY AND CONCLUSION

This chapter begins with a summary of the results in Section 8.1. General conclusions drawn from the findings are presented in Section 8.2. In Section 8.3, the findings are considered in terms of their theoretical and practical application. The following Section 8.3 considers some of the limitations of this study, and finally, Section 8.4 draws some conclusions.

8.1 Results Summary

8.1.1 Types of and reason for planned attention to language

In response to Research Question 1, '*What is the planned attention to language in two EMI settings in South Korea?'*, the types and the content teachers' and lecturers' reasons for planned attention to language in Sokuk High School (SHS) and the University of Seoul (UoS) were examined. The findings revealed that all the teachers and lecturers in this study provided their students with language support in their planned practice. The type of planned language support provided in each setting was different. The schoolteachers provided students with a glossary or wordlist and small glosses included in the handouts used in classes. The lecturers also provided language support in the form of power-point slides or slide notes containing disciplinary vocabulary. All the planned language support identified in this study focused mainly on disciplinary vocabulary; the content teachers and lecturers appeared to regard disciplinary language learning as disciplinary vocabulary learning regardless of disciplinary area.

The interview data indicated that the content teachers and lecturers appeared to think supporting students with disciplinary language was integral to their EMI teaching. All were aware that disciplinary language would pose challenges for students' learning and felt responsible for helping their students overcome such linguistic challenges. In addition, Kim and Chen, ESL speakers, were found to take students' general English proficiency into consideration while planning their teaching.

8.1.2 Occurrence of Language-related episodes (LREs)

In response to Research Question 2, '*What is the frequency and nature of Language Related Episodes (LREs) in disciplinary classes in these settings?'*, the study examined the extent to which LREs occur and their characteristics in the EMI classes. LREs were found to occur with 430 episodes in around 21 hours of recordings of the four EMI classes. The frequency rate of LREs differed between the settings. In the school setting, there were 233 episodes with a rate of one LRE every 2.19 min, and LREs accounted for around 9.5% of the total class time. In the university setting, there were 197 episodes with a rate of one LRE every 6.11 min, and LREs accounted for around 2.8% of the total class time.

Results revealed that a vast majority of the LREs were initiated by the teachers and lecturers (94% and 96%, respectively) in both settings. Overall, pre-emptive LREs occurred more than four times more frequently than reactive LREs, in response to a problematic utterance or because a participant failed to comprehend something another had said (85.4% and 14.6%, respectively). However, one contrasting finding was seen in Glenn's mathematics class in the school setting, in which reactive LREs occurred more than twice as frequently than pre-emptive LREs (70.4% and 29.6%, respectively).

In general, the LREs focused mostly on vocabulary (76.1%), followed by disciplinary speak (16.5%), and discourse (5.7%). Grammar received the least attention. More precisely, while there were few grammar-focused LREs found in the school setting (3.8%), there was no attention given to grammar in the university setting. In terms of the complexity of LRE, simple LREs occurred far more frequently than complex LREs (96.1% and 3.9%, respectively) in both settings. In the school setting, complex LREs occurred when the teachers tried to elicit linguistic information from their students, whereas in the university setting, they occurred when the lecturers responded to silence.

8.1.3 Effectiveness of LREs on students' learning of language

In response to Research Question 3, '*Do students learn linguistic items targeted in LREs in these settings?'*, the ability of students who were responsible for the LREs tested to acquire and recall correct information about the linguistic items targeted in the LREs was examined. A total of 33 LREs were tested. The written disciplinary language tests results revealed that LREs had some effects on students' learning of the targeted language items in both EMI settings. Overall, the students responded correctly to 64% of the test items. Fisher's exact test, which analysed the relationship between the characteristics of LRE and students' test item responses, indicated that two categories of LRE, type and complexity, were statistically significantly related to student' correct test item responses. In both settings, student-initiated, pre-emptive LREs resulted in more correct test item responses than teacher-initiated, reactive LREs. This means that the students were more likely to learn the linguistic items in the LREs that they initiated than the LREs the teachers or lecturers initiated. Also, complex LREs resulted in more correct test item responses than simple LREs, indicating that LREs, involving multiple teacher- or lecturer-responses to a previous utterance were more effective for students' learning of language items targeted than LREs with one teacher response.

8.2 Conclusion

A number of general conclusions can be drawn from the findings of the study.

1. Teaching disciplinary English is a key role of content teachers and lecturers to play in EMI. Dealing with language can be a more crucial responsibility for content teachers or lecturers when teaching their subjects through English than when teaching in students' L1. Findings showed that although the focus of the EMI classes was content knowledge, the content teachers and lecturers perceived supporting students with language was an

integral part of EMI teaching. Also, they attended to the language in their planned practices to facilitate students' learning of content and disciplinary language.

2. EMI classes in both school and university settings can include LREs that are incidental and transient. Findings indicate that language often became the topic of discussion during classroom interaction in all the EMI classes observed. Brief shifts of attention from content to language were frequent and common during the classroom interaction, and attention to language appeared to be a usual feature of the content teachers' and lecturers' instruction. The teachers and lecturers were able to integrate a focus on language smoothly into the discussion of content through occasional LREs.
3. LRE can be effective for students' learning of disciplinary English in EMI classes in both school and university settings. There has been a controversy as to the effects of EMI on students' simultaneous learning of content and English, especially in the South Korean context (Cho, 2012; Choi, 2015). The fact that this study provides evidence of the effects of LRE on students' language learning in both the school and university settings is an encouraging result for EMI stakeholders, including content teachers and students.

8.3 Theoretical implications

In general, the teachers, lecturers, and students in this study seemed to be doing what SLA theorists claim is necessary to foster students' language acquisition. The findings of this study have a crucial theoretical implication in relation to Long's Interaction Hypothesis (1991, 1996), which argues that interaction between language learners and fluent speakers (e.g., teachers or lecturers) is a crucial and effective site for language acquisition. Also, this study confirmed the existence of integration of incidental focus on form (a type of LRE) in meaning-focused lessons, which SLA theorists have long called for (Ellis, 2001), in the content classes observed.

Although the focus of the observed classes was content teaching, the content teachers and lecturers in this study appeared to be aware that planned language support alone did not guarantee students' acquisition of disciplinary language in their L2 and thus initiated LREs to support students with the language issues during classroom interaction. The students also initiated LREs to address linguistic gaps in their knowledge. These results lend support to Doughty's (2001) claim that the benefit of LREs arising within classroom interaction is that it addresses students' linguistic needs at the moment students encounter linguistic challenges. In the EMI classes in this study, LRE seemed to be used as a means to deal with linguistic issues in the course of classroom interaction despite its transient nature.

The current study also adds to our understanding of the effects of LRE on students' language acquisition in EMI contexts by examining students' learning of linguistic items targeted in the LREs. Until recently, the focus of previous research on the effects of EMI has been limited to general English proficiency measured by students' official English exam results, not the language of discipline attended to in EMI classes. This study provides confirmatory evidence that LREs did have effects on students' learning of language in EMI classes in both school and university settings. This finding supports the Interaction Hypothesis (Long, 1996) that LRE facilitates students' language acquisition as it links input, internal student abilities, selective attention, and output.

The results of this study support the Noticing Hypothesis (Schmidt, 1990; 2001) in that only the input that the learner is consciously aware of is a precursor to the learning. In this study, the students were more likely to learn the linguistic items in student-initiated, pre-emptive LREs than in teacher-initiated, reactive LREs. Williams (2001) argues that "learner initiative may make input more likely to be retained than if the teacher simply presented the same information without prompting from the learner" (p. 327). It seems that the students needed to realise linguistic gaps in their knowledge and address the gaps at the moment they

arise by initiating an LRE.

Another theoretical implication of this study relates to the Output Hypothesis (Swain, 1995, 1998, 2000). Output helps learners develop linguistic fluency and accuracy by raising their consciousness to notice linguistic items. The findings of this study showed that complex LREs were more beneficial for students' learning of the targeted linguistic items than simple LREs. Most of the complex LREs in this study involved elicitation of students' responses. These findings correspond with Lyster's (2001) claim that elicitation is a more powerful way to prompt students to produce linguistic items themselves than providing information directly.

8.4 Practical applications

Findings from this study may have several applications in practice in EMI. The study has aimed to examine planned and incidental attention to language and the effects of incidental attention to language on students' language acquisition in two distinctive EMI settings. In this section, suggestions are made whereby the information provided in the study can be reflected in the teaching and learning of disciplinary language in EMI contexts.

8.4.1 Collaboration between content teachers and ESL/EAP teachers

One practical suggestion that the results of this study would provide is a collaboration between EMI teachers or lecturers and ESL/EAP specialists. The content teachers and lecturers in this study perceived that supporting students' learning of disciplinary language was part of their EMI teaching. Yet, to date, not much attention has been given to practical teaching support for EMI teachers and lecturers in the South Korean context. Neither setting in this study had practical suggestions or guidelines for how their content teachers and lecturers could integrate a focus on language within their EMI teaching. Although SHS provided an EMI professional programme for Korean L1 content teachers (see Chapter Four, Section 4.1), it was limited to

developing Korean L1 teachers' general English skills in delivering instruction in a foreign language. Moreover, the programme was outsourced to an external organisation that specialised in ESL teacher training. Thus, it was unlikely that the programme served the actual needs of content teachers at SHS. EMI teachers should not be expected to take full responsibility for students' disciplinary language development. Therefore, I would suggest that EMI teachers or lecturers collaborate with ESL/EAP teaching colleagues who may have an understanding of the context.

Such collaboration could take place when planning EMI classes. At the beginning of the year, ESL/EAP teachers can provide EMI teachers with information about students' English subject grades, enabling them to adjust the level of English used for teaching materials to the level of students' English proficiency to deliver their content classes more systematically. Also, by planning EMI classes together, ESL/EAP teachers can help EMI teachers become more aware of the role of language in their EMI classes. They may share their knowledge about interactive pedagogy methods with EMI teachers and suggest ways EMI teachers could extend their teaching methods to highlight disciplinary language or deal with language issues effectively.

EMI teachers could explore their teaching practices with ESL/EAP teachers. Drawing on the methods of this study, EMI teachers could record their teaching and identify LREs in classroom interactions in collaboration with ESL/EAP teachers. Using the LRE excerpts, ESL/EAP teachers could help EMI teachers reflect on integrating the focus of language within content teaching as well as the kinds of linguistic challenges that students encounter in EMI classes. On invitation, ESL/EAP teachers could observe EMI classes to understand what happens in the class and learn more about content and disciplinary language. Likewise, EMI teachers could observe ESL/EAP classes to understand how language is used to convey information and language teaching strategies used in the classes. Observing each other's classes,

including teaching practices, would enable EMI teachers and ESL/EAP teachers to exchange their ideas about integrating content or language in their classes. They could also work together to develop discipline-specific English language support programmes for students.

8.4.2 Opportunity for students to practice disciplinary language

Finding that student-initiated LREs resulted in more students' correct test item responses than teacher-initiated LREs suggests that EMI teachers should endeavour to shift their instruction styles from teacher-fronted to student-centred and encourage students to attend to the language during classes more actively. One way to encourage students to initiate LREs during classes could be by providing a wealth of opportunities, such as classroom activities or tasks, in which students produce stretches of language in written or spoken production. By practising the disciplinary language, students themselves could perceive gaps in their knowledge that their teachers would not notice and address those gaps on their own by initiating LREs. Also, I would suggest that EMI teachers consider the kinds of linguistic challenges their students encounter when developing classroom activities or designing assignments; they can identify which linguistic categories or items student-initiated LREs to focus on in their classes.

Another pedagogic suggestion would be to extend EMI class time, especially in schools. In this study, the content teachers and lecturers appeared to spend the majority of class time on delivering content and left little time for class activities. The class time for the observed classes, especially in the school setting, seemed insufficient to effectively deal with content as well as language. Also, all the teachers and lecturers were reluctant to spend much class time on language due to the short class time. However, the findings suggested that complex LRE was more beneficial for students' disciplinary English learning than simple LRE. Thus, for more opportunities to develop students' disciplinary English, EMI classes may need longer class times than content classes taught through students' L1.

Finally, EMI classes should have explicit disciplinary language learning objectives, which may help students become aware of the distinctive roles and nature of the disciplinary language and which language skills they need to develop. Content teachers, especially those in non-language-based disciplines such as Mathematics or Engineering, do not necessarily include any language learning goals in their course outlines. For instance, the Social Science classes in this study had language learning aims (See Chapter 4, Section 4.2.1 and Chapter 5, Section 5.2.1), whereas the Mathematics classes did not. Thus, EMI teachers should set clear disciplinary language learning objectives in their classes that cover both receptive (listening and reading) and productive (speaking and writing) skills.

8.4.3 Discipline-specific language support programme for students

One final practical application I would suggest is providing a discipline-specific language support programme for students. In South Korea, language support programmes for students in EMI settings tend to focus mostly on general English skills (Byun et al., 2011; Chang et al., 2017), and teaching disciplinary English is usually left to content teachers or lecturers. In SHS and the UoS, the English language support programmes were provided to first-year students to develop their general or academic English skills. Also, the content of the EAP programme provided in the UoS focused only on two English skills, reading and writing (see Chapter 5, Section 5.1). ESL/EAP teachers were responsible for developing and teaching the programmes. However, the content teachers and lecturers thought it was students' lack of disciplinary language skills rather than their general or academic English proficiency that posed challenges to their learning. Existing language support programmes in the South Korean HE institutions, including the UoS, have another problem: they are provided only to Korean L1 students who have English as a second language but not to other international students.

I would suggest that language support programmes are developed for each academic

discipline reflecting its disciplinary language and be provided to all students regardless of their L1. Also, another suggestion would be to include discipline-related content in the language support programmes, such as identifying technical terms or practising conventionalised ways of using English (disciplinary speak) in discipline-related writing. ESL/EAP teachers could interview EMI teachers about their ideas and suggestions for language support programmes and refer to their teaching materials (textbook, handouts, or PowerPoint slides) used in EMI classes. EMI teachers or lecturers and language teachers could jointly develop such programmes. In addition, language teachers could consider drawing on some pedagogical strategies or techniques used in CLIL for discipline-specific language support programmes.

8.5 Limitations of the study and recommendations

The study has a number of limitations. Although an effort was made to address generalisability in this study by examining four different EMI classes in two distinctive settings with different educational levels, the results of this study pertain to these specific contexts. Further research, drawing on the methodology used in this study, could be conducted to investigate attention to language in the practice across a larger number of content teachers and lecturers and across various disciplines.

Another limitation concerns the mode of the disciplinary language learning test. It was desirable to conduct an oral test to examine students' acquisition of the linguistic items since they were addressed during conversational interaction. Had the study used oral tests, it would have been possible to simulate the environment where the LREs occurred and also test students' acquisition of pronunciation of vocabulary. It was beyond the scope of the study to investigate if students' performances on the test items represent their performances in other non-test contexts such as group discussions or written productions.

Finally, it was beyond the scope of this study to examine LREs in student-student

interactions. Some studies in ESL contexts found that LREs were frequent in student-student interaction (e.g., Erlam & Pimentel-Hellier, 2017; Kim & McDonough, 2008; Leeser, 2004). Further research is needed to ascertain the occurrence and effectiveness of LRE arising in interactions between students in EMI classes.

8.6 Final comment

South Korea has begun to recognise English as a crucial means for learning that goes beyond the goal of learning. With the belief that EMI is effective for simultaneous learning of content and disciplinary English, the number of EMI courses provided in South Korean HE has soared over the past two decades (Byun et al., 2011; KEDI, 2011), and EMI is now offered in both public and private high schools (Hong & Basturkmen, 2020). Despite the growth of EMI in South Korea, however, there has been little classroom-based research on EMI that examines what happens in EMI classrooms to understand better how students' English development can be facilitated. This thesis is the first to examine how content teachers and lecturers support their students with language, and if students learn disciplinary English in EMI classes in the South Korean context.

Aside from the research gaps, the primary impetus for this study emerged from my personal experience of taking EMI courses as an ESL student during my undergraduate years and teaching ESL subjects in public high schools in South Korea. EMI has been typically provided mostly to the private sector and eventually caused educational inequality in many countries, including South Korea. However, I have always believed that the ultimate goal of official English education is to facilitate students to use English for gaining knowledge and that EMI can be an effective way to achieve that goal – even in public schools – if it is well implemented. In an attempt to seek empirical evidence that supports my belief, I carried out this study in a public high school.

This study was situated in EMI classes in two different academic disciplines, Social Studies and Mathematics, which has enabled exploring the previously underreported language issues of those disciplines. The study was also conducted in two settings with different education levels, which has allowed a comparison between the settings. It is hoped that the findings of this study make a valuable contribution to EMI and SLA understanding and research and that have crucial implications for EMI stakeholders, including content teachers and lecturers, as well as EMI policymakers.

References

Airey, J. (2009). *Science, language, and literacy: Case studies of learning in Swedish university physics* (Doctoral dissertation, Acta Universitatis Upsaliensis). Retrieved from https://www.diva-portal.org/smash/get/diva2:173193/FULLTEXT01.pdf

Airey, J. (2011a). The disciplinary literacy discussion matrix: A heuristic tool for initiating collaboration in higher education. *Across the Disciplines, 8*(3), 1-9. https://doi.org/10.37514/ATD-J.2011.8.3.18

Airey, J. (2011b). Talking about teaching in English. Swedish university lecturers' experiences of changing their teaching language. *Ibe´rica, 22*(Fall), 35–54.

Airey, J. (2012). ''I don't teach language''. The linguistic attitudes of physics lecturers in Sweden. *AILA Review, 25*, 64–79.

Airey, J. (2013). Disciplinary Literacy. In E. Lundqvist, L. O¨stman, & R. Sa¨ljo¨ (Eds.), *Scientific Literacy— teori och praktik* (pp. 41–58). Malmo¨, Sweden: Gleerups.

Airey, J. (2014). Disciplinary differences in the use of English. In *CLIL seminar series, Universitat Jaume I, Castelló de la Plana, Spain 19 Feb 2014*. Retrieved from https://www.diva-portal.org/smash/get/diva2:707531/FULLTEXT01.pdf

Airey, J. (2016). EAP, EMI or CLIL? In K. Hyland & P. Shaw (Eds.), *The Routledge handbook of English for academic purposes* (pp. 71– 83). New York, NY: Routledge.

Airey, J. (2018). EMI, CLIL, EAP: What's the difference?. In *Study Abroad, EMI, and Formal Instruction.* Retrieved from https://www.diva-portal.org/smash/get/diva2:1278701/FULLTEXT01.pdf

Airey, J., & Larsson, J. (2018). Developing students' disciplinary literacy? The case of university physics. In Tang, K. S., & Danielsson, K. (Eds.), *Global developments in literacy research for science education* (pp. 357-376). Cham: Springer.

Airey, J., Lauridsen, K. M., Räsänen, A., Salö, L., & Schwach, V. (2017). The expansion of

English-medium instruction in the Nordic countries: Can top-down university language policies encourage bottom-up disciplinary literacy goals?. *Higher education, 73*(4), 561-576. https://doi.org/10.1007/s10734-015-9950-2

Aizawa, I., & Rose, H. (2019). An analysis of Japan's English as a medium of instruction initiatives within higher education: the gap between meso-level policy and micro-level practice. *Higher Education, 77*(6), 1125–1142. https://doi.org/10.1007/s10734-018-0323-5.

Aizawa, I., & Rose, H. (2020). High school to university transitional challenges in English Medium Instruction in Japan. *System*, *95*, 102390. https://doi.org/10.1016/j.system.2020.102390

Al-Bakri, S. (2013). Problematising English medium instruction in Oman. *International Journal of Bilingual and Multilingual Teachers of English, 1*(2), 55-69. https://doi.org/10.12785/ijbmte/010203

An, Y. E. & Kim, S. J. (2018). The effect of the English Medium Instruction Based on Students' English levels - focusing on English communication ability, learning difficulty & GPA. *Asian Journal of Education, 19*(2), 331-352. [in Korean]

An, J., Macaro, E., & Childs, A. (2019). Language focused episodes by monolingual teachers in English Medium Instruction science lessons. *Journal of Immersion and Content-Based Language Education*, *7*(2), 166-191. https://doi.org/10.1075/jicb.18019

Ardasheva, Y., & Tretter, T. R. (2017). Developing science-specific, technical vocabulary of high school newcomer English learners. *International Journal of Bilingual Education and Bilingualism*, *20*(3), 252-271. https://doi.org/10.1080/13670050.2015.1042356

Baker, W., & Hüttner, J. (2017). English and more: a multisite study of roles and conceptualisations of language in English medium multilingual universities from Europe to Asia. *Journal of Multilingual and Multicultural Development*, *38*(6), 501-516.

Baker, W., & Hüttner, J. (2019). “We are not the language police”: Comparing multilingual EMI programmes in Europe and Asia. *International Journal of Applied Linguistics*, *29*(1), 78-94. https://doi.org/10.1111/ijal.12246

Bancroft-Billings, S. (2020). Identifying spoken technical legal vocabulary in a law school classroom. *English for Specific Purposes*, *60*, 9-25. https://doi.org/10.1016/j.esp.2020.04.003

Barton, B., & Neville-Barton, P. (2003). Investigating the relationship between English language and mathematical learning. In M. A. Mariotti (Ed.), *Proceedings of the Third Conference of the European Society for Research in Mathematics Education* (pp. 1-10). Pisa: PLUS-Pisa University Press.

Basturkmen, H. (2010). *Developing courses in English for specific purposes*. New York: Palgrave Macmillan.

Basturkmen, H. (2012). Review of research into the correspondence between language teachers' stated beliefs and practices. *System*, *40*(2), 282-295. https://doi.org/10.1016/j.system.2012.05.001

Basturkmen, H. (2018). Dealing With Language Issues During Subject Teaching in EMI: The Perspectives of Two Accounting Lecturers. *TESOL Quarterly*, *52*(3), 692-700.

Basturkmen, H., & Shackleford, N. (2015). How content lecturers help students with language: An observational study of language-related episodes in interaction in first year accounting classrooms. *English for Specific Purposes*, *37*(1), 87-97. 10.1016/j.esp.2014.08.001

Belhiah, H., & Elhami, M. (2015). English as a medium of instruction in the Gulf: When students and teachers speak. *Language Policy*, *14*(1), 3-23.

Biggs, B. A. (2017). Empower All Students with Collaborative Instruction of Disciplinary Vocabulary. *California Reader*, *50*(4).

Black, J., Hashimzade, Nigar, & Myles, Gareth D. (2017). *A dictionary of economics.* Oxford University Press. Retrieved from https://www.oxfordreference.com/view/10.1093/acref/9780198759430.001.0001/acref-9780198759430

Blaj-Ward, L. (2017). *Language learning and use in English-medium higher education*. London: Palgrave Macmillan.

Bloome, D., Carvalho, G. T., & Ryu, S. (2018). Researching academic literacies. In A. Phakiti, P. De Costa, L. Plonsky, & S. Starfield, *The Palgrave handbook of applied linguistics research methodology* (pp. 887-902). London: Palgrave Macmillan. https://doi.org/10.1057/978-1-137-59900-1

Boyd, F. B., Sullivan, M. P., Popp, J. S., & Hughes, M. (2012). Vocabulary instruction in the disciplines. *Journal of Adolescent & Adult Literacy*, *56*(1), 18-20.

Bradford, A. (2013). English-medium degree programs in Japanese universities: Learning from the European experience. *Asian Education and Development Studies*, *2*(3), 225-240.

Bradford, A., & Brown, H. (Eds.). (2017). *English-medium instruction in Japanese higher education: Policy, challenges and outcomes*. Bristol: Multilingual Matters.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77-101.

Breetvelt, I. (2018). English-medium instruction in Dutch higher education: a policy reconstruction and impact study. Contribution to a special issue in honor of Gert Rijlaarsdam Making Connections: Studies of Language and Literature Education. *L1-Educational Studies in Language and Literature*, *18*, 1-24. https://doi.org/10.17239/L1ESLL-2018.18.03.10

Brenn-White, M., & Faethe, E. (2013). *English-taught master's programs in Europe: a 2013 update*. New York: Institute of International Education.

Brown, H. G. (2018). *Getting started with English-medium instruction in Japan: key factors in program planning and implementation* (Doctoral dissertation, University of Birmingham, Birmingham, The United Kingdom). Retrieved from https://etheses.bham.ac.uk/id/eprint/8324/3/Brown18PhD_Vol_2.pdf

Brown, H., & Bradford, A. (2017). EMI, CLIL, & CBI: Differing approaches and goals. In P. Clements, A. Krause, & H. Brown (Eds.), In *Transformation in language education* (pp. 328–334). Tokyo: JALT

Byun, K., Chu, H., Kim, M., Park, I., Kim, S., & Jung, J. (2011). English-medium teaching in Korean higher education: Policy debates and reality. *Higher Education: The International Journal of Higher Education and Educational Planning, 62*(4), 431-449. https://doi.org/10.1007/s10734-010-9397-4

Byun, K. Y., & Kim, M. J. (2010). Shifting Patterns of the Government's Policies for the Internationalization of Korean Higher Education. *Journal of Studies in International Education, 15*(5), 467-486. https://doi.org/10.1177/1028315310375307

Chalmers, H. (2019). The role of the first language in English medium instruction. In *OUP ELT Position Paper.* Retrieved from https://elt.oup.com/feature/global/expert/eml?cc=gb&selLanguage=en

Chang, J., Kim, W., & Lee, H. (2013). Identification of essential English productive skills for English-medium instruction courses: A syllabus analysis. *English Teaching, 68*(3), 159-186.

Chang, J. Y., Kim, W., & Lee, H. (2017). A language support program for English-medium instruction courses: Its development and evaluation in an EFL setting. *International Journal of Bilingual Education and Bilingualism*, *20*(5), 510-528. https://doi.org/10.1080/13670050.2015.1080658

Cheng, L., & Fox, J. (2008). Towards a better understanding of academic acculturation:

Second language students in Canadian universities. *Canadian Modern Language Review, 65*(2), 307-333.

Cho, D. W. (2012). English-medium instruction in the university context of Korea: Tradeoff between teaching outcomes and media-initiated university ranking. *The Journal of Asia TEFL, 9*(4), 135-163.

Cho, J. S. (2012). Study on the effectiveness of English-medium class. *Journal of the Korean Data & Information Science Society, 23*(6), 1137-1144. [In Korean]

Choi, T. H. (2015). The impact of the teaching English through English policy on teachers and teaching in South Korea. *Current Issues in Language Planning, 16*(3), 201-220. https://doi.org/10.1080/14664208.2015.970727

Chuang, Y. T. (2015). An EMI Pedagogy That Facilitates Students' Learning. *English Language Teaching, 8*(12), 63-73. https://doi.org/10.5539/elt.v8n12p63

Chung, T. M., & Nation, P. (2003). Technical vocabulary in specialised texts. *Reading in a foreign language, 15*(2), 103-116.

Clapham, C., & Nicholson, J. (2014). *The Concise Oxford Dictionary of Mathematics.* Oxford University Press. Retrieved from https://www.oxfordreference.com/view/10.1093/acref/9780199679591.001.0001/acref-9780199679591

Clark, V. L, Creswell, J. W., Green, D. O., & Shope, R. J. (2008). Mixing quantitative and qualitative approaches: An introduction to emergent mixed methods research. In S. N. Hess-Biber & P. Leavy (Eds.), *Handbook of emergent methods* (pp. 363-387). New York: Guilford.

Coleman, J. (2006). English-medium teaching in European higher education. *Language teaching, 39*(1), 1-14. https://doi.org/10.1017/S026144480600320X

Coşgun, G., & Hasırcı, B. (2017). The impact of English medium instruction (EMI) on

students' language abilities. *International Journal of Curriculum and Instruction.9*(2), 11-20.

Costa, F. (2012). Focus on form in ICLHE lectures in Italy: Evidence from English-medium science lectures by native speakers of Italian. *AILA Review, 25*(1), 30-47.

Cousin, G. (2005). Case study research. *Journal of geography in higher education, 29*(3), 421-427.

Coyle, D. (2007). Content and language integrated learning: Towards a connected research agenda for CLIL pedagogies. *International journal of bilingual education and bilingualism, 10*(5), 543-562. https://doi.org/10.2167/beb459.0

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

Coxhead, A. (2016). Reflecting on Coxhead (2000), "A New Academic Word List". *Tesol Quarterly, 50*(1), 181-185.

Coxhead, A. (2018). *Vocabulary and English for Specific Purposes Research: Quantitative and Qualitative Perspectives*. New York: Routledge.

Coxhead, A., & Boutorwick, T. J. (2018). Longitudinal Vocabulary Development in an EMI International School Context: Learners and Texts in EAL, Maths, and Science. *TESOL Quarterly, 52*(3), 588-610. https://doi.org/10.1002/tesq.450

Creswell, J. W. (2012). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research*. Boston, MA: Pearson Education.

Creswell, J. W. (2015). Revisiting mixed methods and advancing scientific practices. In Hesse-Biber, S, Johnson, R. B. (Eds.) *The Oxford Handbook of Multimethod and Mixed Methods Research Inquiry* (pp. 61-71). New York: Oxford University Press.

Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.

Creswell, J. W, Piano Clark, V. L., Guttmann, M. L., & Hanson, E. E. (2003). Advanced mixed methods research design. In A. Tashakkori and C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209-240). Thousand Oaks, CA: Sage. https://doi.org/10.17051/io.2015.07705

Curle, S., Yuksel, D., Soruç, A., & Altay, M. (2020). Predictors of English Medium Instruction academic success: English proficiency versus First language medium. *System*, 102378. https://doi.org/10.1016/j.system.2020.102378

Dafouz, E., & Camacho-Miñano, M. (2016). Exploring the impact of English-medium instruction on university student academic achievement: The case of accounting. *English for Specific Purposes, 44*, 57-67. https://doi.org/10.1016/j.esp.2016.06.001

Dafouz, E., Camacho, M., & Urquia, E. (2014). 'Surely they can't do as well': a comparison of business students' academic performance in English-medium and Spanish-as-first-language-medium programmes. *Language and Education, 28*(3), 223-236. https://doi.org/10.1080/09500782.2013.808661

Dafouz, E., Hüttner, J., & Smit, U. (2018). New Contexts, New Challenges for TESOL: Understanding Disciplinary Reasoning in Oral Interactions in English-Medium Instruction. *TESOL Quarterly, 52*(3), 540-563. https://doi.org/10.1002/tesq.459

Dang, T. N. Y., Coxhead, A., & Webb, S. (2017). The academic spoken word list. *Language Learning, 67*(4), 959-997. https://doi.org/10.1111/lang.12253

Dearden, J. (2014). *English as a medium of instruction - a growing global phenomenon.* London: British Council. Retrieved from https://www.britishcouncil.org/sites/default/files/e484_emi_cover_option_3_final_seb.pdf

Dearden, J., & Macaro, E. (2016). Higher Education Teachers' Attitudes towards English Medium Instruction: A Three-Country Comparison. *Studies in second language learning and teaching*, *6*(3), 455-486.

De Bot, K. (1996). The psycholinguistics of the output hypothesis. *Language learning*, *46*(3), 529-555.

De La Fuente, M. J. (2002). Negotiation and oral acquisition of L2 vocabulary. The roles of input and output in the receptive and productive acquisition of words. *Studies in Second Language Acquisition*, *24*(1), 81-112. https://doi.org/10.1017/S0272263102001043

Del Campo, C., Cancer, A., Pascual-Ezama, D., & Urquía-Grande, E. (2015). EMI vs Non-EMI: Preliminary analysis of the academic output within the INTE-R-LICA project. P*rocedia-Social and Behavioral Sciences*, *212*, 74-79.

Doiz, A., Lasagabaster, D., & Sierra, J. M. (2011). Internationalisation, multilingualism and English-medium instruction. *World Englishes*, *30*(3), 345-359. https://doi.org/10.1111/j.1467-971X.2011.01718.x

Doiz, A., Lasagabaster, D. and Sierra, J.M. (2013). Future Challenges for English-Medium Instruction at the Tertiary Level. In Doiz, A., Lasagabaster, D. and Sierra, J.M. (Eds.). *English Medium Instruction at Universities. Global Challenges* (pp. 213-221). Bristol: Multilingual Matters.

Dörnyei, Z. (2007). *Research methods in applied linguistics: Quantitative, qualitative, and mixed methodologies*. Oxford; New York, N.Y.: Oxford University Press.

Doughty, C. (2001). Cognitive underpinnings of focus on form. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 206–257). Cambridge, England: Cambridge University Press.

Doughty, C. (2003). Instructed SLA: Constraints, compensation, and enhancement. In M. Long & C. Doughty (Eds.), *Handbook of second language acquisition* (pp. 257–310). Malden, MA: Blackwell.

Duff, P., & Anderson, T. (2015). Case study research. *The Cambridge guide to research in language teaching and learning*, 112-118.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review*, *14*(4), 532-550.

Ellis, R. (2001). Investigating form-focused instruction. *Language Learning, 51*(Suppl. 1), 1-46.

Ellis, R., Basturkmen, H., & Loewen, S. (2001a). Learner uptake in communicative ESL lessons. *Language Learning, 51*(2), 281-318.

Ellis, R., Basturkmen, H., & Loewen, S. (2001b). Preemptive focus on form in the ESL classroom. *TESOL Quarterly*, *35*(3), 407-432.

Ellis, R., Basturkmen, H., & Loewen, S. (2002). Doing focus-on-form. *System, 30*(4), 419-432. https://doi.org/10.1016/S0346-251X(02)00047-7

Ellis, R., Loewen, S., & Basturkmen, H. (2006). Disentangling focus on form. A response to Sheen and O'Neill (2005). *Applied Linguistics, 27*(1), 135-141. https://doi.org/10.1093/applin/ami049

Erlam, R., & Pimentel-Hellier, M. (2017). Opportunities to attend to language form in the adolescent near-beginner foreign language classroom. *Language awareness, 26*(2), 59-77. https://doi.org/10.1080/09658416.2017.1314487

Evans, S., & Morrison, B. (2011). Meeting the challenges of English-medium higher education: The first-year experience in Hong Kong. *English for Specific Purposes, 30*(3), 198-208. https://doi.org/10.1016/j.esp.2011.01.001

Fang, Z. (2012). Language correlates of disciplinary literacy. *Topics in language disorders*, *32*(1), 19-34. https://doi.org/10.1097/TLD.0b013e31824501de

Fang, Z., & Coatoam, S. (2013). Disciplinary literacy: What you want to know about it. *Journal of Adolescent & Adult Literacy, 56*(8), 627-632. https://doi.org/10.1002/JAAL.190

Fang, Z., Schleppegrell, M. J., & Cox, B. E. (2006). Understanding the language demands of

schooling: Nouns in academic registers. *Journal of literacy research*, *38*(3), 247-273.

Farrokhi, F., & Chehrazad, M. H. (2012). The Effects of Planned Focus on Form on Iranian EFL Learners' Oral Accuracy. *World Journal of education*, *2*(1), 70-81. https://doi.org/10.5430/wje.v2n1p70

Farrokhi, F., & Gholamy, J. (2005). Preemptive language-related episodes, corrective feedback, and uptake in an EFL class. Retrieved from https://www.sid.ir/En/Journal/ViewPaper.aspx?ID=58403

Galloway. (2017). How effective is English as a medium of instruction?. Retrieved from https://www.britishcouncil.org/voices-magazine/how-effective-english-medium-instruction-emi

Galloway, N., Kriukow, J., & Numajiri, T. (2017). Internationalisation, higher education and the growing demand for English: an investigation into the English medium of instruction (EMI) movement in China and Japan. *ELT Research Papers*, *17*.

Galloway, N., & Ruegg, R. (2020). The provision of student support on English Medium Instruction programmes in Japan and China. *Journal of English for Academic Purposes*, *45*, 100846.

Gardner, R. C. (1988). Attitudes and motivation. *Annual review of applied linguistics*, *9*, 135-148.

Gass, S. M. (1997). *Input, interaction and the second language learner*. Mahwah, NJ: Lawrence Erlbaum.

Gass, S. M., & Mackey, A. (2006). Input, interaction, and output: An overview. *AILA Review*, *19*(1), 3-17.

Gass, S. M., & Mackey, A. (2007). Input, interaction, and output in second language acquisition. In B. VanPatten & J. Williams (Eds.), *Theories in second language acquisition: An introduction* (pp. 175–199). Mahwah, NJ: Lawrence Erlbaum.

Gass, S. M. & Mackey, A. (2015). Input, interaction, and output in second language acquisition. In B. VanPatten&J.Williams(eds.), Theories in second language acquisition (2nd edn.). New York: Routledge, 180–206.

Gee, J. (1991). Socio-cultural approaches to literacy (literacies). *Annual review of applied linguistics*, *12*, 31-48.

Geertz, C. (1973). Thick description: Toward an interpretive theory of culture. *Turning points in qualitative research: Tying knots in a handkerchief*, *3*, 143-168.

Gibbons, P. (2003). Mediating language learning: Teacher interactions with ESL students in a content-based classroom. *TESOL Quarterly*, *37*(2), 247-273.

Graddol, D. (2006). *English next* (Vol. 62). London: British Council.

Gundermann, S. (2014). *English-medium instruction: Modeling the role of the native speaker in a lingua franca context*. (Doctoral dissertation, *University of Freiburg*. Freiburg im Breisgau, Germany). Retrieved from file:///C:/Users/user/Downloads/EMI_DISS.pdf

Guo, H., Tong, F., Wang, Z., Min, Y., & Tang, S. (2018). English-vs. Chinese-Medium Instruction in Chinese Higher Education: A Quasi-Experimental Comparison. *Sustainability*, *10*(11), 4230. https://doi.org/10.3390/su10114230

Gustafsson, J. (2017). Single Case Studies vs Multiple Case Studies: A Comparative Study. Retrieved from: http://www.diva-portal.org/smash/get/diva2:1064378/ FULLTEXT01.pdf

Harmon, J. M., Hedrick, W. B., & Wood, K. D. (2005). Research on vocabulary instruction in the content areas: Implications for struggling readers. *Reading & Writing Quarterly*, *21*(3), 261-280. https://doi.org/10.1080/10573560590949377

Hong, J. (2021). Incidental attention to language during disciplinary teaching: An observation study of LREs in a first-year EMI computer programming lecture. In *Asia-Pacific LSP & Professional Communication Association News*, *3*, 9-12. Retrieved from https://www.lsppc.org/archives

Hong, J., & Basturkmen, H. (2020). Incidental attention to academic language during content teaching in two EMI classes in South Korean high schools. *Journal of English for Academic Purposes, 48*, 100921. https://doi.org/10.1016/j.jeap.2020.100921

Hwang, J. B., & Ahn, H. D. (2011). The Effects of College-Level English-Mediated Instruction on Students' Acquisition of Content Knowledge and English Competence. *Korean Journal of English Language and Linguistics, 11*(1), 77-97. [In Korean]

Jackson, D. O. (2001). Language-related episodes. *ELT Journal, 55*(3), 298-99. https://doi.org/10.1093/elt/55.3.298

Jeon, I. J. (2008). Korean EFL teachers' beliefs of English-only instruction. *English Teaching, 63*(3), 205-229.

Jexenflicker, S. and C. Dalton-Puffer (2010) The CLIL differential: comparing the writing of CLIL and non-CLIL students in higher colleges of technology. In C. Dalton-Puffer, T. Nikula and U. Smit (eds.), *Language use and language learning in CLIL classrooms* (pp. 169-189). Amsterdam: John Benjamins.

Joe, Y., & Lee, H. (2013). Does English-medium instruction benefit students in EFL contexts? A case study of medical students in Korea. *The Asia-Pacific Education Researcher, 22*(2), 201-207. https://doi.org/10.1007/s40299-012-0003-7

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of mixed methods research, 1*(2), 112-133.

Jon, J. E., Cho, Y. H., & Byun, K. (2020). Internationalization by English-Medium Instruction? Professors' decoupling behaviors to EMI policy in Korean higher education. *KEDI Journal of Educational Policy, 17*(2). [In Korean]

Jordan, B. (1997). English for academic purposes. Cambridge: Cambridge University Press.

Jin, S. H., & Shin, S. B. (2011). Effects of English Competence, Motivation, Achievement, and Self-Confidence on Learners' Satisfaction and Effects of EMI. *Journal of*

Engineering Education Research, 14(6), 16-23. [In Korean]

Kamaşak, R., Sahan, K., & Rose, H. (2021). Academic language-related challenges at an English-medium university. *Journal of English for Academic Purposes*, 100945. https://doi.org/10.1016/j.jeap.2020.100945

Kang, S. Y., & Park, H. S. (2004a). Student Belief and Attitudes Korean about English Medium Instruction. *Yonsei Review of Educational Research, 17*(1), 33-53. [In Korean]

Kang, S. Y., & Park, H. S. (2005). English as the Medium of Instruction in Korean Engineering Education. *Korean Journal of Applied Linguistics, 21*(1), 155-174.

Kartchava, E. (2018). Planned Versus Incidental Focus on Form. *The TESOL Encyclopaedia of English Language Teaching*, 1-6.

Keuk, C. N., & Tith, M. (2013). THE ENACTMENT OF ENGLISH-MEDIUM INSTRUCTION (EMI) UNDERGRADUATE PROGRAM IN CAMBODIA: STUDENTS'VOICES. *International Journal of Innovation in English Language Teaching and Research, 2*(2), 159-175.

Kim, E. G. (2017). English medium instruction in Korean higher education: Challenges and future directions. In *English medium instruction in higher education in Asia-Pacific* (pp. 53-69). Springer, Cham.

Kim, E. G., Kweon, S., & Kim, J. (2017). Korean engineering students' perceptions of English-medium instruction (EMI) and L1 use in EMI classes. *Journal of Multilingual and Multicultural Development, 38*(2), 130-145. https://doi.org/10.1080/01434632.2016.1177061

Kim, E. J. (2003). A comparative study of academic oral interaction in English-medium lectures and Korean-medium lectures. *English Teaching, 58*(3), 3-20.

Kim, Y., & McDonough, K. (2008). The effect of interlocutor proficiency on the collaborative dialogue between Korean as second language learners. *Language teaching*

research, 12(2), 211-234.

Kim, J., & Tatar, B. (2017). Non-native English-speaking professors' experiences of English-medium instruction and their perceived roles of the local language. *Journal of Language, Identity & Education, 16*(3), 157-171. https://doi.org/10.1080/15348458.2017.1295811

Kirkpatrick, A. (2014). The language (s) of HE: EMI and/or ELF and/or multilingualism?. *The Asian Journal of Applied Linguistics, 1*(1), 4-15.

Kirkpatrick, A. (2017). The Languages of Higher Education in East and Southeast Asia: Will EMI Lead to Englishisation?. In *English medium instruction in higher education in Asia-Pacific* (pp. 21-36). Cham: Springer.

Korean Educational Development Institute (KEDI). (2011). *Higher education through statistics*. Korean Educational Development Institute. [In Korean]

Krashen, S. (1985). *The input hypothesis: Issues and implications*. London: Longman.

Krashen, S. (1994). The pleasure hypothesis. In J. Alatis (Ed.), *Georgetown University round table on languages and linguistics* (pp. 299–322). Washington, DC: Georgetown University Press.

Kuteeva, M., & Airey, J. (2014). Disciplinary differences in the use of English in higher education: Reflections on recent language policy developments. *Higher Education, 67*(5), 533-549.

Lapkin, S., & Swain, M. (2013). Focus on form through collaborative dialogue: Exploring task effects. In *Researching pedagogic tasks* (pp. 109-128). Routledge.

Larson-Hall, J. (2015). *A guide to doing statistics in second language research using SPSS and R*. Routledge.

Lasagabaster, D., & Sierra, J. M. (2009). Immersion and CLIL in English: More differences than similarities. *ELT Journal, 64*(4), 367-375. https://doi.org/10.1093/elt/ccp082.

Laufer, B. (2005). Focus on form in second language vocabulary acquisition. In S. H. Foster-

Cohen, M. P. Garcia-Mayo & J. Cenoz (eds.), *EUROSLA Yearbook 5* (pp. 223−250). Amsterdam: John Benjamins.

Laufer, B. (2010). Form-focused instruction in second language vocabulary learning. In R. Chacon-Beltrán, C. Abello-Contesse & M. D. M. Torreblanca-Lopez (Eds.), *Insights into non-native vocabulary teaching and learning* (pp. 15-27). Bristol: Multilingual Matters.

Laufer, B. & N. Girsai (2008). Form-focused instruction in second language vocabulary learning: A case for contrastive analysis and translation. *Applied Linguistics 29*(4), 694–716.

Law, J. (2016). *A Dictionary of Accounting*. Oxford University Press. Retrieved from https://www.oxfordreference.com/view/10.1093/acref/9780198743514.001.0001/acref-9780198743514

Lea, M. R., & Street, B. V. (1998). Student writing in higher education: An academic literacies approach. *Studies in higher education*, *23*(2), 157-172.

Lea, M. R., & Street, B. V. (2006). The" academic literacies" model: Theory and applications. *Theory into Practice*, *45*(4), 368-377.

Lee, B. H. (2010). A Study on the Teaching Method for an Efficient EMI Education of Engineering major Subjects. *Korean Society for Engineering Education and Technology Transfer, 13*(6), 188-194. [In Korean].

Lee, H. M., & Kim, Y. W. (2007). The effect of teaching university mathematics in English. *The Korean Journal for History of Mathematics*, *20*(1), 83-102. [In Korean]

Lee, J. & Pyo, K. (2013). A study of language-related episodes in university English group discussion. *English Language & Literature Teaching*, *19*(4), 79-100.

Lee, K., & Hong, J. (2015). Study on the situations and learning effect of English medium instruction at Korean universities. *The Journal of Local Education management*, *19*(1), 1-22. [In Korean]

Lee, K., & Lee, H. (2018). Korean graduate students' self-perceptions of English skills and needs in an English-medium instruction context. *Journal of Multilingual and Multicultural Development,* 1-14. https://doi.org/10.1080/01434632.2018.1438442.

Leeser, M. J. (2004). Learner proficiency and focus on form during collaborative dialogue. *Language Teaching Research, 8*(1), 55-81.

Lei, J., & Hu, G. (2014). Is English-medium instruction effective in improving Chinese undergraduate students' English competence?. *International Review of Applied Linguistics in Language Teaching*, *52*(2), 99-126.

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

Lillis, T., & Scott, M. (2007). Defining academic literacies research: Issues of epistemology, ideology and strategy. *Journal of applied linguistics*, *4*(1), 5-32.

Liyanage, I. (2018). Internationalization of higher education, mobility, and multilingualism. In *Multilingual Education Yearbook 2018*, 1-20. Springer, Cham.

Llach, A., & Pilar, M. (2009). The role of Spanish L1 in the vocabulary use of CLIL and non-CLIL EFL learners. *Content and language integrated learning: Evidence from research in Europe*, *1*, 12-129.

Llinares, A., Morton, T., & Whittaker, R. (2012). *The roles of language in CLIL*. Cambridge: Cambridge University Press.

Lo, Y. Y., & Lo, E. S. C. (2014). A meta-analysis of the effectiveness of English-medium education in Hong Kong. *Review of Educational Research, 84*(1), 47-73.

Loewen, S. (2002). *Attention to grammar in incidental focus on form* (Doctoral dissertation, University of Auckland, Auckland, New Zealand). Retrieved from

Loewen, S. (2004). Uptake in incidental focus on form in meaning-focused ESL lessons. *Language learning*, *54*(1), 153-188.

Loewen, S. (2005). Incidental focus on form and second language learning. *Studies in Second*

Language Acquisition, 27(3), 361-386. https://doi.org/10.1017/S0272263105050163

Loewen, S., & Sato, M. (2018). Interaction and instructed second language acquisition. *Language teaching*, *51*(3), 285-329.

Long, M. (1991). Focus on form: A design feature in language teaching methodology. In K. de Bot, R, B. Ginsberg, & C. Kramsch (Eds.), *Foreign language research in cross-cultural perspective* (p. 39–52). Amsterdam: Benjamins.

Long, M. (1996). The role of the linguistic environment in second language acquisition. In W. Ritchie & T. Bhatia (Eds.), *Handbook of second language acquisition* (p. 413–468). San Diego, CA: Academic Press.

Long, M., & Robinson, P. (1998). Focus on form: Theory, research, and practice. In C. Doughty & J. Williams (Eds.), *Focus on form in the classroom second language acquisition* (pp. 15–41). New York: Cambridge University Press

Love, A. M. (1991). Process and product in geology: An investigation of some discourse features of two introductory textbooks. *English for Specific Purposes, 10*(2), 89109.

Lyle, C. (2015). The complex nature of Language-related Episodes. In D. Koike & C. S. Blyth (Eds.), *Dialogue in multilingual and multimodal communities* (pp. 25–48). Amsterdam: John Benjamins.

Lyster, R. (2001). Negotiation of form, recasts, and explicit correction in relation to error types and learner repair in immersion classrooms. *Language learning, 51*, 265-301.

Lyster, R. (2015). Using form-focused tasks to integrate language across the immersion curriculum. *System, 54*, 4-13. https://doi.org/10.1016/j.system.2014.09.022

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. https://doi.org/10.1017/S0272263197001034

Macaro, E. (2018). *English medium instruction: Content and language in policy and practice.*

Oxford, United Kingdom: Oxford University Press.

Macaro, E. (2019). Exploring the role of language in English medium instruction. *International Journal of Bilingual Education and Bilingualism*. *23*(3), 263-276.

Macaro, E., Briggs Baffoe-Djan, J., Rose, H., di Sabato, B., Hughes, B., Cuccurullo, D., Coonan, C.M., Menegale, M., & Bier, A. (2019). *Transition from secondary school CLIL to EMI at university: Initial evidence from research in Italy*. Retrieved from: https://www.teachingenglish.org.uk/article/transition-secondary-school-clil-emi-university-initial-evidence-research-italy

Macaro, E., Curle, S., Pun, J., An, J., & Dearden, J. (2018). A systematic review of English medium instruction in higher education. *Language Teaching, 51*(1), 36-76. https://doi.org/10.1017/S0261444817000350

Mackey, A. & Gass, S. M. (2005). *Second language research: methodology and design.* Mahwah, NJ: Lawrence Erlbaum Associate, Inc.

Maiworm, F., & Wächter, B. (2002). *English-language-taught: Degree programmes in European higher education*. Bonn: Lemmens.

Markee, N. (2011). Doing, and justifying doing, avoidance. *Journal of Pragmatics, 43*(2), 602-615.

Marsh, H., Hau, K. T., & Kong, C. K. (2000). Late immersion and language of instruction in Hong Kong high schools: Achievement growth in language and non-language subjects. *Harvard Educational Review, 70*(3), 302-347.

McConachie, S.M., & Petrosky, A.R. (2010). Engaging content teachers in literacy development. In S.M. McConachie & A.R. Petrosky (Eds.), *Content Matters: A disciplinary literacy approach to improving student learning* (pp. 1-14). San Francisco, CA: Jossey-Bass.

McLaughlin, E., & Parkinson, J. (2018). 'We learn as we go': How acquisition of a technical vocabulary is supported during vocational training. *English for Specific Purposes, 50,* 14-27. https://doi.org./10.1016/j.esp.2017.11.003

Ministry of Education. (2006). *Strategic plan for internationalization of Korean higher education*. Unpublished government document. [In Korean]

Ministry of Education. (2018). *The Enforcement Decree of the Elementary and Secondary Education Act.* [In Korean]

Moje, E. B. (2015). Doing and teaching disciplinary literacy with adolescent learners: A social and cultural enterprise. *Harvard Educational Review, 85*(2), 254-278.

Monroe, E. E., & Orme, M. P. (2002). Developing mathematical vocabulary. *Preventing school failure: Alternative education for children and youth*, *46*(3), 139-142.

Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research, 40*(2), 120-123.

Mudraya, O. (2006). Engineering English: A lexical frequency instructional model. *English for Specific Purposes, 25*(2), 235-256.

Nam, H., & Kwak, E. (2019). Courses in English, without using English. Segye Ilbo. Retrieved January 2020, from http://www.segye.com/newsView/20190520511336?OutUrl=Zum [In Korean]

Nation, P. (2001). *Learning Vocabulary in Another Language*. Cambridge: Cambridge University Press.

Neghina, C. (2017). Asia rising. *Study Portals*. Retrieved from https://www.studyportals.com/intelligence/asia-rising/

Norris, J. M., & Ortega, L. (2000). Effectiveness of L2 instruction: A research synthesis and quantitative meta-analysis. *Language learning, 50*(3), 417-528.

Nunan, D. (2003). The impact of English as a global language on educational policies and

practices in the Asia-Pacific Region. *TESOL Quarterly, 37*(4), 589-613.

Ofsted. (2006). *Evaluating mathematics provision for 14–19-year-olds*. London, Ofsted.

Oh, K.. (2011). Korean Economics students' perceptions concerning EMI. *Korean Journal of Applied Linguistics, 27*(3), 213-253.

Paltridge, B., & Starfield, S. (Eds.). (2012). *The handbook of English for specific purposes* (Vol. 120). John Wiley & Sons.

Park, H. (2007). English Medium Instruction and Content Learning. *English Language and Linguistics, 23,* 257-274. https://doi.org/10.17960/ell.2007..23.012

Park, J, E. (2018). *English Medium Instruction for Academic Purposes in Higher Education: Cases and Principles.* Seoul: Soongsil University Press.

Pecorari, D., & Malmström, H. (2018). At the crossroads of TESOL and English medium instruction. *TESOL Quarterly, 52*(3), 497–515.

Phuong, Y. H., & Nguyen, T. T. (2019). Students' Perceptions towards the Benefits and Drawbacks of EMI Classes. *English Language Teaching, 12*(5), 88-100.

Pica, T. (2002). Subject-matter content: How does it assist the interactional and linguistic needs of classroom language learners?. *The Modern Language Journal*, *86*(1), 1-19.

Pica, T., Holliday, L., Lewis, N., & Morgenthaler, L. (1989). Comprehensible output as an outcome of linguistic demands on the learner. *Studies in second language acquisition, 11*(1), 63-90.

Pritchard, R., & O'HARA, S. U. S. A. N. (2017). Framing the teaching of academic language to English learners: A Delphi study of expert consensus. *TESOL Quarterly, 51*(2), 418-428.

Purves, A. C. (1986). Rhetorical communities, the international student, and basic writing. *Journal of Basic Writing, 5*(1), 38-51.

Ramiro, M. S. S., & Pérez, M. D. M. S. (2015). Analyzing writing in English-medium

instruction at university. *Linguarum Arena: Revista de Estudos em Didática de Línguas da Universidade do Porto*, *6*. 45-58.

Rashidi, N., & Shahab, S. (2013). Disciplinary acculturation: A comparative study of intradiscourse cycles of English and Persian introductory textbooks of sociology and linguistics. *Research in Applied Linguistics*, *4*(2), 33-50.

Rayati, Yaqubi, & Harsejsani. (2012). L1 use and language-related episodes (LREs) in an ELF setting. *The Journal of Teaching Language Skills*, *3*(4), 99-125.

Riccomini, P. J., Smith, G. W., Hughes, E. M., & Fries, K. M. (2015). The language of mathematics: The importance of teaching and learning mathematical vocabulary. *Reading & Writing Quarterly*, *31*(3), 235-252.

Richards, J. C., & Renandya, W. A. (Eds.). (2002). *Methodology in language teaching: An anthology of current practice.* New York: Cambridge university press.

Robinson, P. (2003). The cognitive hypothesis, task design, and adult task-based language learning. *Second Language Studies, 21*(2). 45-105.

Rose, H., Curle, S., Aizawa, I., & Thompson, G. (2020). What drives success in English medium taught courses? The interplay between language proficiency, academic skills, and motivation. *Studies in Higher Education, 45(*11), 2149-2161.

Rogier, D. (2012). *The effects of English-medium instruction on language proficiency of students enrolled in higher education in the UAE* (Unpublished Doctoral dissertation, University of Exeter, Exeter, The United Kingdom). Retrieved from https://ore.exeter.ac.uk/repository/bitstream/handle/10036/4482/RogierD.pdf

Ryoo, H. K. (2009). Language related episode (LRE) in learner interactions as an opportunity for language learning. *English Teaching*, *64*(4), 315-335.

Schleppegrell, M. J. (2002). Challenges of the science register for ESL students: Errors and meaning-making. In M. J. Schleppegrell & M. C. Colombi (Eds.), *Developing advanced literacy in first and second languages: Meaning with power* (pp. 119– 142). Mahwah, NJ: Lawrence Erlbaum.

Schleppegrell, M. J. (2004). *The language of schooling: A functional linguistics perspective*. Mahwah, NJ: Lawrence Erlbaum.

Schleppegrell, M. J. (2007). The linguistic challenges of mathematics teaching and learning: A research review. *Reading & writing quarterly*, *23*(2), 139-159.

Schleppegrell, M. J. (2020). The knowledge base for language teaching: What is the English to be taught as content?. *Language Teaching Research*, *24*(1), 17-27.

Schmidt, R. W. (1990). The role of consciousness in second language learning. *Applied Linguistics*, *11*(2), 129-158. https://doi.org/10.1093/applin/11.2.129

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp.3-32). New York: Cambridge University Press.

Schmidt, R. (2012). Attention, awareness, and individual differences in language learning. In W. M. Chan, K. N. Chin, S. Bhatt, & I. Walker (Eds.), *Perspectives on individual characteristics and foreign language education* (pp. 27–50). Boston, MA: Mouton de Gruyter.

Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and exploring the behaviour of two new versions of the Vocabulary Levels Test. *Language Testing*, *18*(1), 55–88.

Seethaler, P. M., Fuchs, L. S., Star, J. R., & Bryant, J. (2011). The cognitive predictors of computational skill with whole versus rational numbers: An exploratory study. *Learning and Individual Differences*, *21*(5), 536-542.

Sert, N. (2008). The language of instruction dilemma in the Turkish context. *System*, *36*(2), 156-171.

Shanahan, T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard educational review*, *78*(1), 40-59.

Shanahan, T., & Shanahan, C. (2012). What is disciplinary literacy and why does it matter?. *Topics in language disorders*, *32*(1), 7-18. https://doi.org/10.1097/TLD.0b013e318244557a

Shanahan, T., & Shanahan, C. (2017). Disciplinary literacy: Just the faqs. *Educational Leadership, 74*(5), 18-22.

Shekary, M., & Tahririan, M. H. (2006). Negotiation of meaning and noticing in text-based online chat. *The Modern Language Journal*, *90*(4), 557-573.

Shim, Y. S. (2010). Korean University Students' Perception of English-Medium Instruction. *English Language and Linguistics, 16*(3), 47-67. [In Korean]

Shim, Y. S. (2012). The effect of English-medium instruction on university students' listening ability. *Modern English Education, 13*(1), 149-166. [In Korean]

Smith, K. (2004). Studying in an additional language: What is gained, what is lost and what is assessed? In Wilkinson (Ed.), *Integrating content and language: Meeting the challenge of a multilingual higher education* (pp. 78–93). Maastricht: Universitaire pers.

Smit, U., & Dafouz, E. (2012). Integrating content and language in higher education: An introduction to English-medium policies, conceptual issues and research practices across Europe. *Aila Review*, *25*(1), 1-12.

Song, Y. S. (2008). Factors influencing course satisfaction of EMI at universities in Korea. *The Journal of Educational Information and Media, 14*(3), 61-84. [In Korean]

Soruç, A., & Griffiths, C. (2017). English as a medium of instruction: students' strategies.

ELT Journal, *72*(1), 38-48.

Stohler, U. (2006). The Acquisition of Knowledge in Bilingual Learning: An Empirical Study on the Role of Language in Content Learning. *VIEWS-Vienna English working papers*, *15*(3), 41-46.

Street, B.V. (2001). Contexts for literacy work: The "new orders" and the "new literacy studies." In J. Crowther, M. Hamilton & L. Tett (Eds.), *Powerful literacies* (p. 13-22). Leicester: NIACE.

Street, B. V. (2015). Academic Writing: Theory and Practice. *Journal of Educational Issues*, *1*(2), 110-116.

Swain, M. (1995). Three functions of output in second language learning. In G. Cook & B. Siedlhofer (Eds.), *Principle and practice in applied linguistics* (pp. 125– 144). Oxford, UK: Oxford University Press.

Swain, M. (1998). Focus on form through conscious reflection. In Doughty, C, Williams, J. (Eds.), *Focus on form in classroom second language acquisition* (pp. 64– 81). Cambridge: Cambridge University Press.

Swain, M. (2000). The output hypothesis and beyond: Mediating acquisition through collaborative dialogue. In J. P. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 97– 114). Oxford, UK: Oxford University Press.

Swain, M., & Lapkin, S. (1995). Problems in output and the cognitive processes they generate: A step towards second language learning. *Applied Linguistics*, *16*(3), 371-391. https://doi.org/10.1093/applin/16.3.371

Swain, M., & Lapkin, S. (1998). Interaction and Second Language Learning: Two Adolescent French Immersion Students Working Together. *The Modern Language Journal*,*82*(3), 320-337. https://doi.org/10.1111/j.1540-4781.1998.tb01209.x

Tang, K. S. (2016). How is disciplinary literacy addressed in the Science classrooms? A

Singaporean case study. *Australian Journal of Language and Literacy, 39*(3), 200-232.

Tatzl, D. (2011). English-medium masters' programmes at an Austrian university of applied sciences: Attitudes, experiences and challenges. *Journal of English for Academic Purposes, 10*, 252-270.

Thomas, G. (2011). The case: generalisation, theory and phronesis in case study. *Oxford Review of Education*, *37*(1), 21-35.

Tong, F., & Shi, Q. (2012). Chinese–English bilingual education in China: A case study of college science majors. *International Journal of Bilingual Education and Bilingualism, 15*(2), 165-182. https://doi.org/10.1080/ 13670050.2011.607921

Uchihara, T., & Harada, T. (2018). Roles of Vocabulary Knowledge for Success in English-Medium Instruction: Self-Perceptions and Academic Outcomes of Japanese Undergraduates. *TESOL Quarterly*, *52*(3), 564-587.

Unterberger, B., & Wilhelmer, N. (2011). English-medium education in economics and business studies: Capturing the status quo at Austrian universities. *International Journal of Applied Linguistics, 161*, 90-110.

Van de Poel, K., & Gasiorek, J. (2012). Effects of an efficacy-focused approach to academic writing on students' perceptions of themselves as writers. *Journal of English for Academic Purposes, 11*(4), 294-303.

Van de Poel, K., & Van Dyk, T. (2014). Discipline-specific academic literacy and academic integration. In *Integrating content and language in higher education: From theory to practice. Frankfurt am Main: Peter Lang*, 162-179.

Van der Walt, M. (2009). Study orientation and knowledge of basic vocabulary in Mathematics in the primary school. *Suid-Afrikaans Tydskrif vir Natuurwetenskap en Tegnologie/South African Journal of Science and Technology*, *28*(4), 378-392.

Van der Walt, M., Maree, K., & Ellis, S. (2008). A mathematics vocabulary questionnaire for

use in the intermediate phase. *South African Journal of Education, 28*(4), 489-504.

Van Lier, L. (1988). *The classroom and the language learner: Ethnography and second-language classroom research*. London: Longman.

Vu, N. T., & Burns, A. (2014). English as a medium of instruction: Challenges for Vietnamese tertiary lecturers. *Journal of Asia TEFL, 11*(3), 1-31.

Wächter, B., & Maiworm, F. (2008). *English-taught programmes in European higher education. The picture in 2007*. Bonn: Lemmens.

Wächter, B., & Maiworm, F. (2014). *English-taught programmes in European higher education. The state of play in 2014*. Bonn: Lemmens.

Walkinshaw, I., Fenton-Smith, B., & Humphreys, P. (2017). EMI issues and challenges in Asia-Pacific higher education: An introduction. In *English medium instruction in higher education in Asia-Pacific* (pp. 1-18). Springer, Cham.

Webster, H. (2005). The architectural review: A study of ritual, acculturation and reproduction in architectural education. *Arts and humanities in higher education, 4*(3), 265-282.

Werther, C., Denver, L., Jensen, C., & Mees, I. M. (2014). Using English as a medium of instruction at university level in Denmark: the lecturer's perspective. *Journal of Multilingual and Multicultural Development, 35*(5), 443-462.

Wilkinson, D. (2015). English-medium content courses: Student approaches and strategies to increase comprehension levels. *International Journal of Learning, Teaching and Educational Research, 11*(3).

Wilkinson, R. (2013). English-medium instruction at a Dutch university: Challenges and pitfalls. In A. Doiz, D. Lasagabaster, & J. M. Sierra (Eds.), *English-medium instruction at universities: Global challenges* (pp. 3–24). Bristol, UK: Multilingual Matters.

Williams, D. G. (2015). A systematic review of English medium instruction (EMI) and

implications for the South Korean higher education context. *English Language Teaching World Online.com.* Retrieved May 2019, from: http://blog.nus.edu.sg/eltwo/2015/04/27/a-systematic-review-of-English-medium-instruction-emi-and-implications-for-the-south-korean-higher-education-context-2/

Williams, J. (2001). The effectiveness of spontaneous attention to form. *System, 29*(3), 325-340.

Woodward-Kron, R. (2002). *Disciplinary learning through writing: An investigation into the writing development of undergraduate education students*. (Unpublished doctoral dissertation, University of Wollongong, Australia). Retrieved from https://ro.uow.edu.au/cgi/viewcontent.cgi?referer=https://scholar.google.co.kr/&httpsredir=1&article=2776&context=theses

Woodward-Kron, R. (2008). More than just jargon–the nature and role of specialist language in learning disciplinary knowledge. *Journal of English for Academic Purposes, 7*(4), 234-249.

Wolsey, D., & Faust, M. (2013). Getting Started with Disciplinary Literacy. *California Reader, 46*(3).

Wolff, D. (2003). Content and language integrated learning: a framework for the development of learner autonomy. In D. Little, J. Ridley and E. Ushioda (eds) *Learner Autonomy in the Foreign Language Classroom* (pp. 211-222). Dublin: Authentik.

Yang. S. (2014). *The study of variables influencing the effect of English medium instruction on academic content learning and English proficiency development* (Doctoral dissertation, The Pennsylvania State University, Pennsylvania, The United States). Retrieved March 2018, from https://etda.libraries.psu.edu/catalog/22592

Yeh, C. C. (2014). Taiwanese students' experiences and attitudes towards English-medium courses in tertiary education. *RELC Journal, 45*(3), 305-319.

Yin, R. K. (2014). *Case study research: Design and methods (applied social research methods)*. Thousand Oaks, CA: Sage publications.

Yip, D. Y. (2003). *The effects of the medium of instruction on science learning of Hong Kong secondary students* (Doctoral dissertation, University of Nottingham, Nottingham, the United Kingdom). Retrieved June 2018, from https://core.ac.uk/download/pdf/33565343.pdf

Yip, D. Y., Coyle, D., & Tsang, W. K. (2007). Evaluation of the effects of the medium of instruction on science learning of Hong Kong secondary students: Instructional activities in science lessons. *Education Journal, 35*(2), 77-107.

Zaif, Karapınar & Eksi. (2017). A comparative study on the effectiveness of English-medium and Turkish-medium accounting education: Gazi University case, *Journal of Education for Business, 92*(2), 73-80. https://doi.org/10.1080/08832323.2017.1279117

Zyuzin, A. (2012). *How assessment practices influence the academic acculturation process of international graduate students* (Master's Thesis, Queen's University, Kingston, Canada). Retrieved from http://ezproxy.auckland.ac.nz/login?url=https://www.proquest.com/dissertations-theses/how-assessment-practices-influence-academic/docview/1513977845/se-2?accountid=8424

Appendix A: Ethics Approval for the Study

Office of the Vice-Chancellor
Office of Research Strategy and Integrity (ORSI)

The University of Auckland
Private Bag 92019
Auckland, New Zealand

Level 11, 49 Symonds Street
Telephone: 64 9 373 7599
Extension: 83711
humanethics@auckland.ac.nz

UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE (UAHPEC)

30-Aug-2019

MEMORANDUM TO:

Assoc Prof Helen Basturkmen
App Lang Studies & Linguistics

Re: Application for Ethics Approval (Our Ref. 023287): Approved

The Committee considered the application for ethics approval for your study entitled **English-medium instruction in Korean secondary and higher education: A case study investigation.**

We are pleased to inform you that ethics approval has been granted for a period of three years.

The expiry date for this approval is 30-Aug-2022.

Completion of the project: In order that up-to-date records are maintained, you must notify the Committee once your project is completed.

Amendments to the project: Should you need to make any changes to the project, please complete an Amendment Request form in InfoEd, giving full details along with revised documentation. If the project changes significantly, you are required to submit a new application to UAHPEC for approval.

Funded projects: If you received funding for this project, please provide this approval letter to your local Faculty Research Project Coordinator (RPC) or Research Project Manager (RPM) so that the approval can be notified via a Service Request to the Research Operations Centre (ROC) for activation of the grant.

The Chair and the members of UAHPEC would be happy to discuss general matters relating to ethics approvals. If you wish to do so, please contact the Ethics Administrators at humanethics@auckland.ac.nz in the first instance.

Additional information:

1. Do not forget to complete the 'approval wording' on the PISs, CFs and/or advertisements and emails, giving the dates of approval and the reference number. This needs to be completed before you use the documents or send them out to your participants.

Please quote Protocol number **023287** on all communication with the UAHPEC regarding this application.

Appendix B: A Sample of Participant Information Sheet and Consent Form

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

Participant Information Sheet
(Principal)

Title: Attention to Language in English-Medium Instruction in High School and University Settings in South Korea

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

My name is Jiye Hong. I am a doctoral student in Applied Linguistics at the University of Auckland, and my supervisor is Helen Basturkmen. I am the main researcher for this study. I am investigating attention to language that occurs in disciplinary (that is, subject-specialist) classrooms taught in the medium of English in the Korean education context. I am inviting two teachers and a course coordinator from your school to take part in my research. I would like your permission to ask your assistant to send out an invitation email to teachers for me. Your school has been chosen because it is a high school that teaches disciplinary classes in the medium of English. This research is the main PhD study in relation to the pilot study that was conducted last year in your school, which investigated the occurrence of language-related episodes (LREs), which are parts of a dialogue where language learners talk about the language they are producing, question their language use, or correct themselves or others, in the disciplinary classrooms in a public high school in Korea where English is used as a medium of instruction (EMI).

The main study aims to expand the pilot study by examining not only unplanned attention to the language but also planned attention (how teachers aim to support their students' English learning) in two different EMI settings, a school and a university. Moreover, this study will investigate if students learn English (disciplinary vocabulary) from such settings. I wish to (1) observe and audio record naturally occurring lessons, (2) conduct a written vocabulary test for your students, and (3) interview teachers and coordinator at the end of the study.

I will be available to make the observations between 10th September and 30th November 2019. During the study, a maximum of five classroom observations, a written vocabulary test for the whole class and individual interviews with the EMI teachers and course coordinator will be conducted. During the observation, I will audio record the lessons and sit in the classes to take some notes about the setting, activities, and the numbers of students who engage in LREs. From the recordings of the classes, I will identify any LREs that can be used for testing students' leaning of disciplinary vocabulary. A 15-minute written vocabulary test will be given to the whole class, including non-/partial-participating student. Only the data from LREs and test answers of the students who are willing to participate in both the observations and the test will be used for the research. Lastly, I will interview the teachers and course coordinator during the following week of the last class observation. The exact date and time for the interview will be determined by appointment.

The recordings will be transcribed. The transcription of recordings will be stored with a password in my personal Google Drive that is linked to the main researcher's university email address for six years for the prevention of other's access. In order to destroy data from the audio recorders, I will use a software application, ERASER. The drive will be formatted by deleting all the files and emptying the bin after six years. The researcher will shred the hard copy data such as consent forms and test papers after six years. Your consent form will be kept in the principal supervisor's locked cabinet for six years and then will be shredded.

Teachers', course coordinator's, and students' participation in this study is completely voluntary. The recordings will be confidential to me as the researcher. This means that you will not be given access to recordings or transcripts from the classes. I would like to seek an assurance from you that participation or non-participation of the teachers, the course coordinator, and students will not have any impact on their employment, their grades, or their relationship with the school.

I will not use your school's name in the study, and no one will be able to identify your school. The recordings will only be accessed and transcribed by the researcher. They will be stored with a password in Google Drive for six years.

If you are willing for your school to participate, please sign a Consent Form and give it to me in person when I visit you a week before the first day of observation. If you have any questions or if you want to know more about the study, please feel free to ask me. You may contact me directly at:

Jiye Hong
School of Culture, Languages and Linguistics.
The University of Auckland.
Email: jhon860@aucklanduni.ac.nz
Local contact in Korea:

Main supervisor Associate Professor Helen Basturkmen
Department of Applied Language Studies and Linguistics
University of Auckland, Private Bag 92019
Tel: Email: h.basturkmen@auckland.ac.nz

The Head of Department, Professor Bernadette Luciano
School of Cultures, Languages and Linguistics,
University of Auckland, Private Bag 92019,
Auckland, New Zealand
Tel: Email: b.luciano@auckland.ac.nz

For any queries regarding ethical concerns, you may contact the Chair, University of Auckland Human Participants Ethics Committee, Office of Research Strategy and Integrity, University of Auckland, Private Bag 92019, Auckland1142. Tel: 09 373 7599 ext. 83711. Email: humanethics@auckland.ac.nz

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

CONSENT FORM
(Principal)
THIS FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Title: **Attention to Language in English-Medium Instruction in High School and University Settings in South Korea**

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

I have read the Participant Information Sheet, have understood the nature of the researcher and why my school has been selected. I have had the opportunity to ask questions and have had them answered to my satisfaction.

- I allow Jiye Hong to access the school for this research.
- I give my assurance that participation or non-participation will not have any impact on students' grades or relationship with the school.
- I also give my assurance that participation or non-participation will not have any impact on teachers' and the course coordinator's employment or relationship with the school.
- I understand that I cannot access data or edit them.
- I do/do not wish to receive a summary of findings, which can be emailed to me at this email address:

Name:

Date:

Signature:

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

Participant Information Sheet
(Deans)

Title: Attention to Language in English-Medium Instruction in High School and University Settings in South Korea

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

My name is Jiye Hong. I am a doctoral student in Applied Linguistics at the University of Auckland, and my supervisor is Helen Basturkmen. I am the main researcher for this study. I am investigating attention to language that occurs in disciplinary (that is, subject-specialist) classrooms taught in the medium of English in the Korean education context. I am inviting one lecturer and one-course coordinator from your department to take part in my research. I would like your permission to ask your assistant to send out an invitation email to lecturers for me. Your department has been chosen because it provides disciplinary classes in the medium of English. This research is the main PhD study in relation to the pilot study that was conducted last year, which investigated the occurrence of language-related episodes (LREs), which are parts of a dialogue where language learners talk about the language they are producing, question their language use, or correct themselves or others, in the disciplinary classrooms in a public high school in Korea where English is used as a medium of instruction (EMI).

The main study aims to expand the pilot study by examining not only unplanned attention to the language but also planned attention (how teachers aim to support their students' English learning) in two different EMI settings, a school and a university. Moreover, this study will investigate if students learn English (disciplinary vocabulary) from such settings. I wish to (1) observe and audio record naturally occurring lessons, (2) conduct a written vocabulary test for your students, and (3) interview teachers and coordinator at the end of the study.

I will be available to make the observations between 10th September and 30th November 2019. During the study, a maximum of five classroom observations, a written vocabulary test for the whole class and individual interviews with the EMI teachers and course coordinator will be conducted. During the observation, I will audio record the lessons and sit in the classes to take some notes about the setting, activities, and the numbers of students who engage in LREs. From the recordings of the classes, I will identify any LREs that can be used for testing students' leaning of disciplinary vocabulary. A 15-minute written vocabulary test will be given to the whole class, including non-/partial-participating student. Only the data from LREs and test answers of the students who are willing to participate in both the observations and the test will be used for the research. Lastly, I will interview the lecturer and course coordinator during the following week of the last class observation. The exact date and time for the interview will be determined by appointment.

The recordings will be transcribed. The transcription of recordings will be stored with a password in my personal Google Drive that is linked to the main researcher's university email address for six years for the prevention of other's access. In order to destroy data from the audio recorders, I will use a

software application, ERASER. The drive will be formatted by deleting all the files and emptying the bin after six years. The researcher will shred the hard copy data such as consent forms and test papers after six years. Your consent form will be kept in the principal supervisor's locked cabinet for six years and then will be shredded.

Lecturer's and students' participation in this study is completely voluntary. The recordings will be confidential to me as the researcher. This means that you will not be given access to recordings or transcripts from the classes. I would like to seek an assurance from you that participation or non-participation of the lecturer, the course coordinator, and students will not have any impact on their employment or their grades or relationship with the school.

I will not use the university's name in the study, and no one will be able to identify your school. The recordings will only be accessed and transcribed by the researcher. They will be stored with a password in Google Drive for six years.

If you are willing for your department to participate, please sign a Consent Form and give it to me in person when I visit you a week before the first day of observation. If you have any questions or if you want to know more about the study, please feel free to ask me. You may contact me directly at:

Jiye Hong
School of Culture, Languages and Linguistics.
The University of Auckland.
Email: jhon860@aucklanduni.ac.nz
Local contact in Korea:

Main supervisor Associate Professor Helen Basturkmen
Department of Applied Language Studies and Linguistics
University of Auckland, Private Bag 92019
Auckland, New Zealand
Tel: Email: h.basturkmen@auckland.ac.nz

The Head of Department, Professor Bernadette Luciano
School of Cultures, Languages and Linguistics,
University of Auckland, Private Bag 92019,
Auckland, New Zealand
Tel: Email: b.luciano@auckland.ac.nz

For any queries regarding ethical concerns, you may contact the Chair, University of Auckland Human Participants Ethics Committee, Office of Research Strategy and Integrity, University of Auckland, Private Bag 92019, Auckland1142. Tel: 09 373 7599 ext. 83711. Email: humanethics@auckland.ac.nz

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

CONSENT FORM
(Deans)
THIS FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Title: **Attention to Language in English-Medium Instruction in High School and University Settings in South Korea**

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

I have read the Participant Information Sheet, have understood the nature of the researcher and why my school has been selected. I have had the opportunity to ask questions and have had them answered to my satisfaction.

- I allow Jiye Hong to access the lecturers and students for this research.
- I give my assurance that participation or non-participation will not have any impact on students' grades or relationship with the school.
- I also give my assurance that participation or non-participation will not have any impact on the lecturer's and the course coordinator's employment or relationship with the school.
- I understand that I cannot access data or edit them.
- I agree to my assistant emailing all lecturers in the department about participating in the research.
- I do/do not wish to receive a summary of findings, which can be emailed to me at this email address:

Name:
Date:
Signature:

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

Participant Information Sheet
(Teachers/Lecturers)

Title: Attention to Language in English-Medium Instruction in High School and University Settings in South Korea

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

My name is Jiye Hong. I am a doctoral student in Applied Linguistics at the University of Auckland, and my supervisor is Helen Basturkmen. I am the main researcher for this study. I am investigating attention to language that occurs in disciplinary (that is, subject-specialist) classrooms taught in the medium of English in the Korean education context. I am inviting you to take part in my research, and I would like your participation very much. You have been chosen because you are a high school teacher/a university lecturer who teaches a disciplinary subject in English. This research is the main PhD study in relation to the pilot study entitled "Language Related Episodes in disciplinary classrooms in EMI settings (Ref 021203)". It investigated the occurrence of language-related episodes (LREs), which are parts of a dialogue where language learners talk about the language they are producing, question their language use, or correct themselves or others in the disciplinary classrooms in a public high school in Korea where English is used as a medium of instruction (EMI). The disciplinary class means a class that teaches a particular area of studies, such as Economics or Mathematics. From the pilot study, I found that teachers and students frequently drew attention to the language during the EMI classes with a rate of 1 LRE every 1.5 minutes, and 80% of LREs focused on vocabulary.

The main study aims to expand the pilot study by examining not only unplanned attention to the language but also planned attention (how teachers aim to support their students' English learning) in two different EMI settings, a school and a university. Moreover, this study will investigate if students learn English (Disciplinary vocabulary) from such settings. I wish to (1) observe and audio record naturally occurring lessons, (2) conduct a written vocabulary test for your students, and (3) interview you at the end of the study. I will be available to conduct the study between September 10 and November 30, 2019. During the study, five classroom observations, a written language test for students and an individual interview with EMI teachers/lecturers will be conducted. During the observations, I will audio record the lessons and sit in the classes to take some notes about the setting and activities. From the recordings of the classes, I will identify any LREs that can be used for testing students' learning of disciplinary language. A written language test will be given to the whole class, including non-/partial-participating students. However, only the LREs and test answers of the students who are willing to participate in both classroom observation and the test will be used for the research. The test will be no longer than 15 minutes, and I would like to carry out the test during the class time a week after the last classroom observation. I would like your consultation for the time and duration of the testing. The test results of the participating students will not be accessible for you. Lastly, I will interview you during the following week of the last classroom observation. The exact date and time for the interview will be

determined by appointment. The interview will be held no longer than 50 minutes. You will be provided with the interview questions before the interview. The interview will be audio recorded. You will be provided with a transcript of your interview. You can make any changes into your interview transcript, if necessary, for two weeks from your receipt. Once you finish reviewing and editing your transcript, please email the file to me.

The recordings will be transcribed. The transcription of recordings will be stored with a password in a personal Google Drive that is linked to the main researcher's university email address for six years for the prevention of others' access. In order to destroy data from the audio recorders, I will use a software application, ERASER. The drive will be formatted by deleting all the files and emptying the bin after six years. The researcher will shred the hard copy data such as consent forms and test papers after six years. Your consent form and students' test papers will be kept in the principal supervisor's locked cabinet for six years and then will be shredded.

Your participation in this study is completely voluntary. You may choose not to participate in the study without any penalty or loss of benefits to which you may otherwise be entitled. You will not be given access to recordings or transcripts from your classes. Assurance has been provided by the Principal that participation or non-participation will have no impact on your employment or relationship with the school. If you consent to participate and then change your mind, you may withdraw by informing the research by latest September 10, 2019.

I will not use your name in the study, and no one will be able to identify you. Recordings will only be accessed and transcribed by the researcher. They will be stored with a password in my personal Google Drive for six years. If you are willing to participate, please sign a Consent Form and give it to me in person when I visit you a week before the first day of observation. If you have any questions or want to know more about the study, please feel free to ask me. You may contact me directly at:

Jiye Hong
School of Culture, Languages and Linguistics.
The University of Auckland.
Email: jhon860@aucklanduni.ac.nz
Local contact in Korea:

Main supervisor Associate Professor Helen Basturkmen
Department of Applied Language Studies and Linguistics
University of Auckland, Private Bag 92019
Auckland, New Zealand
Tel: Email: h.basturkmen@auckland.ac.nz

The Head of Department, Professor Bernadette Luciano
School of Cultures, Languages and Linguistics,
University of Auckland, Private Bag 92019,
Auckland, New Zealand
Tel: Email: b.luciano@auckland.ac.nz

For any queries regarding ethical concerns, you may contact the Chair, University of Auckland Human Participants Ethics Committee, Office of Research Strategy and Integrity, University of Auckland, Private Bag 92019, Auckland1142. Tel: 09 373 7599 ext. 83711. Email: humanethics@auckland.ac.nz
Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

CONSENT FORM
(Teachers/lecturers)
THIS FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Title: **Attention to Language in English-Medium Instruction in High School and University Settings in South Korea**

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

I have read the Participant Information Sheet, have understood the nature of the researcher and why my school has been selected. I have had the opportunity to ask questions and have had them answered to my satisfaction.

- I agree to take part in this research
- I agree with my class to be audio recorded.
- I allow Jiye Hong to carry out a vocabulary test in normal class time.
- I agree with my interview to be audio recorded.
- I understand that I do not have the opportunity to access the recordings.
- I understand that the Principal/Dean has given assurance that participation or non-participation will not have any impact on my employment or relationship with the school.
- I give my assurance that students' participation or non-participation will not have any impact on their grades or relationship with me.
- I understand that I do not have the opportunity to access the test results.
- I understand that I will receive a transcript of the interview for review, and I can clarify any misunderstandings the researcher makes.
- I understand that there will be no payment for my participation.
- I do/do not wish to receive a summary of findings, which can be emailed to me at this email address:

Name: Date:

Signature:

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

Participant Information Sheet
(Students)

Title: Attention to Language in English-Medium Instruction in High School and University Settings in South Korea

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

My name is Jiye Hong. I am a doctoral student in Applied Linguistics at the University of Auckland, and my supervisor is Helen Basturkmen. I am the main researcher for this study. I am investigating attention to language that occurs in disciplinary (that is, subject-specialist) classrooms taught in the medium of English in the Korean education context. I am inviting you to take part in my research, and I would like your participation very much. You have been chosen because you are a student who takes a disciplinary class/lecture in English. This research is the main PhD study in relation to the pilot study entitled "Language Related Episodes in disciplinary classrooms in EMI settings (Ref 021203)". It investigated the occurrence of language-related episodes (LREs), which are parts of a dialogue where language learners talk about the language they are producing, question their language use, or correct themselves or others in the disciplinary classrooms in a public high school in Korea where English is used as a medium of instruction (EMI). The disciplinary class means a class that teaches a particular area of studies, such as Economics or Mathematics. From the pilot study, I found that teachers and students frequently drew attention to the language during the EMI classes with a rate of 1 LRE every 1.5 minutes, and 80% of LREs focused on vocabulary.

The main study aims to expand the pilot study by examining not only unplanned attention to the language but also planned attention (how teachers and lecturers aim to support their students' English learning) in two different EMI settings, a school and a university. Moreover, this study will investigate if students learn English (disciplinary vocabulary) from such settings. I wish to observe and audio record naturally occurring lessons and conduct a written language test.

For the whole research, I will be allocating your seats with numbers. I will give you a number plate which I would like you to bring to the class and place it on your desk for all five lessons observed. This is to track non-/partial-participants without collecting your names or ID numbers. During the observations, I will audio record the lessons and sit in the classes to take some notes about the setting, activities, and interaction. The observations will be used for the main study for my PhD study. You may choose not to be audio-recorded for the class observations, and you may be asked to sit far from the audio recorder so that your voice is not recorded. I will also conduct a 15-minute written language test that asks about words or other language items that are focused within LREs from all five lessons that I will be observing.

The test will be given during normal class/lecture time a week after the last observation. The exact date and time of the test will be announced at the beginning of the class/lecture on the last day of observation. Although the test will be given to the whole class, I will use only the students' test answers

who agree to have their test answers used in the research. Each test answer will be connected to an individual student who engages in each LRE by focusing on a certain vocabulary. I will identify who is related to each test item by tracking the allocated numbers. The test results will only be access by me, the main research. The test will have no impact on your grades or studies and will only be used for the research. Feedback on your test will not be provided to you and your teacher/lecturer. The recordings of the lessons will be transcribed. The transcription of recordings will be stored in a personal Google Drive that is linked to the main researcher's university email address for six years for the prevention of others' access. In order to destroy data in audio recorders, I will use the software, ERASER. Your consent form and test papers will be kept in the principal supervisor's locked cabinet for six years and then will be shredded.

Your participation in this study is completely voluntary. There will be no financial or direct benefits for you. You may refuse to participate in the study without penalty or loss of benefits to which you may otherwise be entitled. The teacher/lecturer has given their assurance that participating or not will have no impact on your standing in the school or your grades. If you do not wish to participate in the whole research, you can inform the researcher by September 10, 2019. If you consent to participate and then change your mind, you may withdraw by informing the researcher anytime during the period of the research without giving any reason. Please note that you cannot withdraw your contribution to the recordings in class once you have consented to participate and your voice has already been recorded before you change your mind because of the nature of group recordings. You may refuse to have your test answers used in the research separately from your participation in classroom observations at any time before the end of the fourth classroom observation. I will not use your name in the study. All the information except any personal information that I collect about the classes will only be used for this research. The recordings will only be accessed and transcribed by the researcher. They will be stored in a personal Google Drive for six years. If you are willing to participate, please sign a Consent Form and give it to me. I will collect the CF on the first day of the observation before the class starts. If you have any questions or if you want to know more about the study, please ask now or contact me directly at:

Jiye Hong
School of Culture, Languages and Linguistics.
The University of Auckland.
Email: jhon860@aucklanduni.ac.nz Local contact in Korea:

Main supervisor Associate Professor Helen Basturkmen
Department of Applied Language Studies and Linguistics
University of Auckland, Private Bag 92019, Auckland, New Zealand
Tel: Email: h.basturkmen@auckland.ac.nz

The Head of Department, Professor Bernadette Luciano
School of Cultures, Languages and Linguistics,
University of Auckland, Private Bag 92019, Auckland, New Zealand
Tel: Email: b.luciano@auckland.ac.nz

For any queries regarding ethical concerns, you may contact the Chair, University of Auckland Human Participants Ethics Committee, Office of Research Strategy and Integrity, University of Auckland, Private Bag 92019, Auckland1142. Tel: 09 373 7599 ext. 83711. Email: humanethics@auckland.ac.nz

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

CONSENT FORM
(High school students)
THIS FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Title: **Attention to Language in English-Medium Instruction in High School and University Settings in South Korea**

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

I have read the Participant Information Sheet, have understood the nature of the researcher and why my school has been selected. I have had the opportunity to ask questions and have had them answered to my satisfaction.

- I agree to take part in this research.
- I agree to participate in the observations by being audio recorded and having my speaking used in the study.
- I understand that I do not have the opportunity to edit transcripts or access recordings.
- I understand that the Principal and teacher have given assurance that participation or non-participation will not have any impact on my grade.
- I understand that there will be no payment for my participation.
- I understand that I can refuse to have my test answers used in the research by informing the researcher at any time before the final observation.
- I understand that I cannot withdraw my contribution to the class recordings once I have consented to participate.
- I do/do not wish to receive a summary of findings, which can be emailed to me at this email address:
- I agree to participate in the class observations and recordings _____ and have my test results used for research _____ (Please check)

Name: Date:

Signature:

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Applied Linguistics and Language Teaching
ARTS 2 Building 207
Level 3, Room 311
18 SYMONDS ST
AUCKLAND 1010
New Zealand

CONSENT FORM
(University students)
THIS FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Title: **Attention to Language in English-Medium Instruction in High School and University Settings in South Korea**

Principal Supervisor: Helen Basturkmen
Student Researcher: Jiye Hong

I have read the Participant Information Sheet, have understood the nature of the researcher and why my school has been selected. I have had the opportunity to ask questions and have had them answered to my satisfaction.

- I agree to take part in this research.
- I agree to participate in the observations by being audio recorded and having my speaking used in the study.
- I understand that I do not have the opportunity to edit transcripts or access recordings.
- I understand that the Dean and lecturer have given assurance that participation or non-participation will not have any impact on my grade.
- I understand that there will be no payment for my participation.
- I understand that I can refuse to have my test answers used in the research by informing the researcher at any time before the final observation.
- I understand that I cannot withdraw my contribution to the class recordings once I have consented to participate.
- I do/do not wish to receive a summary of findings, which can be emailed to me at this email address:
- I agree to participate in the class observations and recordings _____ and have my test results used for research _____ (Please check)

Name: Date:

Signature:

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Appendix C: Semi-structured interview protocol

Date: / / 2019 High school ( ) / University ( )

Introductory script:

First of all, thank you for your participation in this interview. You have been selected to speak with me today as you teach English Medium Instruction classes in this school. My study focuses on EMI classes, with a specific interest in understanding how teachers support students' English learning in EMI classes. I do not aim to evaluate your experiences or techniques. The focus is to case study more about how teachers practice and support student' learning in EMI classes. I have planned this interview to last no longer than 50 minutes.

During this session, there are several questions that I would like to cover with you. There is no specific format outline in your replies, so please feel free to answer as you please. If you have brought any documents relevant to your EMI class, please feel free to refer to them as you answer the questions. To facilitate the note-taking, I'd like to audio record our conversations today, as I mentioned in PIS and consent form. You will be provided with a summary of our conversation via email within five days after the interview. If you have any uncertainties or want to add any other thoughts to it, please let me know.

Interviewee background:

How long have you been teaching? _____

at this school / university? _____

teaching EMI programmes? _____

What is your highest degree? _____

What is your field of study? _____

Questions on language support (attention):

What kind of language support (e.g. glossary, translated summary, etc.) do you provide to students prior to teaching?

Probe: How long have you provided support to students?
Who is involved in developing support?
Are there any guidelines from the school/department?
Do you provide support to students prior to the class or after the class?
How frequently do you provide them to students?

How do you use the support in relation to EMI classes/lectures? (e.g. reading through the glossaries together, asking students to read summaries before the class, etc.)

Probe: Which of the strategies you have mentioned was most effective?

How do you perceive your role in relation to your EMI classes?

Probe: Do you think dealing with English is a part of teaching your subject in English?

if yes,

Do you sometimes collaborate with ESL/EAP teachers?
Do you sometimes correct any English mistakes students make in speech or in writing?

C4. *What do you see as the functions of the language support you provide?*

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019, for three years. Reference Number 023287

Appendix D: Observation Schedule

Observation Schedule

TITLE: Language-related episodes (LREs) in EMI classrooms in Korea

Observer: Jiye Hong Date (Time): ___ / ___ / 2018 (: ~ :)

Subject: Number of Students:

Lesson Topic:

	General Interaction	Teacher's Action	Students' Action	Note on attention to language	Note
	Teacher to Class (T-C), Teacher to student (T-S), Student to Teacher (S-T)				
Stage ( ) Time (~)					
Stage ( ) Time (~)					
Stage ( ) Time (~)					

Approved by the University of Auckland Human Participants Ethics Committee on August 30, 2019 for three years. Reference Number 023287

Appendix E: Transcription conventions based on Markee (2011)

Symbol	Meaning
C	Class
S	Student
T	Teacher
CAPITALS	Emphasis
**	Student's or someone else's name called by the teacher
(silence)	Extra information
<>	In audible
()	Untimed pause
(.)	Micro pause
(:)	Lengthening
(1)	Longer pause marked with the number of seconds in parentheses
?	Rising intonation (not necessarily a question)
.	Falling (final) intonation
,	Low-rising intonation suggesting continuation
…	Continuing discourse

Appendix F: Language test sheet

Written language test (Economics) **Allocated number**_____

PLEASE DO NOT WRITE YOUR NAME OR ID NUMBER ON THIS TEST PAPER

1. The following sentence contains an error. Please find out the error and correct it to improve the sentence: The acronym, *K*, stands for quantity. _____ (Answer: Capital)	7. Please fill in the blank with the appropriate word: C_____ returns to output _____ (Answer: Constant)
2. The following sentence contains an error. Please find out the error and correct it to improve the sentence: In the beginning, ATC decreases and eventually, it increases. So, if you draw the ATC graph, the shape of the graph will be reverted U-shape. (Answer: reverted → reversed)	8. Please rewrite the underlined section in the following sentence correctly: By lowering costs, a company can get economic scale. A_____ (answer: achieve economies of scale)
3. The following sentence contains an error. Please find out the error and correct it to improve the sentence: The shape of the graph looks like line. _____ (Answer: line → linear)	9. Please rewrite the underlined section in the following sentence correctly. According to the law of diminishing returns, marginal cost is relation of marginal product. _____ (Answer: is reciprocal of)
4. Please provide the meaning of the following word: Outlay _____ (Answer: an amount of money we spend on something)	10. Please provide the meaning of the following word: Welfare _____ (Answer: to live well/healthy/happily)
5. The following sentence contains an error. Please find out the error and correct it to improve the sentence: f-1(f(x)) is a combined function _____ (Answer: combined → composition)	11. Please rewrite the underlined section in the following sentence correctly. Companies get diseconomy early in their business growth. E_____ (Answer: Experience diseconomies of scale)
6. Please provide the appropriate word for the following definition: This occurs when the consumption or production of a good causes a harmful effect to others. N_____ E_____ (Answer: negative externality)	12. Please rewrite the underlined section in the following sentence: Opportunity Cost (OC) is plus of implicit cost and explicit cost. _____ (answer: is sum of)

Written language test (Mathematics) **Allocated number:_____**

PLEASE DO NOT WRITE YOUR NAME OR ID NUMBER ON THIS TEST PAPER

1. Please rewrite the underlined section in the following sentence correctly: The graph will be transited two units vertically. _____ (Answer: translated)	7. The following sentence contains errors. Please find out the errors and correct them to improve the sentence: The range of y is equal or better than zero _____ (Answer: The range of y is greater than or equal to zero)
2. Please provide the meaning of the following word: Intercepts _____ (Answer: a point on the y-axis)	8. Please fill in the blank with the appropriate word. The name of the value inside the roots is R_____. (Answer: radicand)
3. The following sentence contains errors. Please find out the errors and correct them to improve the sentence: Y is equal or more than zero. _____ (Answer: y is greater than or equal to zero)	9. Please provide the appropriate word for the following definition: The numbers that is in front of a variable and multiply the variable. C_____ (Answer: coefficient)
4. The following sentence contains errors. Please find out the errors and correct them to improve the sentence: X is more or equal to three and y is small than two. _____ (Answer: x is greater than or equal to 3 and y is less than 2)	10. The following sentence contains errors. Please find out the errors and correct them to improve the sentence. The range is y is bigger than or similar to q. _____ (Answer: The range is y is greater than or equal to q)
5. Please rewrite the underlined section in the following sentence correctly: After we got all the numbers, we need to choose x and y. _____ (answer: label)	11. Please rewrite the underlined section in the following sentences correctly. The graph goes three times positive x. _____ (Answer: The graph moves three units in the x-directions/ The graph moves three units to the right)
6. Please fill in the blank in the following sentence with the appropriate word: When y equals to zero, the x-axis is the H____ asymptote. _____ (Answer: horizontal)	

Written language test (Accounting) **Allocated number:**_____

PLEASE DO NOT WRITE YOUR NAME OR ID NUMBER ON THIS TEST PAPER

1. The underlined word in the following sentence is incorrect or inappropriate. Please replace it with the correct or appropriate word. Total revenue is a sum of explicit cost, accounting profit, and depresment. (answer: depreciation)	3. Please provide the synonym for the following term: Net earnings _____ (Net income)
2. Please rewrite the underlined section in the following sentence correctly. The amount that a company owes to its creditors or suppliers is called account payment _____ (Answer: account payable)	4. Please rewrite the underlined section in the following sentence correctly. The monthly portion of the total amount will be cut in the unearned revenue. _____ (answer: will be deducted from)

Written language test (Mathematics-University) **Allocated number:**_____

PLEASE DO NOT WRITE YOUR NAME OR ID NUMBER ON THIS TEST PAPER

1. The following sentence contains errors. Please find the errors and correct them to improve the sentence. X is same to 1π and 2π _____ (Answer: X is equal to 1π and 2π)	4. Please provide the original term for the following acronym: GKD _____ (Answer: Generalised Kronecker Delta)
2. Please provide the meaning of the underlined word: Adding 3 and 4 yields a result of 7. _____ (Answer: to give)	5. Please provide the original term for the underlined abbreviation in the following sentence: "Find the derivative of y w.r.t. x." _____ (Answer: with respect to)
3. Please provide the synonym for the following term: Orthogonal P_____ (Answer: Perpendicular)	6. Please fill in the blank in the following sentence with the appropriate term: A function has a repeating pattern, and it is called P_____ function. (Answer: periodic)

APPENDIX G: LREs from observation 2 of each class

Kim's economics class (SA-E)

E2-1
T: It reflects the increase in the velocity. You know what velocity means? The speed.

E2-2
T: So, in economics, the slope here represents the MP, the marginal product and it's the change in…

E2-3
T: Suppose that at this point, the top point of the slope or at the point that hits the highest of the graph.

E2-4
T: By using the MP curve, we can draw MC curve. MC stands for?
C: Marginal cost.
T: Yes, marginal cost. MP and MC are related very closely.

E2-5
T: Marginal product, MP, equals a change in TP over a change in L.

E2-6
T: Marginal product, MP, equals a change in TP over a change in L. You can also say 'a change in TP over a change in cost'. Because (.) Labour causes cost, right?

E2-7
T: So, when we produce products, in the beginning, marginal product is increasing but, in the end, it's diminishing, decreasing.

E2-8
T: So, the answer would be (.) simply 'a change in L over a change in TP' or 'a change in L caused by a change in TP'.

E2-9
T: So, the definition for the law of diminishing marginal return is (.) at a certain point, employing an additional factor of production makes relatively smaller increase in products. So, this is the definition of the law of diminishing marginal return.

E2-10
T: This makes the firms in the market decide to RETREAT from the market, you know, get out of the market.

E2-11
T: So, variable cost is related to L, labour and fixed cost is related to capital.

E2-12
T: This one is changeable, variable, and the other is fixed, () which means unchangeable.

E2-13
T: This one is changeable, variable, and the other is fixed, which means unchangeable.

E2-14
T: There's total variable cost, a total cost that CAN be changed (.) and fixed cost, a cost that CANNOT be changed, right?

E2-15
T: There's total variable cost, a total cost that CAN be changed… and fixed cost, a cost that CANNOT be changed, right?

E2-16
T: If you divide both sides by output, you can get the average cost, average total cost, ATC.

E2-17
T: So, what I mean here is that Q stands for a quantity of output, right? So, total cost divided by the quantity equals total variable cost, TVC, divided by Q plus TFC divided by quantity…

E2-18
T: So, total cost divided by the quantity equals total variable cost, TVC, divided by Q plus TFC divided by quantity…

E2-19
T: …and this is the average variable cost, which is (.) AVC, plus (.) AFC, the average fixed cost equals average total cost which is (.) ATC.

E2-20
T: …and this is the average variable cost, which is (.) AVC, plus (.) AFC, the average fixed cost equals average total cost which is (.) ATC.

E2-21
T: …and this is the average variable cost, which is (.) AVC, plus (.) AFC, the average fixed cost equals average total cost which is (.) ATC.

E2-22
T: If you divide this by Q, quantity, the quantity of product, you will get the average total cost, ATC, and the average variable cost, AVC, and then, AFC, average fixed cost.

E2-23
T: If you divide this by Q, quantity, the quantity of product, you will get the average total cost, ATC, and the average variable cost, AVC, and then, AFC, average fixed cost.

E2-24
T: If you divide this by Q, quantity, the quantity of product, you will get the average total cost, ATC, and the average variable cost, AVC, and then, AFC, average fixed cost.

E2-25
T: If you divide this by Q, quantity, the quantity of product, you will get the average total cost, ATC, and the average variable cost, AVC, and then, AFC, average fixed cost.

E2-26
T: So, we shall begin with AVC, the average variable cost of labour. Again, variable means? Changeable.

E2-27
T: So, we shall begin with AVC, the average variable cost of labour. Again, variable means? Changeable.

E2-28
T: But as the marginal return diminishes, I mean, when the marginal return gets smaller, MC becomes bigger, MC increases.

E2-29
T: But as the marginal return diminishes, I mean, when the marginal return gets smaller, MC becomes bigger, MC increases.

E2-30
T: You can clearly see that point is the lowest one of the average variable cost when MC exceeds, crosses the average variable cost. That point is the lowest point of the AVC, right?

E2-31
T: You can clearly see that point is the lowest one of the average variable cost when MC exceeds, crosses the average variable cost. That point is the lowest point of the AVC, right?

E2-32
T: However, as the MC exceeds AVC, AVC starts to increase. That's the relationship between the MC curve, marginal cost curve, and average variable cost.

E2-33
T: Second, AFC. AFC is average fixed cost and in economics, fixed here means it is CONSTANT regardless of quantity so, the graph of total fixed cost is horizontal at all output.

E2-34
T: Second, AFC. AFC is average fixed cost and in economics, fixed here means it is CONSTANT regardless of quantity. So, the graph of total fixed cost is horizontal at all output.

E2-35
T: But AFC is TFC divided by Q. TFC is fixed, constant but Q is getting bigger as the output increases.

E2-36
T: The gap between ATC and AVC is?
S: Average fixed cost.
T: Yes, AFC.

E2-37
T: Then the gap between ATC and AVC is getting reduced, getting smaller.

E2-38
S: Isn't 'marginal' an adjective and 'average' a noun?
T: No, they are both adjectives.

E2-39
T: When MC is lower than ATC or AVC, ATC or AVC falls, decreases**.** But when MC is greater than ATC or AVC, then, ATC or AVC is rising, increases. AFC, which is average fixed cost keeps falling as the output increases.

E2-40
T: When MC is lower than ATC or AVC, ATC or AVC falls, decreases**.** But when MC is greater than ATC or AVC, then, ATC or AVC is rising, increases. AFC, which is average fixed cost keeps falling as the output increases.

E2-41
T: When MC is lower than ATC or AVC, ATC or AVC falls, decreases**.** But when MC is greater than ATC or AVC, then, ATC or AVC is rising, increases. AFC, which is average fixed cost keeps falling as the output increases.

E2-42
T: So, as you can see, the gap between ATC and AVC is getting closer in this diagram () and it eventually makes a decrease of AFC, makes AFC keep falling.

E2-43
T: In short-run, capital is fixed whereas labour is variable (.) but in the long-run, on the other hand, all factors, all inputs, are variable.

Glenn's mathematics class (SA-M)
M2-1
T: That doesn't follow the properties, the traits, we are gonna be looking at. You could also have like…

M2-2
T: So, if you have this, 'y equals 2x plus 3 over x plus 1', you can make 'x plus 1' numerable, too.
S: Numerable?
T: Countable. You can make 'x plus 1' countable.

M2-3
S: What if the coefficient of the denominators, x, is bigger than… um… number of… bar? I mean…
T: Uh (.) k will be less than one.
S: So, is denominators are somewhat raise?
T: Yes, denominators are somewhat rising.
S: Yup, okay. And we only need to…

M2-4
T: So, for this one, what do you think the domain would be?
S: x is greater or the same… greater than one over two or the same(:)
T: Yeap, awesome. X is greater than or equal to a half.

M2-5
T: So, if you go to a certain height, there's a formula to <> how far you can see. So, with the height you go to (.) h metres, h for height, by the way. And you can see for a distance of 3,600 times squares of h metres.

M2-6
T: …how many times further can you see from the height of 400 metres than the maximal distance you can see from the height of 100 metres?
S: 66?
T: Umm… So, how many times further, the longer distance can you see?
S: Oh, two. Two?
T: Yeah, we can see two times or twice further.

M2-7
T: Umm (.) So, how many times further, the longer distance can you see?
S: Oh, two. Two?
T: Yeah, we can see two times or twice further.

M2-8
T: So, what do you call, do you know the name of this symbol?
C: Roots.
T: Yes, that's roots sign or roots symbol.

M2-9
T: So, for example, for squared of x minus 2 (x-2) to be the real number, we need what?
S: Uh, x is bigger than four or same (:)
T: Yes, so, x is greater than or equal to four. Or x minus four is greater than or equal to zero.

M2-10
T: So, q is less confusing because it just moves vertically (.) Vertically, that's if q's positive, it moves upwards or if q's negative, it moves downwards.

M2-11
S: Only two are constant in the root.
T: Yes. Two **is** the only constant in the root.

M2-12
T: What kind of expressions does it use?
S: Line(:)
T: Yeah, this function uses a linear expression.

Chen's accounting class (ACC101)

A2-1
L: Accrual means what? You just pay them first and then you get the services, you enjoy the services <> or you just receive the money first and then perform the services.

A2-2
L: Revenue means the money you earn by selling services or products, right?

A2-3
L: That is a sum of explicit cost and accounting profit and...?
S: Dep, depressment?
L: Pretty close. Depreciation.

A2-4
L: You can say accounting profit or financial profit. Or bookkeeping profit, and we will do this part later.
A2-5
L: Take a look at that graph above. What can we see?
C: <>
L: The gradual increase in net income. Again (1) what does net income mean?
S: The income without the expenses ()
L: And if we move onto the next graph…

A2-6
L: This (accounting profit) is a profit (.) to be recorded in a journal so, it can be called bookkeeping profit.

A2-7
L: …and this will eventually make us think about its useful life. This is what depreciation means (.) It's the way we plan how we will spend a part of the revenue each and every year.

A2-8
L: Maybe sometime later, I CANNOT use my car anymore (.) In accounting, we say 'residual value for this care is zero'.

A2-9
L: What does residual value mean here? Anyone?
(silence)
L: That means remained value of an asset or salvage value.

A2-10
L: …net income means the company's total earnings subtracting all the expenses, right?

A2-11
L: On the other hand, depreciation means a decrease in the value of capital stock of a firm or a country.

A2-12
T: So, again, I performed service first and then they will pay me later. I performed services on account. I performed on credit.

A2-13
L: So, any buildings, equipment (.) these are all assets. Assets, the resources you have in your company which will bring you a, a future benefit.

A2-14
L: As you consume, spend () use these assets every year, but they are not like other assets like supplies.

A2-15
L: But for the equipment, you can't just disassemble them. You can't just divide them into pieces, right?

A2-16
L: In accounting, depreciation is defined as the process of allocating, spreading the cost of an asset to expense over its useful life.

A2-17
T: Depreciation is the process of (.) the process of allocating, spreading the cost of an asset to expense over its useful life.

A2-18
L: So, you divide the cost of an asset, let say, by 12, 12 months to make what you have supposed more tangible (.) more, more concrete.

A2-19
T: Also, inventory. Inventory is what? (.) Products in your warehouse, we call them 'inventory'.

A2-20
L: 'Contra' means the opposite way, right? So, we call it 'contra equipment account' or 'accumulated depreciation'.

A2-21
L: 'Contra' means the opposite way, right? So, we call it 'contra equipment account' or 'accumulated depreciation'.

A2-22
L: Again, depreciation means what? The expenses, right?

A2-23
L: Then, how about ACCUMULATED depreciation? To cumulate them all together, add them up altogether, add depreciation over time, right?

A2-24
L: Then, how about ACCUMULATED depreciation? To cumulate them all together, add them up altogether, add up depreciation over time, right?

A2-25
L: Then, how about ACCUMULATED depreciation? To cumulate them all together, add them up altogether, add up depreciation over time, right?

A2-26
L: Because accumulate means collecting something over time, right?

A2-27
L: And then you will see the new word, book value. Book value means? (.) Maybe in the ppt files? It has the definition...

A2-28
L: So, the value of my equipment is $400, right? Another name would be the book value. The book value is $400.

A2-29
L: Book value means the difference between the cost of any depreciable asset and its accumulated depreciation.

Luke's mathematics class (EMT103)
M2-1
L: What is orthogonality? Do you remember what it means? I think I told you guys last week (.) it's to and for. This is the mean value that moves like this () pendulum.

M2-2
L: Do you know what I mean by to and for? It's like going towards this and then returning back.

M2-3
L: The last thing. Itself is...
S: P or F.
L: That's correct. How much p or f, how much power or force do we put in that red?

M2-4
L: So, for this, we use SHM. What is this? What is SHM?
S: Simple <>
L: Please, I can't hear you.
S: Simple harmonic motion.
L: There we go. We use that model to get the frequency and…

M2-5
L: Okay, so, we call this work 'binomial theorem'. Okay? Binomial theorem, binomial expression. Because this prefix (bi-) means two.

M2-6
L: Okay, so, we call this work 'binomial theorem'. Okay? Binomial theorem, binomial expression. Because this prefix (bi-) means two.

M2-7
T: …x equals to A sine (.) what does this A mean? This A here.
S: Amplitude.
T: Yes, amplitude. How do we get the period then?

M2-8
S: …and the derivative of y with response to
T: With respect to x(:)
S: Oh, I see. Y with respect to x is…

M2-9
L: So, what we need to find out is the velocity, the speed, right?

M2-10
L: So, next, we have these two vectors x and y in <> are perpendicular, orthogonal if x times y is…

M2-11
L: Then, what about orthonormal? So, we have these two concepts here. One is orthogonal, and the other is orthonormal. We know what orthogonal is, but what is orthonormal? It will be your homework for today. One hint is (.) you know, ortho- means something erect, straight.

M2-12
L: It will be your homework for today. One hint is (.) you know, ortho- means something erect, straight.